MVP Southgate Project

Docket No. CP19-14-000

October 2019 Supplemental Filing

October 2019

October 2019 Supplemental Filing – Index

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 1 Table Updates

October 2019

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REVISED [Oct 2019] Table 1

Table of Changes to the MVP Southgate Project Workspaces and the Pipeline Route

Tract ID	Modification No.	Reason	Approx. Begin MP	Approx. End MP	Length (miles)	Workspaces and Pipeline Route Description / Justification	Modification Type
VA-PI-002.000	MVP-VRA5-218-1328	Engineering	0	0.1	0.1	Adjusted the centerline of easement ("CL") to be 25 feet away from H-605 pipeline.	CL
VA-PI-092.000 VA-PI-092.100 VA-PI-092.200	MVP-VRR5-214-1049	Environmental	14.2	-	-	Adjusted TA-PI-035 to avoid VA-PI-092.100. Added turning flares to the corners because of the back to back turns.	Access Road
VA-PI-104.100 VA-PI-106.000	MVP-VRA5-228-1631	Land	15.95	-	-	Trimmed additional temporary workspace ("ATWS") 1126 to avoid VA-PI-104.100. Change avoids one landowner.	Workspace
VA-PI-121.000	MVP-VRA5-234-1420	Environmental	17.8	-	-	Trimmed temporary workspace ("TWS") out of environmental buffer.	Workspace
VA-PI-169.000	MVP-VRA5-227-0840	Land	22	-	-	Trimmed a 25-foot x 25-foot area from ATWS 1169 to minimize impacts on septic.	Workspace
VA-PI-174.000	MVP-VRA5-217-1124	Environmental	23.05	-	-	Added neck down for wetland.	Workspace
VA-PI-174.000	MVP-VRA5-217-1125	Environmental	23.15	-	-	Trimmed ATWS 1173G out of environmental buffer.	Workspace
VA-PI-178.000	MVP-VRA5-217-1026	Environmental	23.9	-	-	Trimmed ATWS 1173P out of environmental buffer.	Workspace
NC-RO-006.000	MVP-VRR5-221-1633	Constructability	27.6	27.7	0.1	Adjusted the CL to be parallel to Transco's existing pipelines.	CL
NC-RO-006.000	MVP-VRA5-249-1433	Engineering	28.2	-	-	Adjusted permanent easement to LN 3600 for tie-in.	Facility Site
NC-RO-006.000	MVP-VRA5-249-1435	Engineering	28.2	-	-	Adjusted temporary easement to LN 3600 for tie-in.	Facility Site
NC-RO-006.000	MVP-VRA5-249-1437	Engineering	28.2	-	-	Adjusted PA-RO-000.	Access Road
NC-RO-006.000	MVP-VRA5-262-1208	Engineering	28.2	-	-	Adjusted permanent easement to LN 3600 (for tie-in.	Workspace
NC-RO-011.000	MVP-VRA5-213-1621	Environmental	29.9	-	-	Trimmed ATWS 1247D out of environmental buffer.	Workspace
NC-RO-037.000	MVP-VRA5-246-0901	Environmental	32.1	-	-	Added TWS for typical construction.	Workspace
NC-RO-038.000 NC-RO-038.025 NC-RO-038.050	MVP-VRA5-226-1008	Land	32.4	-	-	Adjusted TA-RO-085 to be 15-feet wide and removed from NC-RO-038.025 and NC-RO-038.030. Added 1-foot property line buffers.	Access Road

REVISED [Oct 2019] Table 1

Table of Changes to the MVP Southgate Project Workspaces and the Pipeline Route

Tract ID	Modification No.	Reason	Approx. Begin MP	Approx. End MP	Length (miles)	Workspaces and Pipeline Route Description / Justification	Modification Type
NC-RO-038.000	MVP-VRA5-246-0922	Environmental	32.5	-	-	Added TWS for typical construction.	Workspace
NC-RO-038.000	MVP-VRA5-246-0935	Environmental	32.5	-	-	Deleted ATWS 1268.	Workspace
NC-RO-061.000	MVP-VRA5-213-1623	Environmental	36	-	-	Trimmed ATWS 1303A out of environmental buffer.	Workspace
NC-RO-112.000	MVP-VRA5-234-1422	Environmental	41.6	-	-	Trimmed ATWS 1369 out of environmental buffer.	Workspace
NC-RO-111.000.RC	MVP-VRA5-234-1423	Environmental	41.6	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-GU-001.000 NC-RO-181.000	MVP-VRA5-234-1532	Environmental	42.4	-	-	Added ATWS 100-feet x 100 feet for stream crossing.	Workspace
NC-RO-117.000 NC-RO-116.000	MVP-VRA5-226-1010	Land	42.4	-	-	Trimmed ATWS 1379B off of NC-RO-116.000. Added 1-foot property line buffer.	Workspace
NC-RO-133.200	MVP-VRA5-213-1627	Environmental	43.8	-	-	Trimmed ATWS 1395 out of environmental buffer.	Workspace
NC-RO-143.000	MVP-VRA5-234-1424	Environmental	46.05	-	-	Added ATWS 100-foot x 100-foot for stream crossing.	Workspace
NC-RO-143.000	MVP-VRA5-234-1426	Environmental	46.1	-	-	Trimmed TWS for environmental neck down	Workspace
NC-RO-143.000	MVP-VRA5-234-1425	Environmental	46.1	-	-	Extended ATWS 1420.	Workspace
NC-RO-143.000	MVP-VRA5-234-1433	Environmental	46.2	-	-	Added ATWS 100-feet wide for stream crossing.	Workspace
NC-RO-143.000	MVP-VRA5-234-1435	Environmental	46.2	-	-	Trimmed TWS for environmental neck down.	Workspace
NC-RO-143.000	MVP-VRA5-234-1530	Environmental	46.25	-	-	Added ATWS 100-feet x 100-feet stream crossing.	Workspace
NC-RO-148.505	MVP-VRA5-217-1031	Environmental	46.7	-	-	Moved ATWS 1426B east to avoid environmental buffer.	Workspace
NC-GU-001.000	MVP-VRA5-234-1531	Environmental	52.35	-	-	Added ATWS 100 feet x 100-feet for stream crossing.	Workspace
NC-GU-001.000	MVP-VRA5-234-1533	Environmental	52.4	-	-	Trimmed TWS for environmental neck down.	Workspace
NC-AL-000.005 NC-RO-186.000	MVP-VRA5-235-1650	Land	52.6	-	-	Deleted TA-RO-146A.	Workspace
NC-AL-000.005	MVP-VRA5-213-1629	Environmental	52.7	-	-	Trimmed ATWS 1480 out of environmental buffer.	Workspace
NC-AL-010.000	MVP-VRA5-234-1536	Environmental	55.3	-	-	Trimmed ATWS 1507D out of environmental buffer.	Workspace
NC-AL-010.000	MVP-VRA5-234-1538	Environmental	55.3	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-010.000	MVP-VRA5-234-1535	Environmental	55.3	-	-	Moved ATWS 1507C out of environmental buffer.	Workspace

REVISED [Oct 2019] Table 1 Table of Changes to the MVP Southgate Project Workspaces and the Pipeline Route							
Tract ID	**Modification No.**	**Reason**	**Approx. Begin MP**	**Approx. End MP**	**Length (miles)**	**Workspaces and Pipeline Route Description / Justification**	**Modification Type**
NC-AL-053.000	MVP-VRA5-211-1439	Landowner Request	59	-	-	Added ATWS 100-feet x 200-feet for point of inflection ("PI") construction.	Workspace
NC-AL-053.000 / NC-AL-055.000 / NC-AL-061.000 / NC-AL-062.000 / NC-AL-063.000 / NC-AL-064.000	MVP-VRA5-211-1436	Landowner Request	59	-	-	Modified workspace and limit of disturbance ("LOD") per landowner request.	Workspace
NC-AL-053.000 / NC-AL-055.000 / NC-AL-061.000 / NC-AL-062.000 / NC-AL-063.000 / NC-AL-064.000	MVP-VRR5-094-0903	Landowner Request	59	59.6	0.6	Modified the CL per landowner request.	CL
NC-AL-055.000	MVP-VRA5-211-1440	Landowner Request	59.2	-	-	Added ATWS 60-feet x 200-feet for PI construction.	Workspace
NC-AL-055.000	MVP-VRA5-211-1442	Landowner Request	59.25	-	-	Added ATWS 100-feet x 200-feet for road crossing.	Workspace
NC-AL-060.000 NC-AL-061.000	MVP-VRA5-211-1443	Landowner Request	59.3	-	-	Added ATWS 100-feet x 100-feet for road crossing.	Workspace
NC-AL-062.000 NC-AL-064.000	MVP-VRA5-211-1445	Landowner Request	59.6	-	-	Deleted ATWS 1552.	Workspace
NC-AL-074.000	MVP-VRA5-234-1539	Environmental	60.8	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-077.000	MVP-VRA5-234-1542	Environmental	61.3	-	-	Added ATWS 100-feet x 100-feet for stream crossing.	Workspace
NC-AL-077.000	MVP-VRA5-234-1543	Environmental	61.3	-	-	Trimmed TWS for environmental neck down.	Workspace
NC-AL-077.000	MVP-VRA5-234-1551	Environmental	61.35	-	-	Added ATWS 100-feet x 100-feet for stream crossing.	Workspace
NC-AL-077.000	MVP-VRA5-234-1552	Environmental	61.35	-	-	Deleted ATWS 1562.	Workspace
NC-AL-103.000	MVP-VRA5-234-1553	Environmental	63.8	-	-	Trimmed ATWS 1584 out of environmental buffer.	Workspace

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NC-AL-103.000 / NC-AL-104.000	MVP-VRA5-234-1555	Environmental	63.9	-	-	Trimmed ATWS 1587 out of the environmental buffer.	Workspace
NC-AL-104.000	MVP-VRA5-234-1556	Environmental	63.9	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-106.000	MVP-VRA5-234-1557	Environmental	64.1	-	-	Revised ATWS.	Workspace
NC-AL-106.000	MVP-VRA5-234-1559	Environmental	64.1	-	-	Deleted ATWS 1587B.	Workspace
NC-AL-106.000	MVP-VRA5-234-1601	Environmental	64.1	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-106.000	MVP-VRA5-234-1600	Environmental	64.1	-	-	Trimmed ATWS 1587C out of environmental buffer.	Workspace
MVF-NC-AL-007.000 MVF-NC-AL-010.000	MVP-VRR5-107-0843	Landowner Request	64.8	65.05	0.25	Modified the CL per landowner request.	CL
MVF-NC-AL-007.000	MVP-VRA5-207-1532	Landowner Request	64.8	-	-	Adjusted ATWS 1588E 100-feet x 250-feet.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1529	Landowner Request	64.8	-	-	Modified workspace and LOD per landowner request.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1533	Landowner Request	64.9	-	-	Added ATWS for PI construction and stream crossing.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1536	Landowner Request	65	-	-	Added ATWS 100-feet x 260-feet for PI construction and stream crossing.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1539	Environmental	65.05	-	-	Trimmed TWS for environmental neck down.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1542	Environmental	65.1	-	-	Trimmed TWS for environmental neck down.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1540	Environmental	65.1	-	-	Added ATWS 100-feet wide for stream crossing.	Workspace
MVF-NC-AL-007.000	MVP-VRA5-207-1543	Environmental	65.15	-	-	Extended ATWS 1588FF to the edge of the neck down.	Workspace
FA3-AL-009.000	MVP-VRA5-248-1445	Land	66.55	-	-	Adjusted ATWS 1588V.	Workspace
FA3-AL-009.000 NC-AL-127.000 NC-AL-128.000 NC-AL-129.000 NC-AL-131.000 NC-AL-132.000 NC-AL-	MVP-VRR5-248-1439	Land	66.55	-	-	Adjusted TWS out of the environmental buffer. Adjusted TWS to be 25-feet away from the base of the electric tower.	Workspace

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Tract ID	**Modification No.**	**Reason**	**Approx. Begin MP**	**Approx. End MP**	**Length (miles)**	**Workspaces and Pipeline Route Description / Justification**	**Modification Type**
133.000 NC-AL-134.000 NC-AL-135.000 NC-AL-136.000 NC-AL-137.000							
NC-AL-127.000	MVP-VRA5-234-1603	Environmental	66.6	-	-	Trimmed TWS and ATWS 1588U1 out of environmental buffer.	Workspace
FA3-AL-009.000	MVP-VRA5-248-1446	Land	66.6	-	-	Added ATWS 100-feet x 200-feet.	Workspace
FA3-AL-009.000 NC-AL-127.000	MVP-VRA5-234-1604	Environmental	66.65	-	-	Trimmed TWS out of environmental buffer.	Workspace
FA3-AL-009.000	MVP-VRA5-248-1447	Land	66.65	-	-	Added ATWS 100-feet x 100-feet for stream crossing. Added a 1-foot property line buffer.	Workspace
FA3-AL-009.000 NC-AL-127.000 NC-AL-128.000 NC-AL-129.000 NC-AL-131.000 NC-AL-132.000 NC-AL-133.000 NC-AL-134.000 NC-AL-135.000 NC-AL-136.000 NC-AL-137.000	MVP-VRR5-248-1443	Land	66.65	67.6	0.95	Adjusted CL to be further away from the Martin Marietta Materials Inc. property line.	CL
FA3-AL-009.000	MVP-VRA5-248-1448	Land	66.7	-	-	Added ATWS 100-feet wide for stream crossing with 1-foot property line buffer.	Workspace
NC-AL-127.000 NC-AL-129.000	MVP-VRA5-248-1449	Land	66.8	-	-	Added ATWS for PI construction with 1-foot property line buffer.	Workspace
NC-AL-129.000	MVP-VRA5-248-1451	Land	66.9	-	-	Added ATWS 1588Y around PI 100-feet x 200-feet.	Workspace

REVISED [Oct 2019] Table 1 Table of Changes to the MVP Southgate Project Workspaces and the Pipeline Route							
Tract ID	**Modification No.**	**Reason**	**Approx. Begin MP**	**Approx. End MP**	**Length (miles)**	**Workspaces and Pipeline Route Description / Justification**	**Modification Type**
NC-AL-129.000	MVP-VRA5-248-1453	Land	67	-	-	Added ATWS for PI construction.	Workspace
NC-AL-131.000	MVP-VRA5-248-1457	Land	67.05	-	-	Added ATWS 100-feet x 100-feet for PI construction.	Workspace
NC-AL-131.000	MVP-VRA5-234-1606	Environmental	67.1	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-131.000	MVP-VRA5-248-1504	Land	67.1	-	-	Adjusted ATWS 1588Y2 to be 100-feet wide.	Workspace
NC-AL-131.000	MVP-VRA5-248-1505	Land	67.11	-	-	Added ATWS to stay 25-feet away from electric tower base.	Workspace
NC-AL-132.000	MVP-VRA5-248-1506	Land	67.2	-	-	Added ATWS for stream crossing with 1-foot property line buffer.	Workspace
NC-AL-132.000	MVP-VRA5-248-1508	Land	67.2	-	-	Trimmed ATWS 1588Y3 to compensate for current CL.	Workspace
NC-AL-132.000	MVP-VRA5-248-1509	Land	67.25	-	-	Added ATWS 100-feet x 100-feet for stream crossing.	Workspace
NC-AL-133.000 NC-AL-134.000	MVP-VRA5-248-1510	Land	67.4	-	-	Added ATWS 100-feet x 200-feet for PI construction.	Workspace
NC-AL-133.000 NC-AL-136.000 NC-AL-137.000	MVP-VRA5-248-1511	Land	67.5	-	-	Adjusted ATWS 1588Z1 100-feet x 200-feet.	Workspace
NC-AL-136.000 NC-AL-137.000	MVP-VRA5-234-1607	Environmental	67.6	-	-	Deleted ATWS 1619B.	Workspace
NC-AL-139.000	MVP-VRA5-234-1609	Environmental	67.9	-	-	Added ATWS for stream crossing.	Workspace
NC-AL-139.000	MVP-VRA5-234-1610	Environmental	67.9	-	-	Trimmed TWS for environmental neck down.	Workspace
NC-AL-140.000 NC-AL-141.000	MVP-VRA5-234-1611	Environmental	68.1	-	-	Moved ATWS 1623 north out of environmental buffer.	Workspace
NC-AL-142.000	MVP-VRA5-234-1614	Environmental	68.1	-	-	Trimmed ATWS 1624 out of environmental buffer.	Workspace
NC-AL-142.000	MVP-VRA5-234-1612	Environmental	68.1	-	-	Moved ATWS 1623A south out of environmental buffer.	Workspace
NC-AL-142.000	MVP-VRA5-234-1615	Environmental	68.1	-	-	Trimmed TWS out of environmental buffer.	Workspace
NC-AL-144.000 NC-AL-145.000	MVP-VRA5-226-1011	Land	68.5	-	-	Trimmed TWS and ATWS 1635 at driveway and provided a 5-foot buffer.	Workspace
NC-AL-144.000	MVP-VRA5-212-1139	Landowner Request	68.6	-	-	Adjusted ATWS 1636 to avoid barn and large tree.	Workspace

REVISED [Oct 2019] Table 1

Table of Changes to the MVP Southgate Project Workspaces and the Pipeline Route

Tract ID	Modification No.	Reason	Approx. Begin MP	Approx. End MP	Length (miles)	Workspaces and Pipeline Route Description / Justification	Modification Type
NC-AL-148.000	MVP-VRA5-213-1630	Environmental	68.8	-	-	Trimmed ATWS 1641 out of environmental buffer.	Workspace
NC-AL-148.000	MVP-VRA5-213-1631	Environmental	68.9	-	-	Trimmed ATWS 1645 out of environmental buffer.	Workspace
NC-AL-149.000 NC-AL-150.000	MVP-VRA5-246-0946	Environmental	69.05	-	-	Added TWS for road bore.	Workspace
NC-AL-166.000 NC-AL-167.000 NC-AL-165.000	MVP-VRA5-212-1140	Landowner Request	69.5	-	-	Deleted TA-AL-187 and the ATWS pull offs.	Access Road
NC-AL-188.000	MVP-VRA5-246-0948	Environmental	70.5	-	-	Added TWS for typical construction.	Workspace
NC-AL-191.000	MVP-VRA5-213-1633	Environmental	71.05	-	-	Trimmed ATWS 1675 out of environmental buffer.	Workspace
NC-AL-194.000	MVP-VRA5-249-1101	Landowner Request	71.9	72	0.1	Adjusted the CL to avoid large tree.	CL
NC-AL-194.000	MVP-VRA5-249-1103	Landowner Request	71.9	-	-	Adjusted the workspace to avoid large tree, keep workspace 90-feet away from the tree canopy.	Workspace
NC-AL-207.000	MVP-VRA5-248-1354	Constructability	72.9	-	-	Trimmed TWS to avoid mobile home.	Workspace
NC-AL-210.000	MVP-VRA5-221-1540	Land	73.17	-	-	Gave the property line a 1-foot buffer.	Workspace
VA-PI-142.200	MVP-VRA5-218-1533	Environmental	CY-03	-	-	Trimmed Contractor Yard (“CY”)-03 out of environmental buffer.	Yard
VA-PI-142.200	MVP-VRA5-218-1534	Environmental	CY-03	-	-	Trimmed CY-03 out of environmental buffer.	Yard
NC-RO-001.300	MVP-VRA5-218-1536	Environmental	CY-05	-	-	Trimmed CY-05 out of environmental buffer.	Yard
NC-RO-001.300 NC-RO-001.400	MVP-VRA5-218-1537	Environmental	CY-05	-	-	Trimmed CY-05 out of environmental buffer.	Yard
	MVP-VRA5-212-1129	Land	CY-25A	-	-	Deleted TA-CA-105D.	Access Road
NC-CA-001.000	MVP-VRA5-213-1129	Land	CY-25A	-	-	Deleted TA-CA-105A.	Access Road
NC-CA-001.000	MVP-VRA5-213-1134	Land	CY-25A	-	-	Deleted TA-CA-105B.	Access Road
NC-CA-001.000	MVP-VRA5-213-1135	Land	CY-25A	-	-	Deleted TA-CA-105C.	Access Road
NC-CA-001.000	MVP-VRA5-213-1136	Land	CY-25A	-	-	Deleted CY-25A.	Yard
NC-CA-001.000	MVP-VRA5-225-1110	Constructability	CY-25B	-	-	Reduced size of CY-25B to approx. 25 acres.	Yard
NC-AL-226 NC-AL-227	MVP-VRA5-218-1540	Environmental	CY-26	-	-	Trimmed CY-26 out of environmental buffer.	Yard
NC-AL-226 NC-AL-227	MVP-VRA5-218-1542	Environmental	CY-26	-	-	Trimmed CY-26 out of environmental buffer.	Yard

REVISED [Oct 2019] - Table 1.2-1 MVP Southgate Project Pipeline Facilities			
Approximate Milepost[a/]	**Pipeline / Diameter**	**County, State**	**Approximate Length (miles)**
0.0 – 0.5	H-605 Pipeline / 24-inch	Pittsylvania, VA	0.5
0.0RR – 26.1	H-650 Pipeline/ 24-inch	Pittsylvania, VA	26.4
26.1 – 30.4	H-650 Pipeline / 24-inch	Rockingham, NC	4.4
30.4 – 52.6	H-650 Pipeline / 16-inch	Rockingham, NC	22.4
52.6 – 73.2RR	H-650 Pipeline / 16-inch	Alamance, NC	21.5
Total (H-605 and H-650 pipelines)[b/]			**75.1**

a/ Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

b/ Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits. The H-650 pipeline length is longer than the end milepost due to incorporation of equations along re-routes to maintain the original Project mile-posting.

NO CHANGE - Table 1.2-2 MVP Southgate Project Aboveground Facilities					
Compressor Station					
Facility	**Approximate Milepost a/**	**County, State**	**Nominal HP**	**Suction PSIG**	**Discharge PSIG**
Lambert Compressor Station	0.0RR	Pittsylvania, VA	28,915	780	900
Pig Launchers/Receivers					
Launcher/Receiver		**Approximate Milepost a/**	**Associated Facility**		
Pig Launcher		0.0RR	Lambert Compressor Station		
Pig Receiver		30.4	T-15 Dan River Interconnect		
Pig Launcher		30.4	T-15 Dan River Interconnect		
Pig Receiver		73.2RR	T-21 Haw River Interconnect		
Meter Stations			Approximate Milepost a/		
Lambert Interconnect			0.0RR		
LN 3600 Interconnect			28.2		
T-15 Dan River Interconnect			30.4		
T-21 Haw River Interconnect			73.2RR		

a/ Mileposts are on the H-650 pipeline.

Note: Southgate Project Mainline Valve Locations are shown on Table 1.2-3. Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

REVISED [Oct 2019] - Table 1.2-3 MVP Southgate Project Mainline Valve Locations a/		
Name	**County, State**	**Approximate Milepost Location b/**
MLV 1 / Lambert Compressor Station & Interconnect	Pittsylvania, VA	0.0RR
MLV 2	Pittsylvania, VA	7.4
MLV 3	Pittsylvania, VA	18.3
MLV 4 / T-15 Dan River Interconnect	Rockingham, NC	30.4
MLV 5	Rockingham, NC	42.2
MLV 6	Alamance, NC	55.1
MLV 7	Alamance, NC	68.7
MLV 8 / T-21 Haw River Interconnect	Alamance, NC	73.2RR

a/ Mainline Valves ("MLV's") will be 30 feet by 30 feet in area and will be wholly contained within the permanent right-of-way. Mainline valves at the Lambert Compressor Station / Interconnect, the T-15 Dan River Interconnect, and T-21 Haw River Interconnect will be located within the fence line of those facilities.
b/ Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

REVISED [Oct 2019] - Table 1.3-1 Land Requirements for the MVP Southgate Project Pipeline/Associated Workspace		
Facility	**Land Required for Construction (acres)**	**Land Required for Operation (acres)**
H-605 Pipeline a/	5.3	2.6
H-650 Pipeline a/	861.3	429.0
Additional Temporary Workspace	292.9	0.0
Cathodic Protection	1.8	1.8
Contractor Yards	174.8	0.0
Access Roads b/	99.5	5.7
Total Project Pipeline / Associated Workspace c/	**1,435.6**	**439.1**

a/ Acreage based on 100-foot construction right-of-way and 50-foot permanent right-of-way.
b/ Acreage based on a 25-foot road width for temporary and permanent access roads. Includes access roads for aboveground facilities.
c/ Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

REVISED [Oct 2019] Table 1.3-2 Land Requirements for the MVP Southgate Project Aboveground Facilities			
Facility Name	**Approximate MP**	**Land Required for Construction (acres)**	**Land Required for Operation (acres)**
Compressor Station			
Lambert Compressor Station / MLV 1	0.0RR	19.1	8.6
Meter Stations			
Lambert Interconnect a/	0.0RR	0.0	0.0
LN 3600 Interconnect	28.2 RR	4.6	0.9
T-15 Dan River Interconnect / MLV 4	30.4	5.2	0.8
T-21 Haw River Interconnect / MLV 8	73.2 RR	1.3	0.6
Pig Launcher/Receiver b/			
Mainline Valves			
MLVs 2, 3, 5, 6, 7	Various c/	0.1	0.1
Total d/	**---**	**30.3**	**10.9**

Note: MPs are on the H-650 pipeline. Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment. Impact calculations do not include associated access roads.

a/ The Lambert Interconnect will be within the Lambert Compressor Station site; therefore, acreage calculations for the Lambert Interconnect are included with the Lambert Compressor Station.

b/ Pig launchers will be within aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreages calculations for the pig launchers and receivers are included with those facilities.

c/ See Table 1.2-3 for milepost locations of mainline valves ("MLV"). The land required for MLVs 2, 3, 5, 6, and 7 has been pulled out of the land requirements for pipeline operation (i.e., there is no overlap in acres for these facilities).

d/ Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

REVISED [Oct 2019] Table 1.3-4

Contractor Yards along the MVP Southgate Project Pipeline

Name	Type	Approx. MP	County	State	Municipality	Parcel	Current Landowner Status	Land Use a/	Total Acres	Justification for forest clearing
CY-01	Contractor Yard / Laydown Yard	0.0 on H-605	Pittsylvania	VA	Chatham	VA-PI-001.000	MVP owned property; environmental survey complete	OL	22.0 (Forest to be cleared 0.0)	Not Applicable
CY-03	Contractor Yard / Laydown Yard	13 miles East of 20.5	Pittsylvania	VA	Danville	VA-PI-142.200.CY	VA-PI-142.200.CY - Survey permission granted; environmental survey complete	FW, OL, CI	16.8 (Forest to be cleared 0.1)	Needed for staging and storage of pipe and equipment. The property is developed with a manufacturing building and is zoned (M-1) Industrial District, Light Industry.
CY-05	Contractor Yard / Laydown Yard	3.6 miles West of 28.3	Rockingham	NC	Eden	NC-RO-001.200.CY NC-RO-001.300.CY NC-RO-001.400.CY	Survey permission granted; environmental survey complete	CI, OL	18.3	Not applicable
CY-08	Contractor Yard / Laydown Yard	2.9 miles West of 44.6	Rockingham	NC	Reidsville	NC-RO-136.100.CY NC-RO-136.300.CY	Survey permission granted; environmental survey complete	OL, CI	11.5	Not applicable
CY-19	Contractor Yard / Laydown Yard	1.9 miles northwest of 24.7	Pittsylvania	VA	Cascade	VA-PI-207	Survey permission granted; environmental survey complete	OL	36.2	Not applicable
CY-22	Contractor Yard / Laydown Yard	1.9 miles northwest of 16.1	Pittsylvania	VA	--	VA-PI-218.CY	Survey permission granted; environmental survey complete	FW, OL	23.1 (Forest to be cleared 2.9)	Needed for staging and storage of pipe, materials, equipment and possible contractor work area. The yard is part of a larger, previously disturbed roadside parcel. The remaining trees to be cleared are patchy, do not consist of interior forest, and are vulnerable to windthrow.

REVISED [Oct 2019] Table 1.3-4

Contractor Yards along the MVP Southgate Project Pipeline

Name	Type	Approx. MP	County	State	Municipality	Parcel	Current Landowner Status	Land Use a/	Total Acres	Justification for forest clearing
CY-25	Contractor Yard / Laydown Yard	12.3 miles east of 38.9	Caswell	NC	Yanceyville	NC-CA-001.000.CY	Survey permission granted; environmental survey complete	FW, OL	24.9 (Forest to be Cleared <0.01)	Forest clearing reduced from 0.3 acre to <0.01. Needed for staging and storage of pipe, materials, equipment and possible contractor work area The yard is located in a previously disturbed / harvested area with a network of logging access trails. Remaining trees are patchy, do not consist of interior forest, and are vulnerable to windthrow.
CY-26A	Contractor Yard / Laydown Yard	2.4 miles east of 71.7	Alamance	NC	Swepsonville	NC-AL-226.CY NC-AL-227.CY	Survey permission granted; environmental survey complete	OL	11.8	Not applicable
CY-26B	Contractor Yard / Laydown Yard	2.4 miles east of 71.7	Alamance	NC	Swepsonville	NC-AL-226.CY NC-AL-227.CY	Survey permission granted; environmental survey complete	FW, OL	10.3 (Forest to be cleared 0.2)	Needed for staging and storage of pipe, materials, equipment and possible contractor work area The yard is located in a previously cleared area with signs of gravel extraction, remaining trees are patchy, do not consist of interior forest, and are vulnerable to windthrow.
								Total	**174.8 (Forest to be cleared 3.2)**	

a/ CI = Commercial / Industrial; FW = Upland Forest / Woodland; OL = Upland Open Land

REVISED [Oct 2019] - Table 1.4-1

Construction Spreads for the MVP Southgate Project

Spread	Facility	Begin MP	Ending MP	Spread Length (Miles)	Construction Year	Peak Workforce	Average Workforce
1	H-605 Pipeline	0.0	0.5	0.5	2020	300	185
1	H-650 Pipeline	0.0	30.4	30.8	2020		
2	H-650 Pipeline	30.4	73.2RR	43.9	2020	385	200

REVISED [Oct 2019] - Table 1.7-1 Anticipated Permits and Consultations for the MVP Southgate Project			
Agency	**Permit/ Approval/ Consultation a/**	**Submittal Date or Anticipated Submittal/ Initiation Date**	**Anticipated Permit Receipt/ Completion Date**
Federal			
Federal Energy Regulatory Commission	Natural Gas Act, Section 7; Certificate for construction and operation of interstate natural gas pipeline.	Submitted November 6, 2018	March 2020
U.S. Army Corps of Engineers Norfolk District Wilmington District	Section 404 Permit for impacts on waters of the U.S., including wetlands	Submitted November 30, 2018	May 2020
U.S. Fish and Wildlife Service Virginia North Carolina	Consultation under Section 7 of ESA for potential impacts on federally protected species Consultation regarding impacts on migratory birds and eagles	May 2018	May 2020
Virginia			
Virginia Department of Historic Resources, Division of Review and Compliance ("SHPO")	Consultation and clearance regarding potential impacts on pre-historic and historic resources eligible for listing on the National Register of Historic Places	May 2018	March 2020
Virginia Marine Resources Commission	Permit for encroachment to state-owned subaqueous lands	November 30, 2018	May 2020
Virginia Department of Environmental Quality ("VDEQ"), Water Division	Section 401 Water Quality Certification and Water Protection Permit for impacts to non-404 regulated wetlands or waters	November 30, 2018	May 2020 (Automatic under Nationwide Permit 12)
VDEQ, Water Division	Virginia Pollution Discharge Elimination System (VPDES) permit for discharge of construction stormwater	March 2019	December 2019
VDEQ, Water Division	General Permit No. VAG83 (Petroleum Contaminated Sites, Groundwater Remediation and Hydrostatic Tests GP	Covered under General Permit Conditions	
VDEQ, Air Division	VADEQ Article 6 Minor New Source Air Quality Permit	November 8, 2018	March 2020
Virginia Department of Conservation and Recreation, Division of Natural Heritage	Consultation for state threatened and endangered species	May 2018	November 2019
Virginia Department of Game and Inland Fisheries	Consultation for state protected wildlife species	May 2018	November 2019
Virginia Department of Transportation	Road bonds and crossing permits	August 2019	December 2019
North Carolina			

REVISED [Oct 2019] - Table 1.7-1 Anticipated Permits and Consultations for the MVP Southgate Project			
Agency	**Permit/ Approval/ Consultation a/**	**Submittal Date or Anticipated Submittal/ Initiation Date**	**Anticipated Permit Receipt/ Completion Date**
North Carolina Department of Environmental Quality ("NCDEQ"), Division of Water Resources	401 Water Quality Certification, Isolated/non-404 wetlands and water permit	November 30, 2018	January 2020
North Carolina Department of Environmental Quality ("NCDEQ"), Division of Water Resources	Jordan Lake Watershed Major Variance	February 8, 2018	January 2020
NCDEQ, Division of Energy, Mineral and Land Resources	General Permit NCG010000 to discharge stormwater under the NPDES for Construction Activities	April 2019	December 2019
NCDEQ, Natural Heritage Program	Consultation for state threatened and endangered species	May 2018	November 2019
North Carolina Wildlife Resources Commission	Consultation for state threatened and endangered species	May 2018	November 2019
North Carolina Department of Cultural Resources ("SHPO")	Consultation and clearance regarding potential impacts on pre-historic and historic resources eligible for listing on the National Register of Historic Places	May 2018	March 2020
North Carolina Department of Transportation	Road bonds and crossing permits	June 2019	December 2019
a/ Consultations will occur continuously throughout the development of the Project.			

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Energy Projects														
Reidsville Energy Center NCUC EMP-92, Sub 0	Total Project: 20 acres (forest land)	N/A	N/A	N/A	NTE Energy is developing and plans to construct, own and operate the Reidsville Energy Center, an approximately 500 MW natural gas electric generating facility in Rockingham County, North Carolina.	Rockingham, NC	N/A	N/A	81.150 Northern Piedmont	12 miles	West	Construction to start Summer 2019, pending financing Projected commercial operation date is October 1, 2021, with expected final completion date of January 1, 2022	Air Quality (Operation), Socioeconomics	FERC, State and Local (NCDEQ Air Permit receive, USACE Nationwide Permit received, NCDEQ Section 401 WQC received)
Virginia Southside Expansion FERC Docket CP13-30 b/	Total Project Acres: (Construction / Operation) 1,454 / 119 Wetland acres: (Construction / operation): PEM 24.9 / 0.3; PSS 3.3 / 0.0; PFO 23.3 / 4.5 Upland Forest acres (Construction / Operation): 482 / 89	17.1 acres Construction / 14.1 acres operation (including CS 166 and pipeline right-of-way within one-mile of the Southgate Project)	18 acres (Cherrystone Creek – Banister River) 63.2 acres (Stinking River – Banister River)	18 acres (Cherrystone Creek) 58 acres (Shockoe Creek – Banister River)	100 miles of new 24-inch diameter pipeline extending from the Transco mainline in Pittsylvania County, Va., and into Halifax, Charlotte, Mecklenburg, and terminating in Brunswick County, Va. Also construction of a 21,800 horsepower compressor station in Pittsylvania County, VA.	Pittsylvania County, VA	Cherrystone Creek-Banister River, Stinking River-Banister River	Cherrystone Creek Shockoe Creek-Banister River	81.143 Central Virginia	0 miles (PA-PI-001A)	North (CS 166)	In-service September 2015	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics	FERC, State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Transco Southeastern Trail FERC Docket CP18-186 c/	Total Project acres (construction / operation): 466 / 42.6 Station 165 only: 82.1 acres construction / 10.0 acres operation Upland Forest Acres (construction / operation): 66.6 / 12.5 Wetland acres (construction / Operation): PEM 1.0 / 0.2, PFO 1.0 / 0.4	Station 165: 63.4 acres for construction / 10.0 acres for operation	19.2 acres (Cherrystone Creek – Banister River) 62.9 acres (Stinking River – Banister River)	19.2 acres (Cherrystone Creek) 62.9 acres (Shockoe Creek – Banister River)	Transco Southeastern Trail expansion project will consist of 7.7 miles of 42-in. pipeline looping facilities in Virginia, horsepower additions at existing compressor stations in Virginia, and piping and valve modifications on other existing facilities in South Carolina, Georgia, and Louisiana to allow for bidirectional flow. Compressor Station 165 upgrade in Chatham, VA within Pittsylvania County, VA.	Various; Pittsylvania County, VA	Cherrystone Creek-Banister River Stinking River – Banister River	Cherrystone Creek Shockoe Creek – Banister River	81.143 Central Virginia	0 miles (PA-PI-001A and PA-PI-001C)	Northeast (CS 165)	FERC Application Filed April 2018; Construction to start August 2019; Transco anticipates in-service in November 2020	Soils and Geology, Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics	FERC, State and Local
Mountain Valley Pipeline FERC Docket CP16-10	Total Project acres (construction / operation): 6,363.4 / 2,117.8 Wetland acres (construction / operation): PEM 23.9 / 0.8; PSS 2.5 / 2.5; PFO 4.6 / 4.6 Upland forest acres (construction / operation): 4,453.1 / 1,596.9	49.8 acres construction / 8.7 acres operation	182.3 acres (Cherrystone Creek – Banister River) 49.3 acres (Stinking River – Banister River)	182.3 acres (Cherrystone Creek) 15.5 acres (Shockoe Creek – Banister River)	Natural gas pipeline system that spans approximately 303 miles from northwestern West Virginia to southern Virginia	Various; ends at Pittsylvania, VA	Cherrystone Creek-Banister River (2 perennial stream crossings and 1 intermittent stream crossing in common with the Project) Stinking River-Banister River	Cherrystone Creek (2 perennial stream crossings, and one intermittent stream crossing in common with the Project) Shockoe Creek-Banister River	81.143 Central Virginia	0 miles	Overlaps	Under Construction; 2019 In-Service Date anticipated fourth quarter 2019	Soils and Geology, Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics	FERC, State and Local
Solar Projects														
Sigora Solar NCUC SP 15803	N/A (no ground disturbance)	N/A	N/A (no ground disturbance)	N/A (no ground disturbance)	7.44 kW residential rooftop installation – 2144 Waterview Drive, Graham, NC 27253	Alamance, NC	Back Creek – Haw River	Boyds Creek Haw River	81.150 Northern Piedmont	1.5 miles	Southeast	Application filed 2019	No impact anticipated, no ground disturbance proposed	State and Local

REVISED [Oct 2019] - Table 1.10-2 Projects with Potential Cumulative Impacts														
Project	**Acres Affected a/, b/, c/**	**NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/**	**HUC 10 Acres (in Shared HUC 10) a/, b/, c/**	**HUC 12 Acres (in Shared HUC 12) a/, b/, c/**	**Description**	**County/ State**	**Shared Watershed (5th Level/ HUC10)**	**Shared Watershed (Level/HUC12)**	**Shared Air Quality Control Region**	**Approximate Distance from Project**	**Direction**	**Status**	**Cumulative Resources potentially within the Geographic Scope**	**Potential Permits**
Kimrey Road Solar NCUC SP 16880	N/A (no ground disturbance)	N/A	N/A (no ground disturbance)	N/A (no ground disturbance)	7.6 kilowatt (AC) residential rooftop installation - Kimrey Road Solar – 1900 Kimrey Road, Haw River, NC	Alamance, NC	Back Creek – Haw River	Lower Back Creek	81.150 Northern Piedmont	1.5 miles	East	In Development; Application filed 2016. Pending intent to construct approval	No impact anticipated, no ground disturbance proposed	State and Local
Southwick Solar Farm, LLC NCUC SP 7968	Total Project: 26 acres (Agricultural Land)	N/A	N/A	N/A	4,000 MW (AC) Solar photovoltaic electric generation facility - Southwick Solar Farm – 3110 Boywood Road, Graham, NC	Alamance, NC	N/A	N/A	81.150 Northern Piedmont	2.5 miles	South	Application filed 2017; pending planning site review	Air Quality (Operation), Socioeconomics	Federal, Stata and Local
Woodgriff Solar Farm NCUC SP 7992	Total Project: 38 acres Upland Forest: 10 acres	N/A	38 acres	38 acres	4,000 MW (AC) Solar photovoltaic electric generation facility - Woodgriff Solar Farm, 221 Southern High School Road, Graham NC	Alamance, NC	Big Alamance Creek	Lower Little Alamance Creek	81.150 Northern Piedmont	3.2 miles	Southwest	Intent to construct permit expires June, 2019	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local
Cypress Creek Renewables Solar Farm - Williamsburg Solar, LLC NCUC SP 11809	Total Project: 341 acres Upland Forest: 229 acres	248 acres (construction and operation)	341 acres	147 acres (Giles Creek Haw River) 182 acres (Town of Altamahaw – Haw River)	Cypress Creek Renewables Williamsburg Solar, LLC 174,000 MW 600 acre solar farm. Adjacent to Project at MP 50	Rockingham, NC	Headwaters Haw River	Giles Creek Haw River Town of Altamahaw-Haw River	81.150 Northern Piedmont	0 miles	East/West	Permitted; Construction to begin in 2019	Soils and Geology, Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics	Federal, State and Local
Husky Solar Farm - Husky Solar, LLC NCUC SP 2848	Total Project: 29 acres (Commercial / Industrial Land)	24 acres (construction and operation)	29 acres	29 acres	Husky Solar Farm, a 7.02 megawatt DC solar photovoltaic facility located on both sides of North Carolina Highway 87 adjacent to Project at MP 49	Rockingham, NC	Headwaters Haw River	Giles Creek-Haw River	81.150 Northern Piedmont	0 miles	North/South	In operation; Permitted prior to 2015	Soils and Geology, Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics	Federal, State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Gallant Solar Farm NCUC SP 10241	Total Project: 276 acres Upland Forest: 35 acres	N/A	276 acres	N/A	45,000 MW (AC) PV array – Koger Road and Meadow Branch Road, Reidsville, NC	Rockingham, NC	Headwaters Haw River	N/A	81.150 Northern Piedmont	10 miles	West	The projected in-service date is 6/1/2019 Annual Certification issued 4/2/2019	Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local
Washington Solar NCUC SP 6053	Total Project: 30 acres Upland Forest: 10 acres	N/A	30 acres	N/A	5.0 MW (AC) PV array - South side of US Route 158 in Reidsville, NC	Rockingham, NC	Headwaters Haw River	N/A	81.150 Northern Piedmont	13 miles	West	The projected in-service date was December 2016 – no constructed facility visible on aerials – timeframe unknown. Annual Certification issued 4/1/2016, 3/17/2017, 3/23/2018, and 3/21/2019	Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local
Old Road Solar NCUC SP 6991	Total Project: 18 acres Upland Forest: 8.5 acres	N/A	18 acres	N/A	4.99 MW (AC) system - Off Mt. Herman Church Road	Rockingham, NC	Cascade Creek – Dan River	N/A	81.150 Northern Piedmont	8 miles	East	The projected in-service date was October 15, 2016 – no constructed facility visible on aerials – timeframe unknown. Annual Certification issued 3/16/2018	Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local
Green Level-Charles Drew Solar Energy Farm NCUC SP 13214	Total Project: 5 acres Upland Forest	2.5 acres (construction and operation)	5 acres	5 acres	5 MW PV array – 1248 Yanceyville Road, Green Level, NC	Alamance, NC	Back Creek – Haw River	Boyds Creek – Haw River	81.150 Northern Piedmont	0.9 mile	East	The projected in-service date was March 30, 2019 Application filed 8/24/2018	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics, Environmental Justice	Federal, State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Osceola Solar Project NCUC SP 7976	Total Project: 70 acres Upland Forest: 16 acres	N/A	70 acres	70 acres	4.9 MW (AC) System – 3935 Osceola Road, Elon, NC	Alamance, NC	Headwaters Haw River	Town of Altamahaw – Haw River	81.150 Northern Piedmont	1.8 mile	West	The projected in-service date was September 1, 2017 – no constructed facility visible on aerials – timeframe unknown. Annual Certification issued 3/30/2017, 3/16/2018, and 4/1/2019	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local
Bakatsias Solar Farm NCUC SP 7457	Total Project: 24 acres Upland Forest: 8.4 acres	5.5 acres (construction and operation)	24 acres	24 acres	4.9 MW (AC) System – 150 Kronbergs Ct. Haw River, NC	Alamance, NC	Back Creek – Haw River	Lower Back Creek	81.150 Northern Piedmont	0.4 mile	East	Constructed; Amended Certificate issued 11/6/2017	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics, Environmental Justice	Federal, State and Local
Norris Solar Farm NCUC SP 7785	Total Project: 24 acres Upland Forest: 21.5 acres	N/A	24 acres	24 acres	5.0 MW (AC) solar PV system – 1865 US 70 Highway, Mebane, NC	Alamance, NC	Back Creek – Haw River	Lower Back Creek	81.150 Northern Piedmont	1.9 mile	East	The projected in-service date was 12/31/2017- no constructed facility visible on aerials – timeframe unknown. Annual Certification issued 4/13/2017 and 1/9/2018	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	Federal, State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Necal Solar Farm NCUC SP 8039	Total Project: 42 acres Upland Forest (pine plantation)	N/A	42 acres	N/A	5.0 MW (AC) Solar PV System – South of NC Highway 49, Pleasant Grove, NC	Alamance, NC	Back Creek – Haw River	Quaker Creek – Quaker Creek Reservoir	81.150 Northern Piedmont	5.3 miles	Northeast	The projected in-service date was August 2017 - no constructed facility visible on aerials – timeframe unknown. Annual Certification issued 5/30/2018	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Waters, Air Quality (Operation), Socioeconomics	Federal, State and Local
Whitehorn Solar, LLC	700 acres	N/A	700 acres	700 acres	50.0 MW (AC) Solar PV System – East of Route 29 and sotheast of the town of Gretna, VA.	Pittsylvania County, VA	Stinking River – Banister River	N/A	81.143 Central Virginia	8 miles	North	NOI submitted 6/5/2019	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Waters, Air Quality (Operation), Socioeconomics	Federal, State and Local
Danville Farm Solar – Strata Solar Services, LLC	185 acres	N/A	185 acres	185 acres	12 MW facility in Ringgold, VA on land previously a golf course.	Pittsylvania County, VA	Hogan's Creek – Dan River	Cane Creek – Dan River	81.143 Central Virginia	13 miles	East	Permit Received	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Waters, Air Quality (Operation), Socioeconomics	Federal, State and Local
Transportation Projects														
Route 311 Connector Road	Not Available	N/A	Not Available	Not Available	Construction of a connector road from the existing interchange of Oak Ridge Farms Road (Route 1260) and the Danville Expressway (US Route 58) to improve mobility, safety, functionality, and connectivity primarily along the US Route 58 Corridor- and will reduce travel times for employees and freight associated with the development of the Berry Hill Industrial Park.	Pittsylvania County, VA	Cascade Creek – Dan River	Trotters Creek – Dan River	81.143 Central Virginia	3.5 miles	East	Planning – Est Construction Sept 2022-May 2025	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources	State and Local
Universal Project Code (UPC) T18123 Rural Rustic project on Route 621	Not Available	N/A	N/A	N/A	Unknown	Montgomery County, VA	N/A	N/A	N/A	Approximately 65 miles	northwest	Construction work on UPC T18123 is proposed to begin on 10/04/2022 and conclude on 02/10/2023.	No resources expected to be cumulatively affected given the construction timeframes for the projects and distance between the projects.	State
Route 58 over Route 311	Total Project: 8 acres (commercial / industrial land)	N/A	8 acres	8 acres	About 3.3 million in upgrades to the intersection of Berry Hill Road and U.S. 58 West of Danville to accommodate traffic for the nearby Berry Hill Road industrial Park	Pittsylvania County, VA	Wolf Island Creek-Dan River	Lower Sandy River	81.143 Central Virginia	2 miles	East	In Design	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Berry Hill Road	Not Available	N/A	Not Available	Not Available	Reconstruction of Berry Hill Road in order to accommodate more traffic- 23.7 million.	Pittsylvania County, VA	Wolf Island Creek-Dan River Cascade Creek-Dan River	Trotters Creek - Dan River	81.143 Central Virginia	2 miles	East	Planning	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
Stony Mill Road (Route 869 / Tunstall High Road (Route 869)	Total Project: 0.4 acres (commercial / industrial land)	0.0 acre	0.4 acres	0.4 acres	The construction of a single lane roundabout at the intersection of Stony Mill Road and Tunstall High Road- 2.2 million	Pittsylvania County, VA	Wolf Island Creek-Dan River	Lower Sandy River	81.143 Central Virginia	0.5 mile	East	Planning	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
Mount Cross Road (Route 844)	Total Project: 3.3 acres (commercial / industrial land)	N/A	3.3 acres	1.6 acres (Lower Sandy River) 1.7 acres (Sandy Creek [West] – Dan River)	A two-phase plan to widen Mount Cross Road to the city limits, making the road a five-lane section with a two-way center turn lane with a new park and ride lot and sidewalk -17 million	Pittsylvania County, VA	Wolf Island Creek-Dan River	Lower Sandy River Sandy Creek (West) – Dan River	81.143 Central Virginia	5 miles	East	Planning	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
Climax Road	Not Available	N/A	Not Available	Not Available	Widening Climax Road to a minimum of 20 feet to accommodate traffic- 1.3 million	Pittsylvania County, VA	Cherrystone Creek – Banister River	Cherrystone Creek	81.143 Central Virginia	12 miles	Northwest	Planning	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
U. S. Route 29 South over Norfolk Southern Railroad	Total Project: 0.4 acres (commercial / industrial land)	N/A	0.4 acre	N/A	Replacement of the structurally deficient bridge on U.S. Route 29 South over Norfolk Southern Railroad with approaches on this Principal Rural Arterial roadway in Pittsylvania County	Pittsylvania County, VA	Stinking River-Banister River	N/A	81.143 Central Virginia	10 miles	East	Complete 2017	Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local
Future I-73	Total Project: 183.0 acre (commercial / industrial land)	N/A	N/A	N/A	Construction of a 9.4-mile, four-lane interstate from Joseph M. Bryan Boulevard/Airport Parkway interchange to U.S. 220 near the Haw River	Guilford, NC	N/A	N/A	81.150 Northern Piedmont	25 miles	West	Complete October 2017	Air Quality (Operation), Socioeconomics	State and Local
Greensboro Urban Loop	Total Project: 30 acres Upland Forest: Approx. 10 acres	N/A	N/A	N/A	Completion of the Greensboro Urban Loop to help relieve I-40 congestion at I-85 Business and U.S. routes 29, 70, 220 and 421. Four projects to complete the remaining 15 miles of the 44-mile loop around the city.	Guilford, NC	N/A	N/A	81.150 Northern Piedmont	10 miles	West	Under Construction; Anticipated Completion December 2020	Air Quality (Operation), Socioeconomics	State and Local
Macy Grove Road Improvements	Total Project: 10 acres Upland Forest: Approx. 2.5 acres	N/A	N/A	N/A	Proposed improvements and an extension to Macy Grove Road in Forsyth and Guilford counties	Forsyth/Guilford, NC	N/A	N/A	81.150 Northern Piedmont	32 miles	West	In Development	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
NC 119 Relocation	Total Project: 12 acres Upland Forest: Approx. 4 acres	N/A	12	N/A	Proposed relocation of a portion of N.C. 119 in Mebane – from I-85 to existing the N.C. 119 near Mrs. White Lane	Alamance, NC	Back Creek-Haw River	N/A	81.150 Northern Piedmont	5 miles	East	In Development	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
N.C. 62 Widening - Ramada Road to U.S. 70	Total Project: 9 acres (commercial / industrial land)	N/A	9	N/A	Proposed widening an approximately 1-mile stretch of N.C. 62 to improve traffic flow and safety	Alamance, NC	Big Alamance Creek	N/A	81.150 Northern Piedmont	4 miles	West	In Development	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
U.S. 158 (Reidsville Road) Improvements	Total Project: 71 acres (commercial / industrial land)	N/A	11	N/A	Proposed 18.8-mile widening of U.S. 158 from U.S. 421/Business 40 in Winston-Salem to U.S. 220 in Guilford County	Guilford, NC	Headwaters Haw River	N/A	81.150 Northern Piedmont	18 miles	West	In Development	No resources expected to be cumulatively affected given the unknown construction timeframe	State and Local
Commercial, Industrial, Residential Projects														
Berry Hill Industrial Park	Total Project: 133 acres Open Field	N/A	133 acres	133 acres	A 3,500 acres mega-park owned by Danville and Pittsylvania Counties through the Regional Industrial Facilities Act. Phase I activities began in March 2017 and include approximately 133 acres of site preparation. Schedule for additional phases is unknown.	Pittsylvania County, VA	Cascade Creek – Dan River	Trotters Creek – Dan River	81.143 Central Virginia	1.3 miles	East	In Development	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local
Panaceutics Research and Development Facility	Total Project: 112 acres (commercial / industrial)	N/A	112 acres	N/A	Panaceutics, a manufacturer of personalized medicine and nutrition solutions, will invest $5.8 million to establish a research and development and high-tech manufacturing facility in the Ringgold East Industrial Park in Pittsylvania County, Virginia.	Pittsylvania, VA	Hogans Creek-Dan River	N/A	81.143 Central Virginia	10 miles	East	Under Construction	Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local
Carter Ridge	Total Project: 30 acres Upland Forest: 3.5 acres	N/A	30 acres	30 acres	Carter Ridge new construction homes, Carter Ridge Drive, Reidsville, NC	Rockingham, NC	Headwaters Haw River	Little Troublesome Creek	81.150 Northern Piedmont	5 miles	West	Under Construction; land associated with the development appears cleared since 2005 on Google Earth imagery; all house lots currently constructed except for two.	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomic	State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
LGI Homes-Bedford Hills	Total Project: 95 acres Upland Forest: 25 acres	N/A	95 acres	95 acres	New construction housing development single family homes near 111 Pillow Ln., Burlington, NC	Alamance, NC	Back Creek-Haw River	Lower Back Creek	81.150 Northern Piedmont	1.5 miles	East	Under Construction; land associate with the development appears cleared since 2016/2017 on Google Earth imagery; approximately half of the house lots currently constructed.	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local
Forest Creek	Total Project: 40 acres Upland Forest: 5 acres	N/A	40 acres	40 acres	New construction housing development 5 new homes in development	Alamance, NC	Back Creek-Haw River	Travis Creek – Haw River	81.150 Northern Piedmont	3.5 miles	Southwest	Under Construction; majority of land associated with the development appears cleared since 2006 on Google Earth imagery; five house lots left under construction	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local
Brassfield Meadows	Total Project: 5 acres Upland Forest: 5 acres	N/A	5 acres	5 acres	New construction housing development; 18 units	Alamance, NC	Back Creek – Haw River	Boyds Creek – Haw River	81.150 Northern Piedmont	1.7 miles	South	Under Construction; land associated with development appears cleared in 2017/2018 on Google Earth Imagery; all units to be constructed	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Air Quality (Operation), Socioeconomics	State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits
Granite Mill Project	Total Project: 6 acres (commercial / Industrial land)	0 acre	6 acres	6 acres	Redevelopment of an abandoned mill including 176 apartments and 15,000 square feet of commercial space located at 122 East Main Street, Haw River, NC	Alamance, NC	Back Creek – Haw River	Boyds Creek – Haw River	81.150 Northern Piedmont	0 (abuts ATWS)	West	Completion of the residential units on north side of Main Street along the river anticipated in December 2019. Mixed use portions on the south side of Main Street is scheduled to start construction in late 2020/early 2021, with completion anticipated for the end of 2022.	Soils and Geology, Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (Construction and Operation), Noise (Construction and Operation), Socioeconomics, Environmental Justice	State and Local
Chatham Park	7,068 acres at final buildout	N/A	N/A	N/A	Large development within the Town of Pittsboro. Includes homes, schools, parks, retail center, and trails.	Chatham, NC	N/A	N/A	N/A	25 miles	South	Fall 2019 anticipated start of residential construction	No resources expected to be cumulatively affected given the distance of Chatham Park to the Project.	Federal, State, and Local
Mineral Extraction Operations														
Kiln Plant	Not Available	Not Available	Not Available	Not Available	The site is identified by the USGS as a plant including a rotary kiln and with a commodity type of bloating materials (i.e., for lightweight aggregate concrete products).	Rockingham, NC	Cascade Creek – Dan River	Cascade Creek	81.150 Northern Piedmont	0.2 mile	West	No active plant site is visible in this location based on review of available aerial photography.	No resources expected to be cumulatively affected given the absence of any visible development at the identified location.	State and Local
East Alamance Quarry	Total Project: 240 acres Commercial / Industrial Land	17 acres (construction and operation)	240 acres	240 acres	Ongoing quarry operation. Products include crushed stone, gravel, and sand.	Alamance, NC	Back Creek – Haw River	Boyds Creek – Haw River	81.150 Northern Piedmont	0.1 mile	East	Ongoing operation	Groundwater Resources, Wetlands, Vegetation, Wildlife, Surface Water Resources, Cultural Resources, Land Use, Recreation, Visual Resources, Air Quality (construction and operation), Noise (construction), Socioeconomics, Environmental Justice	State and Local

REVISED [Oct 2019] - Table 1.10-2

Projects with Potential Cumulative Impacts

Project	Acres Affected a/, b/, c/	NRCS Mapped Prime Farmland Acres Affected (Within 1 mile of the Southgate Project) a/, b/, c/	HUC 10 Acres (in Shared HUC 10) a/, b/, c/	HUC 12 Acres (in Shared HUC 12) a/, b/, c/	Description	County/ State	Shared Watershed (5th Level/ HUC10)	Shared Watershed (Level/HUC12)	Shared Air Quality Control Region	Approximate Distance from Project	Direction	Status	Cumulative Resources potentially within the Geographic Scope	Potential Permits

a/ All acres affected identified in this table are estimated based on information available from various sources including the FERC eLibrary, the North Carolina Utilities Commission Website, the Virginia and North Carolina Department of Transportation websites, County websites, Bing aerials, and Google Earth imagery. Estimated acres affected are not based on final engineered project designs, as that level of detail is not available for all other projects. With the exception of the Virginia Southside Expansion project, the Transco Southeastern Trail project, and the MVP Pipeline project, acres affected by construction and operation are assumed to be the same.

b/ The Project used the topographic mapping available in the Virginia Southside Expansion Project Environmental Assessment (Accession Number 20130614-4004) Appendix A Topographic Maps of pipeline Route and Facilities Map 1 of 28 to estimate shared HUC 10, HUC 12, and Prime Farmland acres within 1-mile. The one mile of pipeline right-of-way was multiplied by the construction width of 85 feet provided in Figure 3 (Typical Right-of-Way Cross-Section Collocated) in the Environmental Assessment to estimate construction pipeline acres. The one mile of pipeline right-of-way was multiplied by the operation width of 25 feet provided in the Environmental Assessment to estimate operation pipeline acres.

c/ The Project used the aerial photography Mapping available in the Transco Southeastern Trail Project Certificate Application (Accession Number 20180411-5132) to estimate shared HUC 10 and HUC 12 and Prime Farmland acres within 1-mile.

REVISED [Oct 2019] - Table 1.10-3 HUC 10 Watersheds Affected by the MVP Southgate Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**
Virginia		
Watershed: Cascade Creek-Dan River	**49,809.8**	
Other Identified Projects a/	133.0	0.3
MVP Southgate and Associated Facilities	141.2	0.3
Watershed: Cherrystone Creek-Banister River	**88,668.2**	
Other Identified Projects a/	219.5	0.3
MVP Southgate and Associated Facilities	227.0	0.3
Watershed: Hogans Creek-Dan River	**52,924.8**	
Other Identified Projects a/	297.0	0.6
MVP Southgate and Associated Facilities	16.9	<0.1
Watershed: Stinking River- Banister River	**148,876.80**	
Other Identified Projects a/	875.8	0.6
MVP Southgate and Associated Facilities	3.5	0.0
Watershed: Wolf Island Creek- Dan River	**97,896.40**	
Other Identified Projects a/	11.7	<0.1
MVP Southgate and Associated Facilities	174.9	0.2
Estimated Virginia Total:	**2,100.6**	0.5
North Carolina		
Watershed: Back Creek- Haw River	**160,350.90**	
Other Identified Projects a/	493.0	0.3
MVP Southgate and Associated Facilities	322.8	0.2
Watershed: Big Alamance Creek	**167,769.50**	
Other Identified Projects a/	47.0	<0.1
MVP Southgate and Associated Facilities	0	0
Watershed: Cascade Creek- Dan River	**83,792.70**	
Other Identified Projects a/	18.0	<0.1
MVP Southgate and Associated Facilities	256.6	0.3

REVISED [Oct 2019] - Table 1.10-3 HUC 10 Watersheds Affected by the MVP Southgate Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**
Watershed: Headwaters Haw River	**120,671.8**	
Other Identified Projects a/	787.0	0.7
MVP Southgate and Associated Facilities	141.3	0.1
Watershed: Hogans Creek-Dan River	**128,257.4**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	177.1	0.1
Watershed: Lower Smith River	**6,785.5**	
Other Identified Projects a/	0.0	NA b/
MVP Southgate and Associated Facilities	4.7	0.1
Estimated North Carolina Total:	**2,200.4**	
Estimated Shared HUC10 Impact Total:	**4,301.0**	
a/ Includes estimated values (see Table 1.10-2)		
b/ Not applicable - No other projects identified in the watershed		

REVISED [Oct 2019] - Table 1.10-4 HUC 12 Watersheds Affected by the MVP Southgate Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**
Virginia		
Watershed: Cane Creek-Dan River	**14,461.8**	
Other Identified Projects a/	185.0	1.3
MVP Southgate and Associated Facilities	16.9	0.1
Watershed: Cascade Creek	**20,879.5**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	37.5	0.2
Watershed: Cherrystone Creek	**29,131.7**	
Other Identified Projects a/	219.5	0.8
MVP Southgate and Associated Facilities	93.3	0.3
Watershed: Lower Sandy River	**34,709.0**	
Other Identified Projects a/	10.0	0.0
MVP Southgate and Associated Facilities	105.5	0.3
Watershed: Sandy Creek (West)-Dan River	**20,670.4**	
Other Identified Projects a/	1.7	0.0
MVP Southgate and Associated Facilities	69.4	0.3
Watershed: Shockoe Creek-Banister River	**18,805.6**	
Other Identified Projects a/	136.4	0.7
MVP Southgate and Associated Facilities	3.5	<0.1
Watershed: Trotters Creek-Dan River	**18,049.6**	
Other Identified Projects a/	133.0	0.7
MVP Southgate and Associated Facilities	103.7	0.6
Watershed: White Oak Creek-Banister River	**23,127.8**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	133.6	0.6
Estimated Virginia Total:	**1,249.2**	

REVISED [Oct 2019] - Table 1.10-4 HUC 12 Watersheds Affected by the MVP Southgate Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**
North Carolina		
Watershed: Boyds Creek-Haw River	**19,153.0**	
Other Identified Projects a/	256.0	1.3
MVP Southgate and Associated Facilities	137.4	0.7
Watershed: Cascade Creek	**6,121.3**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	51.5	0.8
Watershed: Fall Creek-Smith River	**6,738.9**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	4.7	0.1
Watershed: Giles Creek-Haw River	**10,519.9**	
Other Identified Projects a/	176.0	1.7
MVP Southgate and Associated Facilities	16.8	0.2
Watershed: Lick Fork	**12,923.0**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	47.2	0.4
Watershed: Little Troublesome Creek	**8,323.9**	
Other Identified Projects a/	30.0	0.4
MVP Southgate and Associated Facilities	11.6	0.1
Watershed: Lower Back Creek	**21,357.5**	
Other Identified Projects a/	143.0	0.7
MVP Southgate and Associated Facilities	28.4	0.1
Watershed: Lower Little Alamance Creek	**19,489.7**	
Other Identified Projects a/	38.0	0.2
MVP Southgate and Associated Facilities	0	0
Watershed: Stony Creek-Stony Creek Reservoir	**20,308.4**	
Other Identified Projects a/	0.0	N/A b/

REVISED [Oct 2019] - Table 1.10-4 HUC 12 Watersheds Affected by the MVP Southgate Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**
MVP Southgate and Associated Facilities	54.7	0.3
Watershed: Town Creek-Dan River	**22,520.2**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	148.2	0.7
Watershed: Town of Altamahaw-Haw River	**13,012.8**	
Other Identified Projects a/	252.0	1.9
MVP Southgate and Associated Facilities	112.8	0.9
Watershed: Travis Creek-Haw River	**22,306.2**	
Other Identified Projects a/	40.0	0.2
MVP Southgate and Associated Facilities	102.3	0.5
Watershed: Trotters Creek-Dan River	**9,738.4**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	2.4	<0.1
Watershed: Upper Hogans Creek	**29,143.8**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	103.7	0.4
Watershed: Upper Moon Creek	**20,227.3**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	26.1	0.1
Watershed: Upper Wolf Island Creek	**18,148.1**	
Other Identified Projects a/	0.0	N/A b/
MVP Southgate and Associated Facilities	54.5	0.3
Estimated North Carolina Total:	**1,799.4**	
Estimated HUC10 Impact Total:	**3,048.6**	
a/ Includes estimated values (see Table 1.10-2)		

REVISED [Oct 2019] - Table 1.10-5 Waterbodies Affected in Shared HUC 10 Watersheds for the Southgate Project and Other Projects								
Watershed (10-Digit HUC)	**Number of Waterbodies Crossed by the Southgate Project[a/]**				**Number of Waterbodies Crossed by the Other Relevant Projects[b/]**			
	Ephemeral	**Intermittent**	**Perennial**	**Pond**	**Ephemeral**	**Intermittent**	**Perennial**	**Pond**
Stinking River - Banister River (0301010502)	***0***	***0***	***0***	***0***	***0***	***5***	***2***	***0***
Cherrystone Creek-Banister River (0301010501)	***0***	***13***	***10***	***1***	***0***	***11***	***5***	***0***
Wolf Island Creek – Dan River (0301010310)	1	2	18	0	0	0	0	0
Cascade Creek – Dan River (0301010309)	7	21	42	0	0	0	0	0
Hogans Creek – Dan River (0301010401)	3	9	19	0	0	0	0	0
Headwaters Haw River (0303000202)	1	6	13	0	0	0	0	0
Back Creek – Haw River (0303000204)	***6***	***28***	***21***	***2***	***0***	***4***	***1***	***0***
Subtotal Waterbodies Crossed by type	**18**	**79**	**123**	**3**	**0**	**20**	**8**	**0**
Subtotal Waterbodies Crossed by the Project and the projects	**223**				**28**			
Cumulative subtotals Waterbodies Crossed[c/]	***81 d/***				***28***			

a/ Field delineated streams through August 24, 2019, and approximated streams on no survey parcels, crossed by the MVP Southgate Project pipelines.

b/ Mapping included in the FERC eLibrary, available aerial imagery, and the USGS National Hydrography Dataset, were used to determine number of stream crossings for other projects in HUC 10 watersheds shared with the Southgate Project.

c/ Waterbodies crossed by centerline only. Multiple crossings of individual waterbodies are counted as separate crossings.

d/ Sum of waterbodies shown in **bold font** for Stinking River - Banister River, Cherrystone Creek-Banister River, and Back Creek-Haw River.

NO CHANGE - Table 15-1 Facilities with Air Quality Impacts within 50-km of MVP Southgate Operations		
County / State	**Facility**	**Approximate Distance to the MVP Southgate Project (kilometers)**
Pittsylvania, VA	Transcontinental Gas Pipe Line Company, LLC - Station 165	1
Rockingham, NC	Duke Energy Carolinas, LLC - Dan River Combined Cycle Facility	2
Alamance, NC	APAC-Atlantic, Inc. - Plant #8	13
Pittsylvania, VA	Owens-Brockway Glass Container Inc - Ringgold	16
Rockingham, NC	Transcontinental Gas Pipe Line Company, LLC - Station 160	17
Rockingham, NC	Rockingham County Landfill	18
Alamance, NC	Alamance Aggregates, LLC	20
Guilford, NC	City of Greensboro - T.Z. Osborne Water Reclamation Facility	20
Randolph, NC	Norcraft Companies, LP, - UltraCraft Cabinetry	26
Orange, NC	The University of North Carolina at Chapel Hill	31
Guilford, NC	N. S. Flexibles, LLC	36
Stokes, NC	Duke Energy Carolinas, LLC - Belews Creek Steam Station	41
Guilford, NC	Plantation Pipe Line Company	41
Guilford, NC	City of High Point - Eastside Wastewater Treatment Plant	45
Durham, NC	NIEHS	47

NO CHANGE - Table 15-2 Project Emissions for Major Air Quality Projects within 50-km of Lambert Compressor Station					
County / State	**Facility**	**Annual Project Emission Potential (tons per year)**			
		NO_X	**VOC**	**SO_2**	**Particulates**
Pittsylvania, VA	Transcontinental Gas Pipe Line Company, LLC - Station 165	182.3	35.4	12	23.3

REVISED [Oct 2019] - Table 3-1 Biological Survey Completion Status Wetland / Waterbody Survey Status						
Route	**County**	**State**	**Total Miles**	**Survey Status**	**Length Surveyed or Not Surveyed (Miles)**	**Percent Remaining / Complete**
Southgate H605 Total:	**Pittsylvania**	**Virginia**	**0.47**	**Not Surveyed**	**0.00**	**0%**
				Surveyed	**0.47**	**100%**
Southgate H650	Pittsylvania	Virginia	26.41	Not Surveyed	0.00	0%
				Surveyed	26.41	100%
Southgate H650	Rockingham	North Carolina	26.73	Not Surveyed	0.58	2%
				Surveyed	26.16	98%
Southgate H650	Alamance	North Carolina	21.49	Not Surveyed	2.61	12%
				Surveyed	18.88	88%
Southgate H650 Total:			**74.63**	**Not Surveyed**	**3.18**	**4%**
				Surveyed	**71.45**	**96%**
Project Total:			**75.10**	**Not Surveyed**	**3.18**	**4%**
				Surveyed	**71.92**	**96%**

REVISED [Oct 2019] - Table 3-2 Cultural Resource Survey Completion Status						
Route	**County**	**State**	**Total Miles**	**Survey Status**	**Length Surveyed or Not Surveyed (Miles)**	**Percent Remaining / Complete**
Southgate H605 Total:	**Pittsylvania**	**Virginia**	**0.47**	**Not Surveyed**	**0.00**	**0%**
				Surveyed	**0.47**	**100%**
Southgate H650	Pittsylvania	**Virginia**	26.41	Not Surveyed	0.14	1%
				Surveyed	26.27	99%
Southgate H650	Rockingham	North Carolina	26.73	Not Surveyed	1.17	4%
				Surveyed	25.56	96%
Southgate H650	Alamance	North Carolina	21.49	Not Surveyed	3.26	15%
				Surveyed	18.23	85%
Southgate H650 Total:			**74.63**	**Not Surveyed**	**4.57**	**6%**
				Surveyed	**70.06**	**94%**
Project Total:			**75.10**	**Not Surveyed**	**4.57**	**6%**
				Surveyed	**70.53**	**94%**

REVISED [Oct 2019] - Table 3-3 Locations of Remaining Biological Surveys Along the MVP Southgate Pipeline				
Pipeline	**Parcel ID**	**MP Start**	**MP End**	**Length (Feet)**
Southgate H650	NC-RO-081.000	37.72	37.76	213
Southgate H650	NC-RO-080.000	37.76	37.84	469
Southgate H650	NC-RO-173.000	49.93 RR	50.13 RR	1,051
Southgate H650	NC-RO-177.000	50.34 RR	50.46 RR	628
Southgate H650	NC-RO-178.000	50.46 RR	50.59 RR	678
Southgate H650	NC-AL-000.020	52.77	52.91	782
Southgate H650	NC-AL-050.000	58.23	58.53	1,593
Southgate H650	NC-AL-052.000	58.67 RR	58.9	1,433
Southgate H650	NC-AL-053.000	58.9	59.22 RR	1,675
Southgate H650	NC-AL-055.000	59.22 RR	59.33 RR	631
Southgate H650	NC-AL-054.000.RC	59.33 RR	59.35 RR	66
Southgate H650	NC-AL-061.000	59.35 RR	59.39 RR	206
Southgate H650	NC-AL-062.000	59.39 RR	59.41 RR	109
Southgate H650	NC-AL-063.000	59.41 RR	59.46 RR	289
Southgate H650	NC-AL-064.000	59.46 RR	59.52 RR	332
Southgate H650	NC-AL-064.000	59.53 RR	59.72	904
Southgate H650	FA4-AL-002.000	65.99 RR	66.09 RR	505
Southgate H650	FA3-AL-007.000	66.5 RR	66.55 RR	243
Southgate H650	NC-AL-127.000	66.55 RR	66.55 RR	29
Southgate H650	FA3-AL-009.000	66.65 RR	66.82 RR	906
Southgate H650	NC-AL-129.000	66.9 RR	67.12 RR	1,136
Southgate H650	NC-AL-128.000	67.12 RR	67.13 RR	77
Southgate H650	NC-AL-131.000	67.13 RR	67.21 RR	429
Southgate H650	NC-AL-128.000	67.21 RR	67.26 RR	240
Southgate H650	NC-AL-131.000	67.26 RR	67.27 RR	51
Southgate H650	NC-AL-145.000	68.47	68.57	525
Southgate H650	NC-AL-144.000	68.57	68.65	415
Southgate H650	NC-AL-166.000	69.47	69.56 RR	463
Southgate H650	NC-AL-194.000	71.87	71.93	286
Southgate H650	NC-AL-196.000	72.11	72.2	451
Southgate H650	NC-AL-206.000	72.84 RR	72.85 RR	19

REVISED [Oct 2019] - Table 3.4 Areas along MVP Southgate Pipeline Alignment Where Cultural Survey is Outstanding				
Pipeline	**Parcel ID**	**MP Start**	**MP End**	**Length (feet)**
Southgate H-650	VA-PI-053.000	9.72	9.85	645
Southgate H-650	VA-PI-090.000	13.53 RR	13.55 RR	91
Southgate H-650	NC-RO-006.000	27.65 RR	27.67 RR	114
Southgate H-650	NC-RO-042.000	33.60	33.88	1,465
Southgate H-650	NC-RO-081.000	37.72	37.76	213
Southgate H-650	NC-RO-080.000	37.76	37.84	469
Southgate H-650	NC-RO-143.000	46.01 RR	46.27 RR	1,354
Southgate H-650	NC-RO-173.000	49.93 RR	50.13 RR	1,051
Southgate H-650	NC-RO-177.000	50.34 RR	50.46 RR	628
Southgate H-650	NC-RO-178.000	50.46 RR	50.59 RR	678
Southgate H-650	NC-RO-183.000	51.65 RR	51.67 RR	133
Southgate H-650	NC-GU-001.000	52.42 RR	52.42 RR	25
Southgate H-650	NC-RO-184.000	52.42 RR	52.43 RR	50
Southgate H-650	NC-AL-000.020	52.77	52.91	782
Southgate H-650	NC-AL-004.000	53.89	53.90	56
Southgate H-650	NC-AL-046.000	57.86	58.23	1,926
Southgate H-650	NC-AL-050.000	58.23	58.53	1,593
Southgate H-650	NC-AL-052.000	58.67 RR	58.90 RR	1,433
Southgate H-650	NC-AL-053.000	58.90 RR	59.22 RR	1,675
Southgate H-650	NC-AL-055.000	59.22 RR	59.33 RR	631
Southgate H-650	NC-AL-054.000.RC	59.33 RR	59.35 RR	66
Southgate H-650	NC-AL-061.000	59.35 RR	59.39 RR	206
Southgate H-650	NC-AL-062.000	59.39 RR	59.41 RR	109
Southgate H-650	NC-AL-063.000	59.41 RR	59.46 RR	289
Southgate H-650	NC-AL-064.000	59.46 RR	59.52 RR	332
Southgate H-650	NC-AL-064.000	59.53 RR	59.72	904
Southgate H-650	MVF-NC-AL-005.000	64.62	64.68	332
Southgate H-650	MVF-NC-AL-006.000	64.68	64.69	46
Southgate H-650	MVF-NC-AL-005.000	64.69	64.78	505
Southgate H-650	FA4-AL-002.000	65.99 RR	66.09 RR	505
Southgate H-650	FA3-AL-007.000	66.50 RR	66.55 RR	243
Southgate H-650	FA3-AL-009.000	66.65 RR	66.82 RR	906
Southgate H-650	NC-AL-129.000	66.90 RR	67.12 RR	1,136
Southgate H-650	NC-AL-128.000	67.12 RR	67.13 RR	77
Southgate H-650	NC-AL-131.000	67.13 RR	67.21 RR	429
Southgate H-650	NC-AL-131.000	67.26 RR	67.27 RR	51
Southgate H-650	NC-AL-145.000	68.47	68.57	525

REVISED [Oct 2019] - Table 3.4 Areas along MVP Southgate Pipeline Alignment Where Cultural Survey is Outstanding				
Pipeline	**Parcel ID**	**MP Start**	**MP End**	**Length (feet)**
Southgate H-650	NC-AL-144.000	68.57	68.65	415
Southgate H-650	NC-AL-166.000	69.47	69.56 RR	463
Southgate H-650	NC-AL-166.000.RR	69.74 RR	69.76 RR	101
Southgate H-650	NC-AL-182.000	69.76 RR	69.80 RR	173
Southgate H-650	NC-AL-174.130	69.80 RR	69.82 RR	104
Southgate H-650	NC-AL-194.000	71.91	71.94 RR	137
Southgate H-650	NC-AL-194.000	72.01 RR	72.06	323
Southgate H-650	NC-AL-195.000	72.06	72.11	271
Southgate H-650	NC-AL-196.000	72.11	72.20	451
Southgate H-650	NC-AL-206.000	72.84	72.85	19
				24,129

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
H-605 Pipeline						
0.0	1000		VA-PI-001.000, VA-PI-002.000	0.83	FW	materials, parking, turn around, pipe staging
0.0	1000A		VA-PI-001.000	1.05	FW, OL	parking, pipe staging, frac tanks for hydro test, materials
0.1	1001		VA-PI-002.000	0.23	FW	materials, pumps, mats, pipe fab
0.3	1001A		VA-PI-002.000	0.40	AG, FW, OL	materials, equipment, pipe staging, pipe fab, mats
H-650 Pipeline						
0.1	1001B		VA-PI-002.000	0.71	AG, FW, OL	materials, equipment, dumpsters for spoils from hydrovac around Transco line, parking, pipe
0.1	1001F		VA-PI-002.000	0.20	FW	material, equipment, mats
0.2	1008		VA-PI-002.000	0.20	FW	material, equipment, mats, pumps
0.3	1009		VA-PI-002.000	0.23	FW	material, pumps, mats
0.5	1010		VA-PI-003.000	0.30	FW, OL	material, pumps, mats
0.6	1012		VA-PI-003.000	0.36	OL	material, parking, equipment
0.7	1013		VA-PI-005.000	0.50	OL	material, equipment, boring equipment
0.8	1014		VA-PI-005.000	0.52	OL	material, pipe, boring equipment, parking
0.9	1015		VA-PI-006.000	0.50	OL, SC	material, pipe, boring equipment, parking
1.0	1016		VA-PI-008.000	0.46	AG	material, pipe, mats, pumps, equipment
1.2	1017		VA-PI-009.000	0.82	OL	material, pipe, mats, pumps, equipment
1.3 RR	1020		VA-PI-009.000	0.99	FW, OL	material, pumps, mats, pipe
1.6	1022	X	VA-PI-010.000	0.47	OL	ATWS needed to support crossing of Cherrystone Creek. Construction workspace in area has been reduced significantly due to environmental features and buffers. This ATWS was located outside of buffers.
1.7	1023		VA-PI-010.000	0.07	OL	materials, equipment
1.7	1024		VA-PI-010.000	0.14	OL	materials, pumps, mats

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
2.2	1025B		VA-PI-012.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
2.2	1025C		VA-PI-012.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
2.3	1025A	X	VA-PI-012.000	1.30	FW, OL	Staging / storage of materials, mats, equipment, pipe during construction, due to the large wetland crossing.
2.3	1025D		VA-PI-012.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
2.4	1025E		VA-PI-014.000	0.03	OL, RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
2.4	1025F		VA-PI-012.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
2.8	1026		VA-PI-014.000	0.13	OL	materials, equipment, pipe
2.8	1027		VA-PI-015.000	0.21	AG	materials, equipment, pipe
2.9	1028		VA-PI-015.000	0.49	AG	material, parking, equipment, pipe
2.9	1029		VA-PI-016.000	0.14	AG	materials, equipment
3.0	1030		VA-PI-018.000	0.51	AG	boring equipment, materials, parking
3.2	1031		VA-PI-022.000	0.45	OL	materials, pumps, mats, pipe
3.3	1032		VA-PI-023.000	0.51	AG, FW, OL	materials, pumps, mats, pipe
3.4	1033	X	VA-PI-023.000	0.12	AG	Project turn around access for TA-PI-006 and offloading / staging, materials, equipment
3.4	1033A		VA-PI-023.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
3.4	1033B		VA-PI-023.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
3.4	1034	X	VA-PI-023.000	0.09	AG	Project turn around access for TA-PI-006 and offloading / staging, materials, equipment. Supports road crossing.
3.5	1035		VA-PI-023.000	0.29	AG	pumps, mats, equipment
3.6	1036		VA-PI-022.000	0.19	AG, FW	pumps, mats, equipment
3.7 RR	1037		VA-PI-022.000	0.17	AG	materials, parking, turn around,
3.8 RR	1037A		VA-PI-025.000	0.39	AG	materials, equipment, pipe
4.0	1038		VA-PI-025.000	0.21	AG	pumps, mats, equipment
4.1	1039		VA-PI-025.000	0.35	AG, FW	pumps, mats, equipment
4.1	1040		VA-PI-026.000	0.22	AG	pumps, mats, equipment
4.2	1041		VA-PI-026.000	0.21	AG	boring equipment, materials, parking
4.3	1042		VA-PI-030.000	0.15	OL	boring equipment, materials, parking, pipe
4.3	1043		VA-PI-031.000	0.28	FW, OL	boring equipment, materials, parking, pipe
4.3	1044		VA-PI-030.001	0.31	FW	boring equipment, materials, parking, pipe
4.4	1045		VA-PI-032.000	0.62	FW, OL	fab sections, equipment, materials, parking
4.4	1046		VA-PI-032.000	0.64	FW, OL	fab sections, equipment, materials, parking
4.6	1047	X	VA-PI-033.000	1.25	FW, OL	Staging to help support RT 29 & Banister River crossings, for storage equipment, of materials, parking and turn around.
4.8	1049		VA-PI-032.000	0.46	FW	pumps, mats, equipment, material
5.0	1050		VA-PI-034.000	0.11	FW	pumps, mats, equipment, material
5.1	1051	X	VA-PI-034.000	0.70	FW, OL	Staging for storage of materials and timber mats for wetland crossing, Banister River, and railroad crossings.

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
5.1	1051A		VA-PI-034.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
5.1	1051C		VA-PI-034.100	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
5.1	1051D		VA-PI-034.100	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
5.1	1051E		VA-PI-034.100	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
5.2	1051B		VA-PI-034.000	0.03	FW	Area to be used to support safe access to the Project, using the area as a pull off during traffic passing.
5.2	1052		VA-PI-034.000	0.46	FW, WL	boring equipment, pipe, materials
5.3	1053		VA-PI-035.000	0.49	FW	boring equipment, pipe, materials
5.6	1054	X	VA-PI-036.000	0.69	FW, OL	Support construction through valley directly southwest of ATWS.
5.7	1054A		VA-PI-036.000	0.03	FW, OL	Area to be used to support safe access to the Project, using the area as a pull off during traffic passing.
5.8	1055	X	VA-PI-036.000	1.06	FW, OL	Support construction through valley directly northeast of ATWS
5.9	1056	X	VA-PI-036.000	0.40	CI, OL	To support construction actives with staging pipe, materials, to limit disturbing trucking access into the landfill, equipment and timber mats for pipeline crossing.
6.0	1057		VA-PI-036.000	0.46	FW	pumps, mats, equipment, material

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
6.1	1058		VA-PI-036.000	0.25	FW	pumps, mats, equipment, material
6.2	1059		VA-PI-036.000	0.46	FW, OL	pumps, mats, equipment, material
6.2	1060		VA-PI-037.000	0.46	FW	pumps, mats, equipment, material
6.2	1061	X	VA-PI-037.000	0.83	OL	To support construction actives with staging pipe, materials, to limit disturbing trucking access into the County property, also parking, mats.
6.3	1061A		VA-PI-037.000	0.03	AG, CI	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
6.3	1061B		VA-PI-035.100	0.03	AG, CI	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
6.5	1062		VA-PI-037.000	0.46	FW	pumps, mats, equipment, material
6.7	1063		VA-PI-038.000	0.46	FW	pumps, mats, equipment, material
6.8	1064	X	VA-PI-038.000	0.25	FW, OL	Staging for timber mats and equipment needed for pipeline crossings through two streams / wetlands. Allows for equipment staging issues that will occur due to collocated foreign pipeline ROW.
6.8	1064A		VA-PI-038.000	0.03	FW	Staging for timber mats and equipment needed for pipeline crossings through two streams / wetlands. Allows for equipment staging issues that will occur due to collocated foreign pipeline ROW.
6.9	1064B		VA-PI-039.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
6.9	1064C		VA-PI-039.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
6.9	1065		VA-PI-039.000	0.53	FW	pumps, mats, equipment, material
7.1	1066		VA-PI-040.000	1.53	AG, FW, OL	pumps, mats, equipment, material
7.2	1068		VA-PI-041.000	0.58	FW, OL	pipe, materials, parking, equipment, boring equipment
7.4	1069		VA-PI-042.000	0.24	FW	pipe, materials, parking, equipment, boring equipment
7.4	1070		VA-PI-044.000	0.48	OL	pipe, materials, parking, equipment, boring equipment
7.6	1071		VA-PI-044.000	0.26	FW	pumps, mats, equipment, material
7.6	1072		VA-PI-044.000	0.23	FW	pumps, mats, equipment, material
7.9	1074		VA-PI-045.000	0.47	OL	pumps, mats, equipment, material
8.0	1075		VA-PI-045.000	0.27	FW, OL	pumps, mats, equipment, material
8.1	1076		VA-PI-045.000	0.52	OL	pipe, materials, parking, equipment, boring equipment
8.1	1077		VA-PI-046.000	0.32	FW, OL	pipe, materials, parking, equipment, boring equipment
8.2	1078		VA-PI-047.000	0.34	FW, OL	Area for storage and turn around for large trucks.
8.3	1080B		VA-PI-048.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
8.3	1080C		VA-PI-048.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
8.4	1079		VA-PI-048.000	0.52	FW, OL	pumps, mats, equipment, material
8.4	1080A		VA-PI-048.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
8.5	1080	X	VA-PI-048.000	0.63	FW, OL	pumps, mats, equipment, material
8.6	1081		VA-PI-048.000	0.52	FW, OL	pumps, mats, equipment, material
8.9	1082	X	VA-PI-050.000	0.87	OL	ATWS to support large water body crossing for parking, pipe storage, material storage away from foreign pipeline ROW
8.9	1082A		VA-PI-051.000	0.03	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
8.9	1082B		VA-PI-050.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
9.0	1082C		VA-PI-051.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
9.0	1082D		VA-PI-051.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
9.0	1083		VA-PI-050.000, VA-PI-051.000	0.66	FW, OL	pumps, mats, equipment, material
9.1	1084		VA-PI-052.000	0.31	AG, FW, OL	Staging for storage of materials and timber mats for wetland and stream crossing.
9.3	1085		VA-PI-052.000	0.37	AG	pipe, materials, parking, equipment, boring equipment
9.4	1086		VA-PI-053.000	0.08	FW, OL	pipe, materials, parking, equipment, boring equipment
9.4	1086A		VA-PI-053.000	0.27	OL	Installation of groundbed
9.6	1088	X	VA-PI-053.000	0.20	AG, FW	turn around for trucks, material staging for large wetland crossing due to ROW width restrictions and long access road
9.7	1088A		VA-PI-053.000	0.51	FW	materials, equipment, pipe

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
9.7	1088C		VA-PI-053.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
9.8	1088B		VA-PI-053.000	0.85	AG, FW, OL	pumps, mats, equipment, material
9.9	1089		VA-PI-053.000	0.23	FW	pumps, mats, equipment, material
10.0	1090		VA-PI-053.000	0.61	FW	pumps, mats, equipment, material
10.1	1091		VA-PI-055.000	0.23	FW	pumps, mats, equipment, material
10.1	1092		VA-PI-055.000	0.23	FW, OL	pumps, mats, equipment, material
10.3	1093	X	VA-PI-061.000	0.69	OL	Project access, parking, pipe storage, material storage due to ROW restriction from housing in the area.
10.8	1094		VA-PI-075.000	1.35	FW, OL	pipe, materials, parking, equipment, boring equipment
10.8	1094A		VA-PI-075.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
10.8	1094B		VA-PI-075.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
10.9	1095A		VA-PI-075.000	0.77	FW, OL	pumps, mats, equipment, material
11.1	1096	X	VA-PI-075.000	1.61	FW, OL	support multiple stream crossings between access points
11.4	1097		VA-PI-076.000	0.37	FW	pumps, mats, equipment, material
11.4	1098		VA-PI-076.000	0.51	FW, OL	pumps, mats, equipment, material
11.6	1099		VA-PI-076.000	0.48	FW	pumps, mats, equipment, material
11.7	1100		VA-PI-077.000	0.36	FW	pumps, mats, equipment, material
11.9	1101		VA-PI-077.000	0.47	FW	pumps, mats, equipment, material

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
12.0	1103		VA-PI-077.000	0.69	FW, OL	materials, pipe, equipment
12.3	1105		VA-PI-079.000	0.52	AG	pipe, materials, parking, equipment, boring equipment
12.4	1106		VA-PI-082.000	0.28	AG, FW	pipe, materials, parking, equipment, boring equipment
12.5	1106A		VA-PI-082.000	0.23	AG	materials, pipe, equipment
12.7	1107		VA-PI-082.000	0.97	AG, FW	materials, pipe, equipment
12.7	1108		VA-PI-082.000	0.26	FW	pumps, mats, equipment, material
12.8	1109		VA-PI-084.000	0.46	FW	pumps, mats, equipment, material
13.1	1110	X	VA-PI-084.000	0.46	FW, OL	support installation of pipeline PI
13.3	1111		VA-PI-085.000	0.26	FW, OL	materials, pipe, equipment
13.4	1112	X	VA-PI-087.000	0.43	OL	Area to be used to support pipe, materials, parking, equipment, boring equipment needed for Sandy Creek Rd & S-E18-27 / wetland crossing areas.
13.4	1112A		VA-PI-087.000	0.11	OL	pipe, materials, parking, equipment, boring equipment
13.4	1113		VA-PI-089.000	0.05	FW, OL	material, pumps, mats, pipe, boring equipment
13.5 RR	1114		VA-PI-090.000	0.53	FW, OL	pumps, mats, equipment, material
13.6 RR	1114A		VA-PI-090.000	0.65	FW, OL	Staging for equipment, timber mats, soil and parking due to lack of access points into this area.
13.8 RR	1114B		VA-PI-091.000	0.26	FW, OL	Staging for equipment, timber mats, soil and parking due to lack of access points into this area.
14.2 RR	1116	X	VA-PI-092.000	0.50	OL	Turnaround and material storage for long access road
14.3 RR	1117		VA-PI-094.000	0.46	FW	pumps, mats, equipment, material
14.4 RR	1116A		VA-PI-092.200	0.06	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
14.4 RR	1118		VA-PI-094.000	0.50	FW	pumps, mats, equipment, material
14.7	1118A		VA-PI-094.000	0.15	OL	pumps, mats, equipment, material
14.8	1118B		VA-PI-096.000	0.46	FW, OL	pumps, mats, equipment, material
14.8	1119		VA-PI-096.000	0.47	OL	pipe, materials, parking, equipment, boring equipment
14.9	1120		VA-PI-099.000	0.19	AG, RD	pipe, materials, parking, equipment, boring equipment
15.2	1120A	X	VA-PI-100.000	0.15	AG	ATWS to be used for pumps, mats, equipment, material, trucking turnaround, to support multiple stream crossings
15.2	1120B		VA-PI-100.000	0.39	AG	pumps, mats, equipment, material
15.3	1120C		VA-PI-100.000	0.38	AG, FW	pumps, mats, equipment, material
15.6	1122		VA-PI-101.000	0.64	FW, OL	pumps, mats, equipment, material
15.7	1123		VA-PI-102.000	0.52	FW	pumps, mats, equipment, material
15.8	1124		VA-PI-103.000	0.90	FW, OL	Staging and storage of materials and timber mats for stream crossing and PI. Also, for pipe storage.
16.0	1126	X	VA-PI-106.000	0.29	FW, OL	staging for materials, equipment, and timber mats for stream crossing and Mt. Cross Road crossing
16.0	1126A		VA-PI-106.000	0.23	FW, OL	materials, pipe, equipment
16.0	1127	X	VA-PI-106.000	0.54	AG, FW	staging for materials, equipment, and timber mats for multiple stream crossing and trucking turnaround. Reduced construction ROW in area.
16.1	1128		VA-PI-106.000	0.21	AG, FW	pumps, mats, equipment, material
16.3	1129		VA-PI-107.000	0.46	AG, RD	materials, pipe, equipment
16.4	1130		VA-PI-111.000	0.30	AG, RD	pipe, materials, parking, equipment, boring equipment

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
16.5	1131		VA-PI-115.000	0.53	AG, FW	pipe, materials, parking, equipment, boring equipment
16.6	1131A		VA-PI-115.000	0.23	AG	pumps, mats, equipment, material
16.7	1132	X	VA-PI-115.000	0.07	AG, FW, OL	Area to support stream crossings, and wetland crossings on either side
16.7	1132A		VA-PI-115.000, VA-PI-116.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
16.8	1133		VA-PI-115.000	0.06	AG, FW	pumps, mats, equipment, material
16.9	1134		VA-PI-115.000	0.66	AG	pumps, mats, equipment, material, pipe
17.1	1135C		VA-PI-115.100	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.1	1135D		VA-PI-115.100	0.03	AG, FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.2	1135	X	VA-PI-118.000	0.88	AG, FW, OL	Area to support stream crossings. Topography issues in area around stream crossings
17.2	1135A		VA-PI-118.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.2	1135B		VA-PI-118.000	0.03	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.3	1137	X	VA-PI-118.000	0.11	OL	pumps, mats, equipment, material, pipe
17.4	1136		VA-PI-118.000	0.62	OL	pumps, mats, equipment, material, pipe
17.4	1136A		VA-PI-118.000	0.36	OL	pumps, mats, equipment, material, pipe

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17.6 RR	1136B		VA-PI-118.000	0.86	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.7 RR	1136C		VA-PI-121.000	0.58	FW, WL	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.
17.8 RR	1136D		VA-PI-121.000	0.49	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
17.9	1136E		VA-PI-120.000, VA-PI-121.000	0.36	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
18.0	1140	X	VA-PI-120.000	0.47	FW	staging and storage of materials, timber mats and equipment for multiple stream crossings
18.1	1141		VA-PI-120.000	0.61	FW, OL	pumps, mats, equipment, material, pipe
18.1	1141A		VA-PI-121.000	0.03	AG	Area to be used to support safe access to the Project, using the area as a pull off during traffic passing.
18.2	1142	X	VA-PI-121.000	0.47	OL	pipe, materials, parking, equipment, boring equipment for Pine Lake Rd
18.3	1143		VA-PI-124.000	0.45	AG	pipe, materials, parking, equipment, boring equipment
18.7	1144	X	VA-PI-128.000	0.57	FW, OL	materials, pipe, equipment
18.9	1145		VA-PI-128.000	0.62	FW, OL	pipe, materials, parking, equipment, boring equipment
19.0	1146		VA-PI-130.000	0.41	AG, FW, OL	pipe, materials, parking, equipment, boring equipment
19.2	1146A		VA-PI-132.000	0.17	RD	pipe, materials, parking, equipment, boring equipment
19.3	1147		VA-PI-135.000	0.32	AG, FW	pipe, materials, parking, equipment, boring equipment
19.4	1147A		VA-PI-137.100	0.27	AG, FW	materials, pipe, equipment

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19.5	1147B		VA-PI-140.000	0.02	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
19.7	1148		VA-PI-144.000	0.23	FW	material, pumps, mats, pipe
19.8	1149		VA-PI-150.000	0.23	FW, OL	material, pumps, mats, pipe
19.9	1150	X	VA-PI-150.100	2.03	FW, OL	ATWS needed to support storage of pipe, mats, materials, parking, equipment, boring equipment for Hwy 58, also to support multiple foreign utility line crossing.
19.9	1151		VA-PI-151.000	0.27	FW, OL	pipe, materials, parking, equipment, boring equipment
20.0	1152		VA-PI-152.000	0.05	CI, OL	pipe, materials, parking, equipment, boring equipment
20.0	1152A		VA-PI-152.000	0.34	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
20.3	1158		VA-PI-160.000	0.46	AG	material, pumps, mats, pipe
20.4	1160	X	VA-PI-160.000	0.66	AG, OL	Staging and storage of materials, timber mats and equipment for multiple stream crossing. Area will also be used for turning around trucks/lowboys, due to ROW restrictions
20.5	1160A		VA-PI-160.000	0.03	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
20.6	1160B		VA-PI-160.000	0.06	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
20.6	1161		VA-PI-160.000	0.46	AG, FW, OL	material, pumps, mats, pipe
20.6	1162		VA-PI-160.000	0.37	OL	material, pumps, mats, pipe
20.9	1163		VA-PI-162.000	0.46	AG, FW	material, pumps, mats, pipe
21.0	1164		VA-PI-162.000	0.65	FW	material, pumps, mats, pipe

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21.2	1165		VA-PI-164.000	0.46	FW, OL	material, pumps, mats, pipe
21.3	1166		VA-PI-163.000	0.46	FW, OL	material, pumps, mats, pipe
21.6	1167		VA-PI-165.000	0.11	FW	turn around for trucks, material
22.0	1169		VA-PI-169.000	0.11	RD	material, pumps, mats, pipe, boring equipment
22.1	1170		VA-PI-171.000	0.46	FW, OL	material, pumps, mats, pipe, boring equipment
22.2	1170A		VA-PI-171.000	0.41	FW	material, pumps, mats, pipe
22.4	1171		VA-PI-173.000	0.34	FW, OL	turn around for trucks, material
22.4	1173		VA-PI-173.000	0.94	FW, OL	materials, pipe, equipment
22.5 RR	1173A		VA-PI-173.000	0.66	FW, OL	This area is need for the multiple line crossings, PI's and stream crossing all in the same area.
22.5 RR	1173B		VA-PI-173.000	0.18	FW	Area to be used to support stream crossing. Soils, and materials to be stored here.
22.7 RR	1173C		VA-PI-173.000	0.28	FW	Area to be used to support stream crossing. Soils, and materials to be stored here.
22.7 RR	1173D		VA-PI-173.000	0.52	FW, OL, OW	Area to be used to support stream crossing. Soils, and materials to be stored here.
22.7 RR	1178E		VA-PI-172.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
22.7 RR	1178F		VA-PI-172.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
22.8 RR	1173E		VA-PI-173.000	0.20	FW	Area to be used to support stream crossing. Soils, and materials to be stored here.
22.8 RR	1178A		VA-PI-174.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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22.8 RR	1178B		VA-PI-174.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
22.8 RR	1178C		VA-PI-172.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
22.8 RR	1178D		VA-PI-172.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
23.0 RR	1173F	X	VA-PI-174.000	0.30	FW, OL	Area to be used as turnaround for trucking, staging equipment / materials needed for multiple stream crossings between access points.
23.1 RR	1173G		VA-PI-174.000	0.18	FW	Area will be used to support stream crossing, for pumps, soils, equipment, etc...
23.2 RR	1173H		VA-PI-174.000	0.16	FW	Area will be used to support stream crossing, for pumps, soils, equipment, etc...
23.2 RR	1173I		VA-PI-174.000	0.24	FW	Area will be used to support stream crossing, for pumps, soils, equipment, etc...
23.5 RR	1173J		VA-PI-175.000	0.19	FW, OL	Area will be used to support stream crossing, for pumps, soils, equipment, etc...
23.6 RR	1173K		VA-PI-175.000	0.18	FW	Area will be used to support stream crossing, for pumps, soils, equipment, etc...
23.7 RR	1173L		VA-PI-175.000	0.19	FW	Area needed to support Oak Hill Rd crossing
23.7 RR	1173M		VA-PI-175.000	0.31	FW, OL	Area needed to support Oak Hill Rd crossing
23.8 RR	1173N		VA-PI-178.000	0.26	FW, OL	Area needed to support Oak Hill Rd crossing & pipeline crossing, equipment, soils, materials will need to be staged in this location.

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23.8 RR	1173O		VA-PI-178.000	0.27	FW, OL	Area needed to support stream crossing & pipeline crossing, equipment, soils, materials will need to be staged in this location.
23.9 RR	1173P		VA-PI-178.000	1.13	FW, OL	Area needed to support stream crossing, & pipeline crossing, equipment, soils, materials will need to be staged in this location.
23.9 RR	1173Q		VA-PI-178.000	0.24	FW	Area needed to support stream crossing, & pipeline crossing, equipment, soils, materials will need to be staged in this location.
23.9	1188		VA-PI-178.000	0.61	FW	material, pumps, mats, pipe
24.0	1189		VA-PI-178.000	0.46	FW	material, pumps, mats, pipe
24.0	1190A		VA-PI-178.100	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
24.0	1190B		VA-PI-178.100	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
24.1	1190	X	VA-PI-178.000	0.69	FW, OL	Area for material storage and turn around for large trucks delivering equipment / materials. Topography issues in area.
24.3	1191		VA-PI-178.000	0.46	FW	material, pumps, mats, pipe
24.4	1192		VA-PI-178.000	0.43	FW	material, pumps, mats, pipe
24.6	1193		VA-PI-178.000	0.77	FW, OL	Area for material storage and turn around for large trucks.
24.8	1194		VA-PI-178.000	0.23	FW	Supports multiple stream/ wetland crossings as well as the railroad bore crossing
24.8	1195	X	VA-PI-179.000	1.02	FW, OL	Area for material storage and turn around for large trucks
24.9	1196		VA-PI-179.000	0.47	FW	pipe, materials, parking, equipment, boring equipment

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25.0	1197		VA-PI-180.000	0.45	FW	pipe, materials, parking, equipment, boring equipment
25.1	1198	X	VA-PI-180.000	0.69	FW, OL	ATWS needed for material storage and turn around for large trucks, while supporting multiple stream/ wetland crossings as well as the railroad bore crossing
25.2	1200		VA-PI-180.000	0.23	FW	material, pumps, mats, pipe
25.7	1201		VA-PI-180.000	0.46	FW, OL	material, pumps, mats, pipe
25.7	1202		VA-PI-180.000	0.46	FW	material, pumps, mats, pipe
25.8	1203		VA-PI-180.000	0.35	FW	material, pumps, mats, pipe
25.9	1204		VA-PI-180.000	0.46	FW	material, pumps, mats, pipe
26.0	1205	X	VA-PI-180.000	0.46	FW	Area for material storage and turn around for large trucks.
26.2	1206	X	NC-RO-001.000	0.53	FW, OL	Staging for storage of equipment, materials and timber mats for wetland crossing and Buffalo Road crossing.
26.3	1207		NC-RO-002.000	0.37	FW	pipe, materials, parking, equipment, boring equipment
26.5	1208		NC-RO-002.000	0.46	FW	pipe, materials, parking, equipment, boring equipment
26.6 RR	1209		NC-RO-004.000	0.50	OL	pipe, materials, parking, equipment, boring equipment
26.6 RR	1210		NC-RO-004.000	0.34	OL	parking, pipe storage, material storage
26.8 RR	1211	X	NC-RO-004.000	1.24	FW, OL	parking, pipe storage, material storage
26.9	1212		NC-RO-004.000	0.14	FW	pipe, materials, parking, equipment, boring equipment
27.0 RR	1213	X	NC-RO-005.000	1.00	AG, WL	Due to large wetlands / streams, and foreign line crossings- mats, pipe, materials, parking, equipment, boring equipment will need to be staged in ATWS

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27.0 RR	1213A	X	NC-RO-005.000	1.31	AG, OL, RD	Due to large wetland / stream, and foreign line crossings mats, pipe, materials, parking, equipment, boring equipment will need to be staged in ATWS.
27.3	1213D		NC-RO-005.000	0.40	WL	material, pumps, mats, pipe
27.4	1218		NC-RO-006.000	1.16	AG, OL	parking, pipe storage, material storage
27.6	1222		NC-RO-006.000	0.76	OL, WL	materials, pipe, equipment
27.8 RR	1224	X	NC-RO-006.000	0.93	AG	Due to large wetland / stream crossings in vicinity, area will be used for material storage
27.9 RR	1224F		NC-RO-006.000	0.04	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
28.2 RR	1224C		NC-RO-006.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
28.3 RR	1230	X	NC-RO-006.000	1.05	FW, OL	Multiple wetlands / streams, and foreign line crossings-mats, pipe, materials, parking, equipment, will need to be staged in ATWS, due to multiple ROW width restrictions.
28.5 RR	1224D		NC-RO-006.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
28.5 RR	1224E		NC-RO-006.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
28.5 RR	1230A		NC-RO-006.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
28.5 RR	1230B		NC-RO-006.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time

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28.5 RR	1231		NC-RO-006.000	0.23	FW, OL	material, pumps, mats, pipe
28.6 RR	1232	X	NC-RO-006.000	0.93	FW, OL	Staging and storage of materials for stream crossings. Topography issues in area and along access road
28.6 RR	1233		NC-RO-006.000	0.46	FW	materials, pipe, equipment
28.7	1234		NC-RO-007.000	0.50	FW	materials, pipe, equipment
28.8	1235		NC-RO-007.000	0.46	FW, OL	materials, pipe, equipment
28.9	1236		NC-RO-007.000	0.46	FW	material, pumps, mats, pipe
29.0	1237		NC-RO-007.000	0.46	FW	material, pumps, mats, pipe
29.1	1238		NC-RO-007.000	0.23	FW	material, pumps, mats, pipe
29.1	1239A		NC-RO-007.000	0.03	OL, RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
29.2	1239	X	NC-RO-007.000	0.49	FW, OL	Staging and storage of materials. Restrictions in area due to foreign pipeline ROW.
29.2	1240		NC-RO-007.000	0.46	FW, OL	materials, pipe, equipment
29.3 RR	1240A		NC-RO-007.000	0.93	FW, OL	materials, pipe, equipment
29.4 RR	1240B		NC-RO-007.000	0.25	FW	materials, pipe, equipment
29.5 RR	1242A		NC-RO-007.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
29.5 RR	1242B		NC-RO-007.000	0.03	OL, RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
29.6	1241		NC-RO-007.000	0.23	FW	material, pumps, mats, pipe
29.6	1242	X	NC-RO-007.000	0.46	FW, OL	support / staging for multiple foreign line equipment crossings Restrictions in area due to foreign pipeline ROW.
29.6	1243		NC-RO-007.000	0.75	AG	material, pumps, mats, pipe
29.7	1247C		NC-RO-011.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time

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29.7	1247D		NC-RO-011.000	0.02	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
29.9	1244		NC-RO-011.000	2.64	AG, FW, OL, WL	material, pumps, mats, pipe, boring equipment
29.9	1244A	X	NC-RO-011.000	0.51	AG, OL	ATWS to work in conjunction with ATWS 1244 to support wetland crossing, material, pumps, mats, pipe, boring equipment of the Dan River.
30.0	1247		NC-RO-011.000	0.39	AG	staging of mats / equipment needed to perform foreign line equipment crossing, then used for as needed for parking, materials, pipe, equipment to support HDD of Dan River and large wetland crossing.
30.0	1247A		NC-RO-011.000	0.03	AG, OL	materials, pipe, equipment
30.0	1247B		NC-RO-011.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
30.3	1251A	X	NC-RO-014.000, NC-RO-015.000	6.42	AG, WL	Staging of mats / equipment needed to perform foreign line equipment crossings. Supports Dan River HDD. Restrictions in area due to large wetland features. Potential point of demarcation and testing between construction spreads.
30.5	1250	X	NC-RO-015.000	0.18	CI, OL, WL	ATWS needed in this area to support the Hwy 700 road bore spoils, material, pumps, mats, pipe, boring equipment.
30.5	1252		NC-RO-018.000	0.12	OL	material, pumps, mats, pipe, boring equipment
30.6	1252A		NC-RO-019.000	0.28	OL	materials, pipe, equipment
30.7	1253		NC-RO-022.000	0.40	FW, OL	materials, pipe, equipment

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30.9	1253D		NC-RO-019.000	0.10	OL	Supports multiple stream crossings on either side and reduced ROW due to environmental buffers.
31.0	1253A		NC-RO-025.000	0.59	FW, OL	materials, pipe, equipment
31.1	1253B		NC-RO-025.000	0.04	FW	material, mats, pumps, pipe
31.1	1253C		NC-RO-025.000	0.22	FW	material, mats, pumps, pipe
31.2	1258		NC-RO-025.000	0.36	FW, OL	materials, pipe, equipment
31.3	1259		NC-RO-025.000	0.23	FW	material, mats, pumps, pipe
31.3	1260		NC-RO-027.000	0.25	FW	material, mats, pumps, pipe
31.7	1261		NC-RO-033.000	0.62	FW, OL	material, pumps, mats, pipe, boring equipment
31.8	1262		NC-RO-033.000	0.53	FW, OL	materials, pipe, equipment
32.0	1263		NC-RO-035.000	0.17	FW, OL	material, mats, pumps, pipe
32.2	1265		NC-RO-037.000	0.17	FW, OL	material, mats, pumps, pipe
32.3	1266		NC-RO-038.000	0.46	OL	material, mats, pumps, pipe
32.4	1267	X	NC-RO-038.000	0.57	OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings.
32.5	1267A		NC-RO-038.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
32.5	1267B		NC-RO-038.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
32.6	1267C		NC-RO-038.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
32.6	1267D		NC-RO-038.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
32.6	1269		NC-RO-038.000	0.46	FW, OL	materials, pipe, equipment
32.8	1270		NC-RO-039.000	0.74	FW	materials, pipe, equipment

REVISED [Oct 2019] - Appendix 1-D Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project						
Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
32.8	1271		NC-RO-040.000	0.27	FW	ATWS, needed to stage equipment /mats for foreign line equipment crossing to access ROW.
32.8	1271A		NC-RO-039.000	0.03	FW	ATWS, needed to stage equipment /mats for foreign line equipment crossing to access ROW.
32.8	1271B		NC-RO-040.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
32.8	1272	X	NC-RO-039.000	0.37	FW, OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings. Topography issues in area.
32.9	1273		NC-RO-040.000	0.23	FW, OL	material, mats, pumps, pipe
33.0	1274		NC-RO-040.000	0.19	FW, OL	material, mats, pumps, pipe
33.1	1267E		NC-RO-038.100	0.03	FW, OL, RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
33.1	1275		NC-RO-041.000	0.17	OL	material, mats, pumps, pipe
33.2	1276		NC-RO-041.000	0.31	FW, OL	material, pumps, mats, pipe, boring equipment
33.2	1277		NC-RO-041.000	0.18	FW	material, pumps, mats, pipe, boring equipment
33.2	1278		NC-RO-042.000	0.19	FW	material, pumps, mats, pipe, boring equipment
33.3	1279		NC-RO-042.000	0.27	FW	material, mats, pumps, pipe
33.4	1280		NC-RO-042.000	0.49	FW	material, mats, pumps, pipe
33.4	1280A		NC-RO-043.000.ABU	0.23	FW	material, mats, pumps, pipe
33.5	1281		NC-RO-044.000	0.23	FW	material, mats, pumps, pipe
33.5	1282C		NC-RO-044.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
33.5	1282D		NC-RO-044.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
33.6	1282	X	NC-RO-044.000	0.46	FW, OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings. Topography issues in area especially closer to stream crossing.
33.6	1282A		NC-RO-044.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
33.6	1282B		NC-RO-044.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
33.7	1283		NC-RO-042.000	0.29	FW	material, mats, pumps, pipe
33.8	1284		NC-RO-042.000	0.52	FW	material, mats, pumps, pipe
33.9	1285		NC-RO-045.000	0.46	FW	material, mats, pumps, pipe
34.0	1286		NC-RO-045.000	0.46	FW, OL	material, mats, pumps, pipe
34.1	1287	X	NC-RO-045.000	0.46	FW, OL	ATWS needed support multiple stream and wetland crossings for staging /storage of materials, equipment. Topography issues in area.
34.2 RR	1288		NC-RO-047.000	0.12	FW	material, mats, pumps, pipe
34.3	1289		NC-RO-047.000	0.52	OL	materials, pipe, equipment
34.5	1290		NC-RO-051.000	0.48	FW	material, mats, pumps, pipe
34.6	1291		NC-RO-051.000	0.44	FW	material, mats, pumps, pipe
34.7	1293		NC-RO-054.000	0.47	FW	material, mats, pumps, pipe
34.7	1293A		NC-RO-053.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
34.7	1293B		NC-RO-053.000	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
34.8	1294		NC-RO-054.000	0.23	FW	material, mats, pumps, pipe
34.8	1296		NC-RO-054.000	0.46	FW	material, mats, pumps, pipe
35.0	1297		NC-RO-054.000	0.57	FW	material, mats, pumps, pipe
35.1	1297A		NC-RO-057.000	0.46	FW	material, mats, pumps, pipe
35.2	1297B		NC-RO-057.000	0.48	FW	material, mats, pumps, pipe
35.4	1299		NC-RO-057.000	0.51	FW, OL	Support foreign line crossing. Restriction in area due to foreign line ROW.
35.4	1300	X	NC-RO-057.000	0.40	FW, OL	Staging and storage of materials, equipment and timber mats for PI work and pipeline crossing. Area may also be used for contractor parking.
35.4	1300A		NC-RO-059.000	0.06	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
35.7	1301	X	NC-RO-058.000	0.37	AG, FW	materials, pipe, equipment
35.9	1302	X	NC-RO-058.000	0.40	FW, OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings, and environmental features such as slopes and drainages.
35.9	1302A		NC-RO-058.000, NC-RO-059.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
35.9	1302B		NC-RO-058.000, NC-RO-059.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
35.9	1303		NC-RO-058.000	0.41	FW, OL	materials, pipe, equipment
36.0	1303A		NC-RO-061.000	0.17	FW, OL	material, mats, pumps, pipe
36.2	1305	X	NC-RO-061.000	0.46	FW, OL	Staging and storage of materials, equipment and turn around for large trucks. Area may also be used for contractor parking.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
36.3	1306		NC-RO-061.000	0.25	AG	material, pumps, mats, pipe, boring equipment
36.3	1307		NC-RO-061.000	0.18	AG	material, pumps, mats, pipe, boring equipment
36.3	1308		NC-RO-063.000	0.25	AG	material, pumps, mats, pipe, boring equipment
36.3	1309		NC-RO-062.000	0.18	AG, FW	material, pumps, mats, pipe, boring equipment
36.3	1310		NC-RO-063.000	0.40	AG, FW	materials, pipe, equipment
36.6	1311		NC-RO-063.000	0.24	OL	material, pumps, mats, pipe, boring equipment
36.6	1312		NC-RO-063.000	0.18	OL	material, pumps, mats, pipe, boring equipment
36.6	1313		NC-RO-067.000.ABU	0.13	FW, RD	material, pumps, mats, pipe, boring equipment
36.8	1315	X	NC-RO-068.000	0.38	AG, FW	Staging and storage of materials, equipment and turn around for large trucks. Area may also be used for contractor parking.
36.8	1316		NC-RO-068.000	0.23	AG, FW	materials, pipe, equipment
36.9	1317A		NC-RO-069.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
36.9	1317B		NC-RO-069.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
37.0	1316A		NC-RO-069.000	0.16	OL	materials, pipe, equipment
37.1	1317	X	NC-RO-069.000	0.46	OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings, and environmental features such as slopes and drainages.
37.1	1318		NC-RO-072.000	0.23	FW	material, mats, pumps, pipe
37.2	1319		NC-RO-072.000	0.23	FW	material, mats, pumps, pipe
37.2	1320		NC-RO-072.000	0.23	FW	material, mats, pumps, pipe
37.3	1321		NC-RO-073.000	0.26	FW	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
37.6	1324	X	NC-RO-077.000	0.53	OL	support multiple stream and wetland crossings, foreign line crossings. Restricted ROW in area.
37.7	1324B		NC-RO-077.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
37.8	1324A		NC-RO-080.000	0.45	FW, OL	materials, pipe, equipment
37.8	1326		NC-RO-080.000	0.53	FW, OL	materials, pipe, equipment
37.9	1327		NC-RO-083.000	0.42	FW, RD	materials, pipe, equipment
38.0	1328	X	NC-RO-084.000	0.82	FW, OL	ATWS needed to stage / off load materials, pipe, equipment to support multiple stream and wetland crossings, foreign line crossings
38.1	1328A		NC-RO-085.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
38.1	1328B		NC-RO-085.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
38.1 RR	1328C		NC-RO-086.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
38.1 RR	1328D		NC-RO-086.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
38.1 RR	1329		NC-RO-086.000	0.30	FW, OL	materials, pipe, equipment
38.2	1330A		NC-RO-087.000, NC-RO-088.000	0.22	FW	Supports multiple stream crossings. Topography issues in area.
38.3	1331		NC-RO-088.000	0.25	FW	materials, pipe, equipment
38.4	1332		NC-RO-089.000	0.53	FW	material, mats, pumps, pipe
38.6	1333		NC-RO-089.000	0.23	FW	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
38.6	1334	X	NC-RO-089.000	0.40	FW, OL	Staging and storage of materials, equipment and turn around for large trucks. Area may also be used for contractor parking.
38.8	1335		NC-RO-090.000	0.28	FW, OL	material, pumps, mats, pipe, boring equipment
38.8	1336	X	NC-RO-090.000	0.40	FW, OL	Support multiple stream and wetland crossings and road bore. Restricted ROW in area.
38.8	1337		NC-RO-091.000	0.24	FW, OL	material, pumps, mats, pipe, boring equipment
38.9	1338	X	NC-RO-091.000	0.96	FW, OL	Support multiple stream and wetland crossings and road bore. Restricted ROW in area due to colocation with high voltage transmission lines.
39.0	1340		NC-RO-091.000	0.45	FW	material, mats, pumps, pipe
39.1	1341		NC-RO-092.000	0.25	FW, OL	material, mats, pumps, pipe
39.1	1342		NC-RO-092.000	0.19	FW	material, mats, pumps, pipe
39.2	1342A		NC-RO-092.000	0.06	FW	material, mats, pumps, pipe
39.3	1343		NC-RO-094.000	0.13	AG	material, mats, pumps, pipe
39.6	1344	X	NC-RO-095.000	0.60	FW, OL, RD	Support stream / wetland crossings and road bore. Tight workspace due to structures at crossings.
39.7	1345		NC-RO-095.000	0.13	CI, FW, OL	material, pumps, mats, pipe, boring equipment
39.7	1346	X	NC-RO-100.000	0.30	FW, OL	stage / off load materials, pipe, equipment, mats, boring equipment to bore US 29 & railroad while supporting stream and wetland crossings
39.7	1347	X	NC-RO-100.000	0.57	FW, OL	stage / off load materials, pipe, equipment, mats, boring equipment to bore US 29 & railroad while supporting stream and wetland crossings.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
39.7	1347A		NC-RO-100.100	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
39.9	1348		NC-RO-100.000	0.39	FW	materials, pipe, equipment
40.0	1349		NC-RO-099.000.AR	0.70	FW, OL	materials, pipe, equipment
40.1	1350		NC-RO-101.000	0.23	FW	material, mats, pumps, pipe
40.2	1351		NC-RO-101.000	0.23	FW	material, mats, pumps, pipe
40.2	1352		NC-RO-101.000	0.24	FW	material, mats, pumps, pipe
40.3 RR	1353		NC-RO-103.000	0.45	FW, OL	material, pumps, mats, pipe, boring equipment
40.3 RR	1353A	X	NC-RO-102.000	0.20	FW	ATWS to be used for project access off of Narrow Gauge Rd, parking, staging of equipment to support road bore and stream/wetland crossing. ATWS was proposed in this location to avoid disturbing landowners to the east of the pipeline.
40.4 RR	1353B		NC-RO-105.000	0.11	FW	Supports road crossing and PI installation
40.4 RR	1354		NC-RO-104.000	0.18	AG, FW	material, pumps, mats, pipe, boring equipment
40.4 RR	1354A		NC-RO-105.000	0.20	AG, FW, OL	Additional space for construction. Topography issues in area.
40.5 RR	1354B		NC-RO-105.000	0.06	AG	Supports stream crossings. Topography issues in area.
40.5	1355		NC-RO-106.000	0.44	AG	materials, pipe, equipment
40.5	1356		NC-RO-108.000	0.23	FW	material, mats, pumps, pipe
40.5	1363D		NC-RO-108.000	0.03	OL, RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
40.5	1363E		NC-RO-108.000	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
40.6	1357		NC-RO-108.000	0.22	FW	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
40.6	1358		NC-RO-108.000	0.29	FW	material, mats, pumps, pipe
40.7	1359		NC-RO-109.000	0.50	FW	materials, pipe, equipment
40.8	1360		NC-RO-109.000	0.27	FW	material, mats, pumps, pipe
40.8	1361		NC-RO-109.000	0.18	FW	material, mats, pumps, pipe
40.8	1362		NC-RO-109.000	0.40	FW	materials, pipe, equipment
40.9	1363	X	NC-RO-109.000	0.35	FW, OL	Staging and storage of materials, equipment and turn around for large trucks.
40.9	1363A		NC-RO-109.000	0.06	AG, FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.0	1363B		NC-RO-109.000	0.03	AG, FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.0	1363C		NC-RO-109.000	0.03	AG, FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.1	1364		NC-RO-110.000	0.46	FW	material, mats, pumps, pipe
41.2	1366		NC-RO-111.000	0.53	FW	material, mats, pumps, pipe
41.4	1367	X	NC-RO-111.000	0.85	FW, OL	Support stream crossing, pipeline staging and boring equipment needed for Hwy 29 road bore. Topography and ROW restrictions in area due to foreign line ROW
41.5	1367A		NC-RO-111.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.5	1367B		NC-RO-111.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.5	1368		NC-RO-111.000	0.42	FW	material, pumps, mats, pipe, boring equipment
41.6	1369		NC-RO-112.000	0.27	FW	material, pumps, mats, pipe, boring equipment

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
41.8	1367C		NC-RO-111.000	0.03	CI, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.8	1367D		NC-RO-111.000	0.03	CI, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.8	1371		NC-RO-112.000	0.64	OL	material, mats, pumps, pipe
41.8	1371A		NC-RO-112.000	0.06	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
41.8	1373		NC-RO-113.000	0.52	FW	material, mats, pumps, pipe
41.9	1374		NC-RO-113.000	0.44	FW, OL	materials, pipe, equipment
42.0	1371B		NC-RO-112.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
42.2	1376		NC-RO-112.000	0.59	CI, OL	material, pumps, mats, pipe, boring equipment
42.2	1377		NC-RO-112.200	0.17	FW, OL	material, pumps, mats, pipe, boring equipment
42.3	1378		NC-RO-112.200	0.09	FW	materials, pipe, equipment
42.4	1379	X	NC-RO-117.000	0.26	FW, OL	Staging and storage of materials, equipment and turn around for large trucks to support multiple stream /wetland crossings
42.4	1379A		NC-RO-117.000	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
42.4	1379B		NC-RO-117.000	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
42.5	1380		NC-RO-117.000	0.82	FW, OL	materials, pipe, equipment
43.1	1383		NC-RO-117.000	0.23	FW	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
43.1	1384	X	NC-RO-118.000.ABU	0.25	FW, OL, RD	Project access point off of Brooks Rd material, pumps, mats, pipe, boring equipment staging for Brooks Rd /Stream crossings.
43.2	1385	X	NC-RO-122.000	0.52	FW, OL	Project access point off Brooks Rd. Material, pumps, mats, pipe, boring equipment staging for Brooks Rd /Stream crossings. Topography issues in area along with ROW restrictions due to foreign line ROW.
43.3	1386		NC-RO-122.000	0.23	FW, OL	material, mats, pumps, pipe
43.3	1389		NC-RO-122.000	0.23	FW	material, mats, pumps, pipe
43.4	1390		NC-RO-122.000	0.30	FW, OL	Staging and storage of materials and equipment for road crossing.
43.4	1391	X	NC-RO-122.000	0.24	FW, OL	Project access point off Knowles Rd. Material, pumps, mats, pipe, boring equipment staging for Knowles Rd /Stream crossings.
43.4	1392	X	NC-RO-122.100	0.38	OL	support boring equipment, needed for Knowles Rd, general pipeline construction and multiple stream crossings.
43.4	1393		NC-RO-122.100	0.27	FW, OL	material, pumps, mats, pipe, boring equipment
43.7	1394		NC-RO-126.000	0.23	FW	material, mats, pumps, pipe
43.8	1395		NC-RO-133.200	0.22	FW	material, mats, pumps, pipe
43.8	1396		NC-RO-133.200	0.23	FW	material, mats, pumps, pipe
43.9	1397	X	NC-RO-133.200	0.40	FW, OL	ATWS to be used for equipment, materials to support general pipeline construction and multiple stream crossings.
43.9	1397A		NC-RO-133.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
43.9	1397B		NC-RO-133.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
43.9	1397C		NC-RO-133.000	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
43.9	1397D		NC-RO-133.000	0.03	RD	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
44.0	1401		NC-RO-133.000	0.23	FW, OL	materials, pipe, equipment
44.1	1402		NC-RO-133.000	0.14	FW, OL	material, mats, pumps, pipe
44.1	1403	X	NC-RO-133.000	0.26	FW, OL	ATWS to be used for equipment, materials to support general pipeline construction and multiple stream crossings.
44.2	1403B		NC-RO-133.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
44.2	1404		NC-RO-133.000	0.59	FW, OL	material, mats, pumps, pipe
44.4	1404A		NC-RO-135.000	0.46	FW, OL, RD	materials, pipe, equipment
44.5	1407		NC-RO-136.000	0.46	AG, FW	materials, pipe, equipment
44.6	1407A		NC-RO-137.000	0.46	FW, OL	materials, pipe, equipment
44.8	1408		NC-RO-138.000	0.56	AG, FW, OL	Staging and storage of materials, equipment for PI work and power line crossing.
44.9	1409		NC-RO-138.000	0.09	AG	material, pumps, mats, pipe, boring equipment
44.9	1410		NC-RO-138.000	0.59	AG, OL	material, pumps, mats, pipe, boring equipment
44.9	1411		NC-RO-139.000	0.46	AG, FW	material, pumps, mats, pipe, boring equipment
44.9	1412		NC-RO-139.000	0.15	AG	material, pumps, mats, pipe, boring equipment

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
45.0	1413	X	NC-RO-139.000	0.11	AG, FW	Offloading and storing boring equipment needed to support Grooms Rd. Topography issues in area.
45.1	1414A		NC-RO-139.000	0.03	AG	Area to be used as pull off during active construction or use of the road to allow safe passage while using the road.
45.1	1414B		NC-RO-139.000	0.03	AG	Area to be used as pull off during active construction or use of the road to allow safe passage while using the road.
45.3	1414	X	NC-RO-139.000	0.51	AG, FW	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream crossings. Topography issues in area
45.5	1415A		NC-RO-140.000	0.36	FW, OL, SC	Area to be used for staging of equipment, materials and soils during wetland / stream crossings.
45.7	1416		NC-RO-142.000	0.44	FW, OL	material, mats, pumps, pipe
45.8	1417		NC-RO-142.000	0.51	OL	material, mats, pumps, pipe
45.8	1418		NC-RO-142.000	0.17	FW	material, mats, pumps, pipe
45.8	1419		NC-RO-142.000	0.23	FW	material, mats, pumps, pipe
45.9	1420C		NC-RO-143.400	0.06	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
46.0 RR	1419A		NC-RO-143.000	0.23	FW	Area to be used for staging of equipment, materials and soils during stream crossing.
46.1 RR	1420	X	NC-RO-143.000	0.69	FW, OL	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream crossings. Topography issues in area
46.1 RR	1420A1		NC-RO-143.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
46.1 RR	1420B1		NC-RO-143.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
46.2 RR	1420A		NC-RO-143.000	0.28	FW	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream and wetland crossing.
46.2 RR	1420B		NC-RO-143.000	0.23	FW	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream and wetland crossing.
46.3 RR	1421		NC-RO-143.000	0.38	AG, FW, OL	materials, pipe, equipment
46.4	1422		NC-RO-146.100	0.23	FW	materials, pipe, equipment
46.4	1423		NC-RO-146.100	0.30	FW	material, mats, pumps, pipe
46.5	1423A		NC-RO-146.100	0.23	OL	material, mats, pumps, pipe
46.7	1426	X	NC-RO-148.500	1.20	AG, FW, OL	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream crossings. Topography issues in area
46.7	1426A		NC-RO-148.505	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
46.7	1426B		NC-RO-148.505	0.02	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
47.0	1427		NC-RO-148.500	0.23	FW	material, mats, pumps, pipe
47.0	1428		NC-RO-148.500	0.16	FW	material, mats, pumps, pipe
47.0	1429		NC-RO-149.000	0.48	OL	material, mats, pumps, pipe
47.1	1431		NC-RO-149.000	0.76	FW, OL	materials, pipe, equipment
47.3	1432	X	NC-RO-153.000	0.42	FW, OL	ATWS needed to stage materials, pipe, equipment, used to complete multiple stream crossings. Topography issues in area

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
47.3	1432A		NC-RO-149.100	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
47.3	1432B		NC-RO-153.000	0.03	FW	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
47.4	1432C		NC-RO-149.100	0.03	FW, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
47.4	1433		NC-RO-153.000	0.17	FW	material, mats, pumps, pipe
47.4	1434		NC-RO-153.000	0.15	FW	material, mats, pumps, pipe
47.5	1435		NC-RO-154.000	0.32	FW	material, mats, pumps, pipe
47.6	1436		NC-RO-154.000	0.56	FW	material, mats, pumps, pipe
47.6	1437		NC-RO-154.000	0.58	FW	material, mats, pumps, pipe
47.7	1438		NC-RO-154.000	0.23	FW	material, mats, pumps, pipe
47.7	1438A		NC-RO-155.000	0.21	FW	material, mats, pumps, pipe
47.8	1439		NC-RO-155.000	0.06	FW	materials, pipe, equipment
47.8	1440		NC-RO-155.000	0.57	FW	materials, pipe, equipment
47.9	1441		NC-RO-155.000	0.06	FW	materials, pipe, equipment
47.9	1442		NC-RO-155.000	0.40	FW	materials, pipe, equipment
48.2	1443		NC-RO-156.000	1.50	AG	materials, pipe, equipment
48.4	1444	X	NC-RO-157.000	0.35	AG	Project access to ROW off Hwy 150. Material, pumps, mats, pipe, boring equipment staging for Hwy 150 bore crossing.
48.4	1445		NC-RO-156.000	0.26	AG, FW	material, pumps, mats, pipe, boring equipment
48.4	1446	X	NC-RO-160.000	0.23	AG	Project access to ROW off Hwy 150. Material, pumps, mats, pipe, boring equipment staging for Hwy 150 bore crossing.
48.5	1446A		NC-RO-160.000	0.22	AG, OL	ATWS in agricultural field to support wetland crossing and associated equipment.
48.6	1448		NC-RO-162.000	0.23	FW	material, mats, pumps, pipe

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
48.7	1449		NC-RO-162.000	0.29	CI, FW	material, mats, pumps, pipe
48.7	1450		NC-RO-162.000	0.46	FW, OL	material, mats, pumps, pipe
49.1	1451		NC-RO-162.000	0.19	FW, RD	material, pumps, mats, pipe, boring equipment
49.2	1452		NC-RO-165.000	0.46	OL	material, pumps, mats, pipe, boring equipment
49.2	1454	X	NC-RO-165.000	0.28	FW, OL	Staging and storage of materials, equipment and timber mats for stream /wetland crossings. Also will be utilized for large truck turnaround and employee parking, spoils storage during open cut of stream crossing.
49.2	1454A		NC-RO-165.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
49.2	1454B		NC-RO-165.000, NC-RO-166.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
49.5	1456	X	NC-RO-168.000	0.51	OL	Project access to ROW off of High Rock Rd, material, pumps, mats, pipe, boring equipment staging for crossings.
49.5	1457	X	NC-RO-169.000	0.28	FW	Project access to ROW off of High Rock Rd, material, pumps, mats, pipe, boring equipment staging for crossings.
49.6	1458		NC-RO-169.000	0.39	FW	materials, pipe, equipment
49.7 RR	1459		NC-RO-170.000	0.55	FW, OL	materials, pipe, equipment
49.7 RR	1460A		NC-RO-170.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time
49.7 RR	1460B		NC-RO-170.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time

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Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
49.8 RR	1460	X	NC-RO-171.000	0.32	FW, OL	staging and storage of materials, equipment for large stream and wetland crossing. Restricted ROW in area due to foreign utility ROW
49.9 RR	1461		NC-RO-171.000	0.46	FW	material, mats, pumps, pipe
50.0 RR	1462		NC-RO-173.000	0.64	FW	material, mats, pumps, pipe
50.1 RR	1463C		NC-RO-174.200	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
50.1 RR	1463D		NC-RO-174.200	0.03	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
50.2 RR	1462A		NC-RO-174.000	0.23	FW	material, mats, pumps, pipe
50.2 RR	1463A1		NC-RO-174.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
50.2 RR	1463B		NC-RO-174.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
50.3 RR	1463	X	NC-RO-175.000	0.46	FW, OL	Staging and storage of materials, equipment and turn around for large trucks. Area may also be used for contractor parking due to lack of access points in this section of the Project. Multiple stream crossings in this section requiring additional mats, equipment and materials.
50.7 RR	1463A		NC-RO-179.000	0.46	FW, OL	material, mats, pumps, pipe
51.2 RR	1464		NC-RO-181.000	0.42	AG, FW	material, mats, pumps, pipe
51.3 RR	1465		NC-RO-181.000	0.28	AG	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
51.4 RR	1466	X	NC-RO-181.000	0.52	AG, FW, OL	Staging and storage of materials, equipment and timber mats for wetland /stream crossing spoils staging during open cut. Restricted ROW in area due to environmental features
51.6 RR	1467	X	NC-RO-181.000	0.53	AG	material, pumps, mats, pipe, boring equipment needed to bore Kernoble Rd, spoil pile storage, and parking. Restricted area due to foreign utility structures
51.7	1168		NC-RO-183.000	0.70	AG, OL	materials, pumps, mats, pipe, boring equipment
51.7	1469		NC-RO-183.000	0.24	AG	material, pumps, mats, pipe, boring equipment
51.8	1470		NC-RO-183.000	0.67	AG	Staging area and turn around for TAR, area will hold materials, pipe, fittings, mats, etc...
52.0	1472		NC-RO-184.000	0.46	OL	material, pumps, mats, pipe, boring equipment
52.1 RR	1472A		NC-RO-185.000	0.69	FW, OL	Staging area and turn around for TAR, area will hold materials, pipe, fittings, mats, etc...
52.2	1474	X	NC-GU-001.000	0.46	FW, OL	Staging and storage of materials, equipment and timber mats for multiple stream /wetland crossing. Area may also be used as turnaround for large trucks. Topography issues in area
52.3	1475	X	NC-GU-001.000	0.59	FW, OL	Staging and storage of materials, equipment and timber mats for multiple stream wetland crossing. Supports foreign utility crossing
52.4 RR	1475A1		NC-GU-001.000	0.23	FW	Area needed to support stream crossing
52.4 RR	1475A2		NC-GU-001.000	0.21	FW	Area needed to support stream crossing
52.5	1475A		NC-GU-001.000	0.55	AG, FW	material, mats, pumps, pipe

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
52.6	1478	X	NC-AL-000.005	0.14	FW, OL	materials, pipe, equipment
52.6	1478	X	NC-RO-186.000	0.41	CI, FW, OL	Staging and storage of materials, equipment and timber mats for multiple stream /wetland crossing.
52.7	1480		NC-AL-000.005	0.30	FW	materials, pipe, equipment
52.7	1481		NC-AL-000.005	0.17	FW	material, mats, pumps, pipe
52.8	1482		NC-AL-000.015	0.28	FW, RD	material, mats, pumps, pipe
52.9	1483		NC-AL-000.020	0.19	FW	materials, pipe, equipment
53.0	1484	X	NC-AL-000.045	0.52	FW, OL, RD	Project access, staging and storage of materials and equipment for road bore crossing equipment
53.1	1485		NC-AL-000.050	0.62	AG, FW	material, pumps, mats, pipe, boring equipment
53.3	1486	X	NC-AL-000.055	0.57	AG, FW, OL	ATWS needed for Project access, equipment, soil, parking and boring equipment needed to bore Lee Lewis Rd. Restricted ROW in area due to foreign utility
53.3	1487	X	NC-AL-000.065	0.23	FW, OL, SC	ATWS needed for Project access, equipment, soil, parking and boring equipment needed to bore Lee Lewis Rd. Restricted ROW in area due to foreign utility
53.5	1489		NC-AL-000.065	0.31	FW, RD, SC	materials, pipe, equipment
53.6	1492		NC-AL-000.065	0.46	RD, SC	materials, pipe, equipment
53.8	1493	X	NC-AL-003.000	0.52	AG, FW, OL	ATWS needed for Staging and storage of materials, equipment and timber mats for multiple stream crossing. Area may also be used as turnaround for large trucks. Restricted ROW due to environmental features.
53.8	1493A		NC-AL-003.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
53.8	1493B		NC-AL-003.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
53.9	1494		NC-AL-005.000	0.46	FW, OL	material, mats, pumps, pipe
54.1	1496		NC-AL-005.000	0.47	AG	material, pumps, mats, pipe, boring equipment
54.1	1497		NC-AL-006.000	0.47	AG	material, pumps, mats, pipe, boring equipment
54.1	1498A		NC-AL-006.000	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
54.3	1498	X	NC-AL-006.000	0.54	AG	ATWS to be used for unloading / staging material, pipe, equipment, needed to cross large wetland in the area, also parking.
54.4	1499		NC-AL-006.000	0.82	AG, FW	material, mats, pumps, pipe
54.6	1500		NC-AL-007.000	0.78	FW	material, mats, pumps, pipe
54.6	1502A		NC-AL-008.100	0.05	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
54.7	1502	X	NC-AL-007.000	0.63	AG, FW	ATWS to be used for offloading / staging material, mats, pumps, pipe to be used in the multiple stream /wetland crossings
54.9	1503		NC-AL-008.000	0.46	AG, OL	material, mats, pumps, pipe
55.0	1504		NC-AL-009.000	0.43	FW	material, mats, pumps, pipe
55.0	1505		NC-AL-009.000	0.13	AG, OL	material, pumps, mats, pipe, boring equipment
55.1	1506		NC-AL-009.000	0.39	AG, FW, OL	material, pumps, mats, pipe, boring equipment
55.1	1507		NC-AL-010.000	0.28	AG	materials, pipe, equipment
55.1	1507A		NC-AL-010.000	0.39	AG, OL	materials, pipe, equipment
55.2 RR	1507B		NC-AL-010.000	0.23	AG	materials, pipe, equipment
55.3 RR	1507C		NC-AL-010.000	0.25	AG, FW, OL	Area needed to support stream crossing

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Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
55.3 RR	1507D		NC-AL-010.000	0.27	FW	Area needed to support stream crossing
55.4 RR	1507E		NC-AL-019.000	0.23	FW	Area needed to support stream crossing
55.5	1507F		NC-AL-018.000	0.67	AG	Area needed to support stream crossing, holding pipe, soils, and construction materials and equipment.
55.5	1511	X	NC-AL-018.000	0.67	AG, FW	Project access, staging and storage of materials, equipment and timber mats for stream/wetland crossing.
55.7	1514		NC-AL-022.000	0.32	FW	material, pumps, mats, pipe, boring equipment
55.8	1515		NC-AL-022.000	1.03	AG, FW	material, pumps, mats, pipe, boring equipment
56.0	1516		NC-AL-025.000	0.46	AG, FW	materials, pipe, equipment
56.3	1518		NC-AL-025.000	0.54	AG, FW, OL	materials, pipe, equipment
56.3	1519		NC-AL-027.000	0.13	FW	material, pumps, mats, pipe, boring equipment
56.4	1521		NC-AL-028.000	0.09	FW	material, pumps, mats, pipe, boring equipment
56.5	1521A		NC-AL-030.000	0.28	FW, RD	Area needed to support the crossing of wetlands/multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
56.7 RR	1521B		NC-AL-027.000	0.43	AG, FW	Area needed to support the crossing of wetlands/multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
56.7	1524		NC-AL-028.000	0.57	AG, FW, OL	material, mats, pumps, pipe, equipment
56.8	1524A		NC-AL-033.000	0.22	FW, OL	ATWS needed for multiple streams / wetland crossings to allow staging of tools, equipment and materials

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
56.8	1526A		NC-AL-033.000	0.03	CI, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
56.8	1526B		NC-AL-033.000	0.03	CI, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
56.9	1526		NC-AL-036.000	0.65	AG	material, mats, pumps, pipe, equipment
57.0	1527		NC-AL-037.000	0.12	FW	material, mats, pumps, pipe, equipment
57.1	1529		NC-AL-039.000	0.49	FW	material, mats, pumps, pipe, equipment
57.3	1530		NC-AL-039.000	0.05	RD	materials, pipe, equipment
57.3	1531		NC-AL-039.000	0.38	FW, OL	materials, pipe, equipment
57.4	1532		NC-AL-041.000	0.45	OL	material, pumps, mats, pipe, boring equipment
57.5	1533		NC-AL-042.000	0.28	FW, OL	material, pumps, mats, pipe, boring equipment
57.5	1533A		NC-AL-042.000	0.61	FW, OL	material, pumps, mats, pipe, boring equipment
57.6	1533B		NC-AL-043.000	0.46	AG, FW, OL	material, mats, pumps, pipe, equipment
57.7	1535	X	NC-AL-043.000	0.41	FW, OL	ATWS to be used for staging and storage of materials, equipment and turn around Supports foreign utility crossing, installation of pipeline PI.
57.7	1535A		NC-AL-043.000	0.02	OL	Increased turning radius for large trucks.
57.8	1536		NC-AL-043.000	0.20	RD	material, pumps, mats, pipe, boring equipment
57.8	1537		NC-AL-044.000	0.24	FW, OL	material, pumps, mats, pipe, boring equipment
57.9	1538		NC-AL-046.000	0.34	OL	material, mats, pumps, pipe, equipment
57.9	1539		NC-AL-046.000	0.15	OL	material, mats, pumps, pipe, equipment

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Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
57.9	1540B		NC-AL-046.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
57.9	1540A1		NC-AL-046.000	0.02	OL	Vehicle pull offf in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
58.1	1540	X	NC-AL-046.000	0.46	OL	Supports wetland crossings in area. Restricted ROW due to environmental features.
58.3	1540A		NC-AL-050.000	0.41	OL	materials, pipe, equipment
58.4	1541	X	NC-AL-050.000	0.27	FW, OL	materials, pipe, equipment
58.4	1541A1		NC-AL-050.100	0.06	OL	Vehicle pull offf in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
58.6 RR	1541A		NC-AL-050.100	0.58	AG, FW	Vehicle pull offf in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
58.6 RR	1541B		NC-AL-051.000	0.34	AG	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
58.6 RR	1541C		NC-AL-051.000	0.48	AG, FW	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
58.7 RR	1541D		NC-AL-052.000	0.39	FW	Area to support road bore, project area staging for pipe, equipment and materials.
58.8	1545		NC-AL-052.000	0.56	FW	material, mats, pumps, pipe, equipment
58.8	1546	X	NC-AL-052.000	0.41	FW, OL	Staging and storage of materials, equipment and turn around for large trucks.
59.0 RR	1546A		NC-AL-053.000	0.55	FW	Area will hold pipe, mats, soils, pumps, parking, equipment.
59.2 RR	1546B		NC-AL-055.000	0.24	FW, RD	Area will hold pipe, mats, soils pumps, parking, equipment.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
59.3 RR	1546C		NC-AL-055.000	0.46	OL	Area to support road bore, project area staging for pipe, equipment and materials.
59.4 RR	1546D		NC-AL-060.000	0.26	RD	Area to support road bore, project area staging for pipe, equipment and materials.
59.6	1553		NC-AL-064.000	0.49	FW, OL	materials, pipe, equipment
59.7	1554		NC-AL-064.000	0.26	FW, OL	materials, pipe, equipment
60.0	1555	X	NC-AL-066.000	0.64	FW, OL	ATWS needed for Project access, equipment, soil, parking and boring equipment needed to bore Burch Bridge Rd.
60.0	1556	X	NC-AL-067.000	0.49	OL	ATWS needed for Project access, equipment, soil, parking and boring equipment needed to bore Burch Bridge Rd.
60.2	1557		NC-AL-068.000	0.40	OL	material, pumps, mats, pipe, boring equipment
60.4	1558		NC-AL-070.000	0.46	FW, OL	materials, pipe, equipment
60.7	1559		NC-AL-075.000	0.26	FW	material, mats, pumps, pipe, equipment
60.7	1560		NC-AL-075.000	0.27	FW	material, mats, pumps, pipe, equipment
60.8 RR	1560A		NC-AL-074.100.AR	0.64	FW, OL, SC	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
60.9	1560B		NC-AL-074.000	0.33	FW, OL	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
60.9	1561		NC-AL-074.000	0.44	FW, OL	material, mats, pumps, pipe, equipment
61.1	1561A	X	NC-AL-076.100.AR	2.04	AG, FW, OL	ATWS needed to stage for materials, pipe, equipment and mats to be used during large wetland crossing / stream crossing.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
61.2	1561B1		NC-AL-076.100.AR	0.03	AG	Vehicle pull offf in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
61.3	1561B		NC-AL-076.100.AR	0.20	FW	General equipment staging and parking in open field
61.4	1552		NC-AL-064.000	0.24	FW, OL	materials, pipe, equipment
61.4	1563		NC-AL-081.000	0.35	FW, OL	material, pumps, mats, pipe, boring equipment
61.4	1564		NC-AL-081.000	0.45	AG, FW, OL	material, pumps, mats, pipe, boring equipment
61.4	1565		NC-AL-081.000	0.38	AG, OL	material, pumps, mats, pipe, boring equipment
61.5	1566	X	NC-AL-081.000	0.35	AG, OL	ATWS needed to stage for materials, pipe, equipment and mats to be used during multiple wetland crossing / stream crossing
61.5	1566A		NC-AL-081.000	0.06	AG, OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
61.7	1567		NC-AL-081.000	0.23	FW, OL	materials, pipe, equipment
61.8	1568		NC-AL-081.000	0.53	OL	material, mats, pumps, pipe, equipment
62.2 RR	1569		NC-AL-084.000	0.53	AG, OL	materials, pipe, equipment
62.3 RR	1569A		NC-AL-084.000	0.50	OL	materials, pipe, equipment
62.4 RR	1569B		NC-AL-085.000	0.22	OL	Area to be used to help support drainage area crossing.
62.5	1572	X	NC-AL-086.000	0.62	FW, OL	ATWS needed to stage for materials, pipe, pumps, equipment and mats to be used during multiple wetland crossing / stream crossing. Reduced ROW in area due to residence.
62.6	1573		NC-AL-086.000	0.23	OL	material, mats, pumps, pipe, equipment

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
62.7	1572A		NC-AL-086.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
62.7	1572B		NC-AL-086.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
62.7	1574		NC-AL-086.000	0.20	OL	material, mats, pumps, pipe, equipment
62.8	1575		NC-AL-089.000	0.58	OL	material, pumps, mats, pipe, boring equipment
62.8	1576		NC-AL-093.000	0.24	FW, OL	material, pumps, mats, pipe, boring equipment
62.9	1577		NC-AL-093.000	0.55	FW	material, mats, pumps, pipe, equipment
63.1 RR	1577A		NC-AL-093.000	0.30	FW, OL	Area to support 62 road bore, project area staging for pipe, equipment and materials.
63.1 RR	1577B		NC-AL-097.000	0.26	FW, OL	Area to support 62 road bore, project area staging for pipe, equipment and materials.
63.2 RR	1577C		NC-AL-093.000	0.36	FW	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
63.4 RR	1577D		NC-AL-097.000	0.16	FW	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
63.4 RR	1581	X	NC-AL-097.000	1.06	FW	material, mats, pumps, pipe, equipment
63.4 RR	1581A		NC-AL-097.000	0.37	FW	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
63.4	1582	X	NC-AL-101.000.AR	0.64	AG, FW, OL	Staging and storage of materials and equipment for HDD. Area may also be used as turnaround for large trucks.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
63.8	1584	X	NC-AL-103.000	1.14	FW, OL, SC	Staging and storage of materials and equipment for HDD Sandy Creek, also staging for Deep Creek Stream bore. Area may also be used as turnaround for large trucks
63.8	1585		NC-AL-104.000	0.46	FW	material, mats, pumps, pipe, equipment
63.9	1587		NC-AL-103.000	0.15	FW, SC	material, mats, pumps, pipe, equipment
63.9	1587A		NC-AL-103.000	0.16	SC	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
64.0 RR	1588		NC-AL-103.000	0.34	FW, SC	material, mats, pumps, pipe, equipment
64.1	1587B		NC-AL-106.000	0.20	FW, OL	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
64.1	1587C		NC-AL-106.000	0.59	FW, OL	Area needed to support the crossing of stream, area will hold pipe, mats, soils, pumps, parking, equipment.
64.4	1588A		MVF-NC-AL-002.000	0.23	FW	material, mats, pumps, pipe, equipment
64.5	1588B		MVF-NC-AL-004.000	0.23	FW	material, mats, pumps, pipe, equipment
64.8	1588C		MVF-NC-AL-005.000	0.29	FW	material, pumps, mats, pipe, boring equipment
64.8	1588D		MVF-NC-AL-005.000	0.29	FW, OL	material, pumps, mats, pipe, boring equipment
64.8	1588E		MVF-NC-AL-007.000	0.58	FW, OL	material, pumps, mats, pipe, boring equipment
65.0 RR	1588F		MVF-NC-AL-007.000	0.14	OL	material, pumps, mats, pipe, boring equipment needed to bore Faucette Ln, also staging for multiple streams/ wetlands in this section.
65.0 RR	1588F1		MVC-NC-AL-007.00	0.50	OL	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
65.1 RR	1588F2		MVC-NC-AL-007.00	0.43	FW, OL	Area needed to support the crossing of multiple streams, area will hold pipe, mats, soils, pumps, parking, equipment.
65.2 RR	1588FF		MVF-NC-AL-007.000	0.43	OL	material, pipe, equipment
65.3 RR	1588H		MVF-NC-AL-007.000	0.63	OL	material, pumps, mats, pipe, boring equipment
65.4 RR	1588I		MVF-NC-AL-012.000.ABU	0.07	AG, FW, OL	material, pumps, mats, pipe, boring equipment
65.4 RR	1588J		MVF-NC-AL-011.000	0.33	AG, OL	material, pumps, mats, pipe, boring equipment
65.5 RR	1588JJ		MVF-NC-AL-011.000	0.35	AG, FW	material, pipe, equipment
65.5	1588K		MVF-NC-AL-013.000	0.36	FW, OL	material, mats, pipe, equipment
65.6	1588L		NC-AL-119.000	0.46	FW, OL	material, mats, pumps, pipe, equipment
66.0 RR	1588N		FA34-AL-001.000	0.58	FW, OL	material, pumps, mats, pipe, boring equipment
66.0 RR	1588P		FA3-AL-002.000	0.23	OL	material, pumps, mats, pipe, boring equipment
66.1 RR	1588M		FA34-AL-001.000	0.44	AG	material, pumps, mats, pipe, boring equipment
66.2 RR	1588O		FA3-AL-003.000	0.45	AG, OL	material, pumps, mats, pipe, boring equipment
66.2 RR	1588Q		FA3-AL-003.000	0.63	AG, OL	materials, pipe, equipment
66.4 RR	1588R		FA3-AL-005.000	0.26	FW	material, pumps, mats, pipe, boring equipment
66.4 RR	1588S		FA3-AL-005.000	0.26	FW	material, pumps, mats, pipe, boring equipment
66.4 RR	1588U		FA3-AL-006.000	0.26	OL	material, pumps, mats, pipe, boring equipment
66.6 RR	1588U1		NC-AL-127.000.ABU	0.28	OL	Area needed to support waterbody crossing.
66.6 RR	1588U2		NC-AL-127.000.ABU	0.52	OL	Area needed to support waterbody crossing.
66.7 RR	1588V		FA3-AL-009.000	0.25	OL	materials, pipe, equipment
66.7 RR	1588U3		FA3-AL-009.000	0.60	FW, OL	Area needed to support multiple waterbody crossings, pipe, soils, equipment.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
66.8 RR	1588W		FA3-AL-009.000	0.21	FW, OL	Staging and storage of materials, equipment and timber mats for stream crossing. Area may also be used as turnaround for large trucks and contractor parking.
66.8 RR	1588W1		NC-AL-128.000	0.16	FW, OL	Staging and storage of materials, equipment and timber mats for stream crossing. Area may also be used as turnaround for large trucks and contractor parking.
66.9 RR	1588X		FA3-AL-129.000	0.37	FW, OL	materials, pipe, equipment
67.0 RR	1588Y		FA3-AL-129.000	0.37	CI, OL	material, pumps, mats, pipe
67.1 RR	1588Y1A		NC-AL-129.000 NC-AL-128.000	0.21	OL	Staging and storage of materials, equipment for commercial/industrial area crossing.
67.2 RR	1588Y1		FA3-AL-131.000	0.27	OL	ATWS for staging / storage of material, pumps, mats, pipe, boring equipment for road crossing. Reduced workspace in area due to foreign utilities, structures, etc.
67.2 RR	1588Y2		FA3-AL-131.000	0.27	OL	Supports foreign utility crossing
67.2 RR	1588Y2A		NC-AL-131.000 NC-AL-128.000	0.18	OL	Supports for foreign utility crossing
67.3 RR	1588Y3		NC-AL-132.000	0.26	FW	Additional space to support stream crossings in area
67.3 RR	1588Y3A		NC-AL-128.000 NC-AL-132.000	0.37	FW	Additional space to support stream crossings in area
67.4 RR	1588Z		NC-AL-132.000	0.23	FW	ATWS needed to staging and storage of materials, equipment and timber mats for multiple stream crossings and ROW width restrictions. Area may also be used as turnaround for large trucks and contractor parking. Limited access points in area.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
67.4 RR	1588Z1A		NC-AL-132.100	0.03	AG	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
67.5 RR	1588Z2		NC-AL-133.000	0.43	FW, OL	materials, pipe, equipment
67.6 RR	1588Z1		NC-AL-133.000	0.43	FW, OL	materials, pipe, equipment
67.6	1619		NC-AL-135.000	0.15	FW	material, pumps, mats, pipe
67.6	1619A		NC-AL-135.000	0.20	FW	material, pumps, mats, pipe
67.6	1620		NC-AL-137.000	0.23	FW, OL	material, pumps, mats, pipe
67.9	1621A		NC-AL-136.000	0.06	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
67.9	1621B		NC-AL-139.000	0.20	FW	Area needed to support stream crossing, via pumps, equipment, soil storage.
68.0	1621	X	NC-AL-139.000	0.78	FW, OL	ATWS to be used for materials, pipe, equipment, needed to complete multiple stream crossings in this section. Topography issues in area.
68.0	1622		NC-AL-139.000	0.69	FW, OL	materials, pipe, equipment
68.1	1622A		NC-AL-141.000	0.12	FW	material, pumps, mats, pipe
68.1	1623		NC-AL-141.000	0.23	FW	material, pumps, mats, pipe
68.1	1623A		NC-AL-142.000	0.23	FW	material, pumps, mats, pipe
68.1	1624		NC-AL-142.000	0.21	FW	material, pumps, mats, pipe
68.2	1625		NC-AL-142.000	0.45	FW, OL, RD	materials, pipe, equipment
68.2	1627	X	NC-AL-142.000	0.31	FW, OL, RD	To be used for boring equipment staging / bore pit spoils, materials, pipe, equipment for Indian Village Trail crossing
68.2	1627A		NC-AL-143.000	0.03	RD	materials, pipe, equipment
68.2	1627B		NC-AL-143.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
68.3	1627C		NC-AL-143.300	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
68.3	1627D		NC-AL-143.300	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
68.3	1628		NC-AL-143.000	0.23	FW, OL	materials, pipe, equipment
68.3	1629		NC-AL-143.000	0.20	FW	material, pumps, mats, pipe
68.3	1630		NC-AL-143.000	0.23	FW	material, pumps, mats, pipe
68.3	1631		NC-AL-143.000	0.20	FW	material, pumps, mats, pipe
68.4	1632		NC-AL-143.000	0.22	FW, SC	material, pumps, mats, pipe
68.4	1633		NC-AL-143.000	0.23	FW	material, pumps, mats, pipe
68.4	1634		NC-AL-143.000	0.22	FW	material, pumps, mats, pipe
68.5	1635		NC-AL-145.000	0.11	FW	material, pumps, mats, pipe
68.6	1636		NC-AL-144.000	0.20	FW, OL	material, pumps, mats, pipe
68.6	1637		NC-AL-144.000	0.11	FW, OL	material, pumps, mats, pipe, boring equipment
68.7	1639		NC-AL-148.000	0.29	FW, OL	material, pumps, mats, pipe, boring equipment
68.8	1640		NC-AL-148.000	0.23	FW	material, pumps, mats, pipe
68.8	1641		NC-AL-148.000	0.22	FW	material, pumps, mats, pipe
68.8	1643		NC-AL-148.000	0.08	FW, OL	material, pumps, mats, pipe
68.9	1644		NC-AL-148.000	0.48	FW, OL	material, pumps, mats, pipe
68.9	1645		NC-AL-148.000	0.22	FW	material, pumps, mats, pipe
68.9	1646A		NC-AL-149.000	0.03	OL	Vehicle pull off in the event construction vehicles or landowner vehicles are utilizing the road at the same time.
69.0	1646	X	NC-AL-149.000	0.52	FW, OL	ATWS is off of the main access point to bore the Haw River Bypass all boring equipment, material, pumps, mats, pipe, will be hauled into this location for this bore
69.0	1647		NC-AL-149.000	0.18	OL	material, pumps, mats, pipe, boring equipment

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
69.0	1648		NC-AL-149.000	0.53	FW, OL	material, pumps, mats, pipe, boring equipment
69.1	1649		NC-AL-150.000	0.10	FW, RD	material, pumps, mats, pipe
69.2	1650		NC-AL-151.000	0.29	OL	material, pumps, mats, pipe
69.3	1651		NC-AL-164.000.ABU	0.18	FW	material, pumps, mats, pipe
69.4	1651A		NC-AL-157.000	0.14	FW, RD	Area needed to support pipeline activities with in "residential" area.
69.4	1652		NC-AL-161.000	0.15	FW, OL	material, pumps, mats, pipe
69.5	1653		NC-AL-166.000	0.33	FW	ATWS, to be used for staging and storage of materials, equipment and timber mats to avoid staging equipment / materials near housing in the area, may also be used as turnaround for large trucks
69.6 RR	1653E		NC-AL-184.000	0.23	FW, OL	material, pumps, mats, pipe, boring equipment needed for boring under railroad, this ATWS is also needed due to wetland in opposing ATWS restricting usages.
69.7 RR	1653F		NC-AL-184.000	0.05	CI, FW, OL, RD	materials, pipe, equipment
69.7 RR	1653G		NC-AL-174.100 NC-AL-174.200 NC-AL-174.300 NC-AL-174.400 NC-AL-174.500 NC-AL-174.000	0.81	FW, RD	Area needed to support residential, stream and bore of Gravel St/ RR.
69.7 RR	1653H		NC-AL-174.000	0.61	CI, FW, OL, RD	Area needed to support residential, stream and bore of Gravel St/ RR.
69.8 RR	1653I		NC-AL-174.130	0.11	FW, OL	Area needed to support residential and bore of Gravel St/ RR.
69.8 RR	1653J		NC-AL-184.000	0.72	CI, FW, OL	Access point, staging area, trucking turnaround.
69.9 RR	1653K		NC-AL-182.050.ABU	0.65	CI, FW, OL	Area needed for staging area, trucking turnaround and lay down space.

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
70.0 RR	1653L		NC-AL-184.000	0.13	FW	Area needed to support stream crossing & pipeline crossing, equipment, soils, materials will need to be staged in this location.
70.0 RR	1653M		NC-AL-184.000	0.38	FW	staging for material, pumps, mats, pipe, equipment.
70.2 RR	1661		NC-AL-184.000	0.26	FW, OL	material, pumps, mats, pipe
70.3	1662		NC-AL-186.000	0.22	FW	material, pumps, mats, pipe
70.4	1663		NC-AL-186.000	0.20	FW	material, pumps, mats, pipe
70.4	1664		NC-AL-188.000	0.20	FW	material, pumps, mats, pipe
70.6	1665		NC-AL-188.000	0.20	FW	material, pumps, mats, pipe
70.7	1666		NC-AL-188.000	0.20	FW	material, pumps, mats, pipe
70.7	1667		NC-AL-189.000	0.23	FW	material, pumps, mats, pipe
70.8	1668		NC-AL-189.000	0.57	FW, OL	material, pumps, mats, pipe
70.9	1669		NC-AL-191.000	0.23	FW	material, pumps, mats, pipe
70.9	1670	X	NC-AL-191.000	0.59	FW, OL	Supports multiple stream crossings in area. Restricted workspace due to environmental features
71.0	1672		NC-AL-191.000	0.19	FW	material, pumps, mats, pipe, boring equipment
71.0	1672A		NC-AL-191.000	0.03	FW	Area to be used to provide safe passage via "pull off".
71.0	1672B		NC-AL-191.000	0.03	FW	Area to be used to provide safe passage via "pull off".
71.0	1674		NC-AL-191.100.AR	0.09	OL	material, pumps, mats, pipe, boring equipment
71.1	1675		NC-AL-191.000	0.20	FW, OL	material, pumps, mats, pipe, boring equipment
71.2	1675A		NC-AL-191.000	0.03	FW, OL	Area to be used to provide safe passage via "pull off".
71.2	1675B		NC-AL-191.000	0.03	FW	Area to be used to provide safe passage via "pull off".
71.3	1676	X	NC-AL-191.000	0.50	FW	Main access point to the I-40 road bore that area will be used for staging and storage of materials, equipment and timber mats for road crossing.

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Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
71.3	1677		NC-AL-191.000	0.51	FW	material, pumps, mats, pipe, boring equipment
71.4	1678		NC-AL-192.000	0.71	FW, OL	material, pumps, mats, pipe, boring equipment
71.7	1679		NC-AL-192.000	0.60	FW, OL	material, pumps, mats, pipe
71.8	1680		NC-AL-193.000	0.50	FW	material, pumps, mats, pipe
71.9	1681		NC-AL-194.000	0.57	FW, OL	materials, pipe, equipment
72.1	1684		NC-AL-199.000	0.21	FW, OL	material, pumps, mats, pipe
72.2	1685		NC-AL-196.000	0.23	FW	material, pumps, mats, pipe
72.2	1686	X	NC-AL-197.000	0.36	FW, OL	ATWS needed to staging and storage of materials, equipment and timber mats for stream crossing. Area may also be used as turnaround for large trucks, due to limited Project access in this area.
72.2	1686A		NC-AL-197.000	0.03	OL	Area to be used to provide safe passage via "pull off".
72.3	1680A		NC-AL-198.000	0.26	FW	materials, pipe, equipment
72.4	1688	X	NC-AL-199.000	1.00	FW, OL	ATWS needed to stage and storage materials, equipment and timber mats for stream crossing. Area may also be used as turnaround for large trucks, due to limited Project access in this area.
72.4	1688C		NC-AL-199.000	0.03	OL	Area to be used to provide safe passage via "pull off".
72.4	1688D		NC-AL-199.000	0.03	OL	Area to be used to provide safe passage via "pull off".
72.5	1688A		NC-AL-199.000	0.13	FW	material, pumps, mats, pipe
72.6	1688B		NC-AL-199.000	0.23	FW	material, pumps, mats, pipe
72.7	1689		NC-AL-200.000	0.23	FW	materials, pipe, equipment
72.8 RR	1689A		NC-AL-204.000	0.15	FW, RD	materials, pipe, equipment
72.8 RR	1691		NC-AL-207.000	0.06	FW, RD	material, pumps, mats, pipe, boring equipment, parking

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Milepost	**Name ID Number a/**	**ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"**	**Ownership**	**Area (Acres)**	**Current Land Use b/**	**Purpose**
72.9 RR	1690	X	NC-AL-207.000	0.30	FW, OL, RD	ATWS needed to store / offload material, pumps, mats, pipe, Hwy 54 boring equipment needed to cross the Hwy also, parking for the boring crews
73.0 RR	1692A		NC-AL-210.000	0.41	CI, OL, WL	material, pumps, mats, pipe, boring equipment
73.1	1692		NC-AL-210.000	3.66	OL, WL	material, pumps, mats, pipe, boring equipment, parking
			Total ATWS Acres Pipeline c/	**292.95**		
Lambert Compressor Station & Interconnect / MLV 1						
0.0 RR	1001E	X	VA-PI-002.000	8.68	AG, FW, OL	ATWS to be used for equipment staging during construction, parking, materials, turn around for unload of materials, pipe, fab yard.
0.1 RR	1001D		VA-PI-002.000	1.02	AG, FW, OL	pipe, materials, parking, work trailers
0.5	1001C		VA-PI-002.000, VA-PI-001.200.AR	0.73	AG	ATWS to be used for equipment staging during construction, parking, materials, turn around for unload of materials, pipe, fab yard.
0.5	1001G		VA-PI-002.000	0.08	FW	Additional space to support tie-in / Lambert Compressor Station
LN 3600 Interconnect						
28.1 RR	1224A	X	NC-RO-006.000	1.68	OL	ATWS to be used by both the pipeline and Interconnect during construction of both and will hold material, mats, pipe, equipment and tools.
28.1 RR	1224B	X	NC-RO-006.000	1.79	OL, SC	ATWS to be used by both the pipeline and Interconnect during construction of both and will hold material, mats, pipe, equipment and tools
28.2 RR	1229		NC-RO-006.000	0.13	FW, OL	ATWS to support construction at LN 3600.
28.2 RR	1229A		NC-RO-006.000	0.12	FW, OL	ATWS to support construction at LN 3600.
T-15 Dan River Interconnect / MLV 4						

REVISED [Oct 2019] - Appendix 1-D

Additional Temporary Workspace Areas Associated with Construction of MVP Southgate Project

Milepost	Name ID Number a/	ATWS is located at the intersection of an access road and the right-of-way, noted with an "X"	Ownership	Area (Acres)	Current Land Use b/	Purpose
30.4	1249	X	NC-RO-014.000	4.34	AG, OL, WL	ATWS will mainly be used during the construction of both the pipeline & Interconnect and will hold material, pumps, mats, pipe, equipment, HDD equipment and heavy construction equipment
30.4	1251		NC-RO-016.000	0.06	OL, WL	material, mats, pumps, pipe
T-21 Haw River Interconnect / MLV 8						
73.17 RR	1692B		NC-AL-210.000	0.67	OL	ATWS will mainly be used during the construction of the T-21 Interconnect and will hold material, pumps, mats, pipe, equipment, heavy construction equipment.
73.17 RR	1692C		NC-AL-210.000	0.02	OL	material, pumps, mats, pipe, boring equipment, parking
73.17 RR	1692D		NC-AL-210.000	0.07	OL	material, pumps, mats, pipe, boring equipment, parking
Total ATWS Acres Aboveground Facilities c/				**19.39**		

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

a/ Includes additional temporary workspace ("ATWS") areas for the H-605 pipeline, the H-650 pipeline, and aboveground facilities.

b/ AG = Agricultural; CI = Commercial / Industrial; FW = Upland Forest / Woodland; OL = Upland Open Land; RD = Residential; SC = Silviculture; WL = Wetland.

c/ Totals may not equal the sum of addends due to rounding. Addends consists of 6-decimal digits.

REVISED [Oct 2019] - Appendix 1-E1 Existing Utility Corridors Adjacent to the MVP Southgate Project						
Begin MP	**End MP**	**Name**	**Type**	**Distance (Miles)**	**Off-Set between Pipe and Edge of Right-of-way**	**Construction Right-of-way Overlap**
H-605 Pipeline						
0.0	0.0	Mountain Valley Pipeline	Pipeline Transmission	0.0	20	125
0.3	0.4	Williams Transco	Pipeline Transmission	0.1	20	150
H-650 Pipeline						
0.1	1.2	Williams Transco	Pipeline Transmission	1.1	25	15
1.4	3.4	Williams Transco	Pipeline Transmission	2.0	25	15
4.4	5.0	Williams Transco	Pipeline Transmission	0.6	25	15
5.3	9.2	Williams Transco	Pipeline Transmission	3.9	25	15
9.4	9.7	Williams Transco	Pipeline Transmission	0.3	25	15
10.1	11.0	Williams Transco	Pipeline Transmission	0.9	25	15
11.5	11.7	Williams Transco	Pipeline Transmission	0.2	25	15
11.8	13.1	Williams Transco	Pipeline Transmission	1.3	25	15
13.8 RR	14.7	Williams Transco	Pipeline Transmission	0.9	25	15
15.6	15.9	Williams Transco	Pipeline Transmission	0.3	25	15
16.0	16.5	Williams Transco	Pipeline Transmission	0.5	25	15
17.9	18.2	Williams Transco	Pipeline Transmission	0.3	25	15
18.4	22.6 RR	Williams Transco	Pipeline Transmission	4.2	25	15
22.7 RR	22.8 RR	Williams Transco	Pipeline Transmission	0.1	25	15
22.9 RR	23.0 RR	Williams Transco	Pipeline Transmission	0.1	25	15
23.1 RR	23.2 RR	Williams Transco	Pipeline Transmission	0.1	25	15
23.9	26.1	Williams Transco	Pipeline Transmission	2.2	25	15
26.1	26.5	Williams Transco	Pipeline Transmission	0.4	25	15
26.6 RR	29.3 RR	Williams Transco	Pipeline Transmission	2.7	25	15
30.0	30.1	Williams Transco	Pipeline Transmission	0.1	25	15
30.3	30.4	Williams Transco	Pipeline Transmission	0.1	25	15
30.5	30.7	Williams Transco	Pipeline Transmission	0.2	25	15
31.7	32.0	Williams Transco	Pipeline Transmission	0.3	25	15
32.1	32.8	Williams Transco	Pipeline Transmission	0.7	25	15
33.2	35.4	Duke Power Co	Electric Transmission	2.2	0	0
37.8	38.0	Colonial Pipeline	Pipeline Transmission	0.2	25	0
38.3	38.5	Duke Power Co	Electric Transmission	0.2	0	0
38.9	39.0	Duke Power Co	Electric Transmission	0.2	0	0
40.7	40.7	Duke Power Co	Electric Transmission	0.1	0	015
40.9	41.6	Duke Power Co	Electric Transmission	0.7	0	0
41.7	41.9	Duke Power Co	Electric Transmission	0.2	0	0
42.5	43.0	Duke Power Co	Electric Transmission	0.5	0	0

REVISED [Oct 2019] - Appendix 1-E1 Existing Utility Corridors Adjacent to the MVP Southgate Project						
Begin MP	**End MP**	**Name**	**Type**	**Distance (Miles)**	**Off-Set between Pipe and Edge of Right-of-way**	**Construction Right-of-way Overlap**
43.3	43.3	Duke Power Co	Electric Transmission	0.1	0	0
44.1	44.8	Duke Power Co	Electric Transmission	0.7	0	0
45.5	45.7	Duke Power Co	Electric Transmission	0.2	0	0
46.0 RR	46.2 RR	Duke Power Co	Electric Transmission	0.2	0	0
49.0	51.5 RR	Duke Power Co	Electric Transmission	2.5	0	0
51.8	52.0	Duke Power Co	Electric Transmission	0.2	0	0
52.2	52.3	Duke Power Co	Electric Transmission	0.1	0	0
53.1	55.0	Duke Power Co	Electric Transmission	1.9	0	0
55.5	56.4	Duke Power Co	Electric Transmission	0.9	0	0
56.5	56.5	Duke Power Co	Electric Transmission	0.1	0	0
56.7	57.3	Duke Power Co	Electric Transmission	0.6	0	0
57.7	57.9	Duke Power Co	Electric Transmission	0.2	0	0
58.2	58.2	Duke Power Co	Electric Transmission	0.1	0	0
59.2 RR	60.1	Williams Transco	Pipeline Transmission	0.9	25	15
73.0 RR	73.2 RR	Williams Transco	Pipeline Transmission	0.2	25	15

REVISED [Oct 2019] - Appendix 1-E2 Deviations from Existing Corridors Along the MVP Southgate Project			
Begin MP	**End MP**	**Distance (Miles)**	**Reasons for Deviation**
H-605 Pipeline			
0.0	0.3	0.3	Location of compressor station
0.4	0.5	0.1	Location of compressor station
H-650 Pipeline			
0.0	0.1	0.1	Terrain and location of pipeline starting point
1.2	1.4	0.2	Avoid sensitive resource area
3.4	4.4	1.0	Pond, home site
5.0	5.3	0.3	Large stream & Wetland
9.2	9.4	0.2	Existing pipeline facility
9.7	10.1	0.4	Avoid sensitive resource area and less impact to stream
11.0	11.5	0.5	Terrain, stream
11.7	11.8	0.1	Avoid sensitive resource area
13.1	13.8 RR	0.7	Multiple Homes, terrain
14.7	15.6	0.9	Home site, pond
15.9	16.0	0.1	Avoid sensitive resource area
16.5	17.9	1.4	Road crossing, home sites, Avoid sensitive resource area
18.2	18.4	0.2	Avoid sensitive resource area
22.6 RR	22.7 RR	0.1	Terrain
22.8 RR	22.9 RR	0.1	Terrain
23.0 RR	23.1 RR	0.1	Terrain
23.2 RR	23.9	0.7	Terrain
26.5	26.6 RR	0.1	Existing pipeline facility
29.3	30.0	0.7	Terrain
30.1	30.3	0.2	Terrain
30.4	30.5	0.1	Location of interconnect
30.7	31.7	1.0	Pond, home site, Avoid sensitive resource area
32.0	32.1	0.1	Avoid Stream Impact
32.8	33.2	0.4	Avoid large Wetland and Stream Impacts
35.4	37.8	2.5	Ponds, wetland, terrain, home sites
38.0	38.3	0.3	Terrain, home site
38.5	38.9	0.4	Terrain, large wetland, road crossing angle
39.0	40.7	1.7	Less stream impact, terrain, power substation, home sites
40.7	40.9	0.2	Terrain
41.6	41.7	0.1	Conventional Bore, crossing angle, terrain
41.9	42.5	0.6	Convenient store
43.0	43.3	0.3	Home sites, terrain

REVISED [Oct 2019] - Appendix 1-E2 Deviations from Existing Corridors Along the MVP Southgate Project			
Begin MP	**End MP**	**Distance (Miles)**	**Reasons for Deviation**
43.3	44.1	0.8	Pond, terrain
44.8	45.5	0.7	Home sites, terrain, pond
45.7	46.0 RR	0.3	Terrain
46.2 RR	49.0	2.8	Terrain, pond, home sites, solar panel farm
51.5 RR	51.8	0.3	Future expansion per landowner
52.0	52.2	0.2	Cross stream perpendicular
52.3	53.1	0.8	Buildings, homes sites
55.0	55.5	0.5	Home sites
56.4	56.5	0.1	Cross stream perpendicular
56.5	56.7	0.2	Cross stream perpendicular
57.3	57.7	0.4	Pond, terrain
57.9	58.2	0.3	Pond
58.2	59.2 RR	1.0	Home sites, terrain
60.1	73.0 RR	12.9	Ponds, home sites, terrain

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions		Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
						Width (feet)	Length (feet)					
Virginia												
TAR	TA-PI-000A	CY-01	Existing	Temporary	Mountain Valley Pipeline, LLC	60	9	G	CI, OL	S, W	0.01	0.00
TAR	TA-PI-000B	CY-03	Existing	Temporary	Private	38	62	A	CI	None	0.10	0.00
TAR	TA-PI-065	CY-19	Existing	Temporary	Private	25	60	D	OL	S, W	0.04	0.00
TAR	TA-PI-065A	CY-19	Existing	Temporary	Private	25	2,230	D	CI, OL	S, W	1.29	0.00
TAR	TA-PI-040	CY-22	Existing	Temporary	Private	25	45	D	CI, OL	S, W	0.04	0.00
TAR	TA-PI-040A	CY-22	Existing	Temporary	Private	25	31	D	CI, OL	S, W	0.03	0.00
TAR	TA-PI-000	0	Existing	Temporary	Mountain Valley Pipeline, LLC	25	334	Gr	FW, OL	G, S	0.19	0.00
PAR	PA-PI-001A	0.47	Existing	Permanent	Transcontinental Gas Pipeline Company, LLC Private Mountain Valley Pipeline, LLC	20	3,028	A, G, D	AG, CI, FW, OL	S, W	1.46	1.46
PAR	PA-PI-001B	0.47	New	Permanent	Transcontinental Gas Pipeline Company, LLC Private Mountain Valley Pipeline, LLC	20	827	Gr	AG, FW, OL	S, W	0.49	0.49
PAR	PA-PI-001C	0.47	Existing	Permanent	Private	20	713	D	OL	S, W	0.34	0.34
TAR	TA-PI-004	1.6	Existing	Temporary	Private	25	2,874	D	CI, FW, OL, RD	S, W	1.82	0.00
TAR	TA-PI-005	2.3	Existing	Temporary	Private	25	3,755	G, D, Gr	CI, FW, OL, OW, RD	S, C, W	2.20	0.00
TAR	TA-PI-006	3.4	Existing	Temporary	Private	25	1,285	G, D, Gr	AG, CI, OL	S, C, W	0.75	0.00
TAR	TA-PI-008	4.5	Existing	Temporary	Private	25	303	G	CI, RD	S, W	0.17	0.00
TAR	TA-PI-007	4.6	Existing	Temporary	Private	25	896	G, D, Gr	OL, RD	S, W	0.53	0.00
TAR	TA-PI-011	5.1	Existing	Temporary	Private	25	5,360	D	AG, CI, FW, OL, RD, WL	S, W	3.08	0.00
TAR	TA-PI-015	5.6	Existing	Temporary	Pittsylvania County, VA	25	1,076	G	FW, OL	S, W	0.62	0.00
TAR	TA-PI-016	5.9	Existing	Temporary	Pittsylvania County, VA	25	3,461	G, Gr	CI, FW, OL	S, W	1.99	0.00
TAR	TA-PI-017	6.2	Existing	Temporary	Pittsylvania County, VA	25	823	G	CI, OL	S, W	0.51	0.00
TAR	TA-PI-018	6.8	Existing	Temporary	Private	25	1,530	D	FW, OL	S, W	0.89	0.00
PAR	PA-PI-018B	7.4	New	Permanent	Private	12.5	50	Gr	CI	S, W	0.02	0.02

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions		Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
						Width (feet)	Length (feet)					
TAR	TA-PI-022	8.5	Existing	Temporary	Private	25	2,899	D	AG, CI, FW, OL, RD	S, W	1.66	0.00
TAR	TA-PI-023	9	Existing	Temporary	Private	25	2,121	G	AG, CI, FW, OL, RD	S, W	1.23	0.00
PAR	PA-PI-024	9.3	New	Permanent	Private	12.5	16	Gr	FW, OL	S, W	0.01	0.01
TAR	TA-PI-025	9.6	Existing	Temporary	Private	25	2,226	D, Gr	AG, CI, FW, OL	S, W	1.37	0.00
TAR	TA-PI-026B	10.4	New	Temporary	Private	25	31	D, Gr	CI, OL	S, W	0.03	0.00
TAR	TA-PI-027	11.1	Existing	Temporary	Independent Timber, Inc.	25	1,590	G, D	FW, OL	S, W	0.92	0.00
TAR	TA-PI-032	13.2	Existing	Temporary	Private	25	1,052	G	OL	S, W	0.60	0.00
TAR	TA-PI-033	13.2	Existing	Temporary	Private	25	735	G	FW, OL	S, W	0.43	0.00
TAR	TA-PI-035	14.2 RR	Existing	Temporary	Private	25	4,378	D, Gr	AG, FW, OL, OW, RD, WL	S, W	2.52	0.00
TAR	TA-PI-037	15.2	Existing	Temporary	Private	25	1,698	G	AG, CI, OL	S, W	0.98	0.00
TAR	TA-PI-037A	15.9	New	Temporary	Private	15	25	Gr	CI, FW, OL	S, W	0.01	0.00
TAR	TA-PI-037B	15.9	New	Temporary	Private	15	41	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-PI-041	16.7	Existing	Temporary	Private	25	639	G	FW, OL, RD	S, W	0.38	0.00
TAR	TA-PI-043	17.2	Existing	Temporary	Private	25	2,123	D	AG, CI, FW, OL, OW, RD	S, W	1.23	0.00
TAR	TA-PI-046	18	Existing	Temporary	Private	25	1,543	G, D, Gr	AG, CI, FW, OL	S, W	0.89	0.00
PAR	PA-PI-046A	18.3	New	Permanent	Private	12.5	24	Gr	AG, CI	S, W	0.01	0.01
TAR	TA-PI-049	19.5	Existing	Temporary	Private	25	273	G	OL, RD	S, W	0.17	0.00
TAR	TA-PI-050	20	Existing	Temporary	Private	25	307	A	CI, OL	None	0.19	0.00
PAR	PA-PI-050	20	New	Permanent	Private	35	17	Gr	CI	S, W	0.01	0.01
TAR	TA-PI-051A	20.2	Existing	Temporary	Private	25	101	D	CI, RD	S, W	0.06	0.00
TAR	TA-PI-052	20.4	Existing	Temporary	Private	25	2,871	D	AG, CI, FW, OL, WL	S, W, C	1.66	0.00
TAR	TA-PI-053	21.1	Existing	Temporary	Private	25	916	G	OL, RD	S, W	0.53	0.00
TAR	TA-PI-061	23.0 RR	Existing	Temporary	Danville-Pittsylvania Regional Industrial Facility Authority	25	3,508	G, D, Gr	FW, OL, OW, WL	S, W, C	2.02	0.00

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions		Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
						Width (feet)	Length (feet)					
TAR	TA-PI-063	24	Existing	Temporary	Danville-Pittsylvania Regional Industrial Facility Authority	25	2,750	G, D, Gr	CI, FW, OL, OW	S, W, C	1.59	0.00
TAR	TA-PI-066	24.8	Existing	Temporary	Private	25	2,345	G, D, Gr	CI, FW, OL	S, W	1.45	0.00
TAR	TA-PI-067	25.1	Existing	Temporary	Private	25	1,917	G, D, Gr	FW, OL, OW, WL	S, W	1.19	0.00
										Virginia Subtotal	**37.71**	**2.34**
North Carolina												
TAR	TA-RO-082C	CY-05	Existing	Temporary	Private	80	8	C	CI	None	0.02	0.00
TAR	TA-RO-082D	CY-05	Existing	Temporary	Private	72	6	A	CI	None	0.01	0.00
TAR	TA-RO-082E	CY-05	Existing	Temporary	Private	70	7	A	CI	None	0.01	0.00
TAR	TA-RO-000A	CY-08	Existing	Temporary	Private	25	344	A	CI, OL	None	0.21	0.00
TAR	TA-CA-105	CY-25	Existing	Temporary	Private	25	2,133	D	CI, FW, OL, RD	S, W	1.29	0.00
TAR	TA-AL-195	CY-26A	Existing	Temporary	Private	25	126	D	OL	S, W, C	0.07	0.00
TAR	TA-AL-196	CY-26B	Existing	Temporary	Private	25	47	D	CI, OL	S, W	0.04	0.00
TAR	TA-AL-197	CY-26B	Existing	Temporary	Private	25	82	D	OL	S, W	0.06	0.00
TAR	TA-RO-072	26.9	Existing	Temporary	Private	25	1,049	G	CI, FW, OL, RD	S, W	0.61	0.00
TAR	TA-RO-072A	26.9	New	Temporary	Private	25	229	Gr	AG, OL, RD	S, W	0.14	0.00
TAR	TA-RO-072B	27.0 RR	Existing	Temporary	Private	25	423	G, Gr	AG, CI, FW, OL	S, W	0.25	0.00
TAR	TA-RO-075	28.1 RR	Existing	Temporary	Private	25	2,219	G, D, Gr	AG, OL, WL	S, W	1.28	0.00
PAR	PA-RO-000	28.2 RR	Existing	Permanent	Private	25	4,959	G, Gr	CI, FW, OL	S, W	2.84	2.84
TAR	TA-RO-076	28.6 RR	Existing	Temporary	Private	25	2,506	G, D	FW, OL	S, W	1.45	0.00
TAR	TA-RO-078	29.2	Existing	Temporary	Private	25	2,209	C, G, D	CI, FW, OL, RD	S, W	1.29	0.00
TAR	TA-RO-079	29.6	Existing	Temporary	Private	25	288	G, D, Gr	AG, OL	S, W	0.17	0.00
TAR	TA-RO-079A	29.6	Existing	Temporary	Private	25	1,846	G, D, Gr	OL, RD	S, W	1.06	0.00
TAR	TA-RO-080	29.9	Existing	Temporary	Private	25	3,587	G, D, Gr	AG, CI, OL, RD	S, W	2.15	0.00
TAR	TA-RO-081	30.4	New	Temporary	Private	34	17	G	OL	S, W	0.02	0.00

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions		Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
						Width (feet)	Length (feet)					
TAR	TA-RO-083	30.4	Existing	Temporary	Public Service Company Of North Carolina, Inc.	25	233	G, Gr	CI, OL, WL	S, W	0.12	0.00
PAR	PA-RO-082	30.4	Existing	Permanent	Public Service Company Of North Carolina, Inc.	25	161	G	CI, OL	S, W	0.12	0.12
PAR	PA-RO-082A	30.4	Existing	Permanent	Public Service Company Of North Carolina, Inc.	25	118	G	CI, OL	S, W	0.06	0.06
TAR	TA-RO-085	32.4	Existing	Temporary	Private	25	3,667	G, D	CI, FW, OL, RD	S, W	2.05	0.00
TAR	TA-RO-087	32.8	Existing	Temporary	Private	25	2,654	G, D, Gr	FW, OL, RD	S, W	1.54	0.00
TAR	TA-RO-088	33.6	Existing	Temporary	Private	25	1,752	G, D, Gr	CI, FW, OL, RD	S, W	1.05	0.00
TAR	TA-RO-091	34.7	Existing	Temporary	Private	25	1,001	D	FW, OL	S, W	0.58	0.00
TAR	TA-RO-092	35.4	Existing	Temporary	Private	25	867	G, D	FW, OL, RD	S, W	0.51	0.00
TAR	TA-RO-094	35.9	Existing	Temporary	Private	25	778	D	AG, FW, OL	S, W	0.46	0.00
TAR	TA-RO-100	37	Existing	Temporary	Private	25	1,744	D	FW, OL	S, W	1.00	0.00
TAR	TA-RO-102	37.6	Existing	Temporary	Private	25	1,532	A, G, D, Gr	OL, RD	S, W	0.89	0.00
TAR	TA-RO-103	38.1	Existing	Temporary	Private	25	1,440	G, D	FW, OL, RD	S, W	0.87	0.00
TAR	TA-RO-106	38.8	Existing	Temporary	City of Reidsville	25	271	G	FW, OL	S, W	0.16	0.00
TAR	TA-RO-106A	38.8	New	Temporary	Private	25	20	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-RO-107	39.6	Existing	Temporary	Private	25	673	D	CI, OL, RD	S, W	0.40	0.00
TAR	TA-RO-108	39.6	New	Temporary	Private	25	195	Gr	FW, OL	S, W	0.12	0.00
TAR	TA-RO-109	39.7	Existing	Temporary	Duke Power Company	25	1,148	G, Gr	CI, OL	S, W	0.67	0.00
TAR	TA-RO-110	40.4 RR	New	Temporary	Private	45	22	Gr	CI, FW, OL	S, W	0.02	0.00
TAR	TA-RO-111	40.9	Existing	Temporary	Private	25	3,243	G, D, Gr	AG, CI, FW, OL, RD	S, W	1.90	0.00
TAR	TA-RO-112	41.4	Existing	Temporary	Private	25	3,433	G, D	CI, FW, OL	S, W	1.97	0.00
TAR	TA-RO-113	41.8	Existing	Temporary	Private	25	162	D, Gr	FW, OL	S, W	0.11	0.00
TAR	TA-RO-113A	41.8	New	Temporary	Private	25	1,870	Gr	FW, OL, WL	S, W	1.03	0.00
PAR	PA-RO-114A	42.2	New	Permanent	Private	12.5	83	Gr	CI, FW, OL	S, W	0.03	0.03
TAR	TA-RO-115	42.4	Existing	Temporary	Private	25	586	G	CI, FW, OL, RD	S, W	0.34	0.00
TAR	TA-RO-115B	43.2	New	Temporary	Private	25	27	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-RO-115C	43.2	New	Temporary	Private	25	10	Gr	OL	S, W	0.01	0.00
TAR	TA-RO-118A	43.4	New	Temporary	Private	25	41	Gr	CI, OL	S, W	0.03	0.00

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-RO-118B	43.4	New	Temporary	Private	25	9	Gr	CI, OL	S, W	0.01	0.00
TAR	TA-RO-119	43.9	Existing	Temporary	Private	25	1,889	G, D	CI, FW, OL, RD	S, W	1.11	0.00
TAR	TA-RO-122	44.1	Existing	Temporary	Private	25	1,845	G, D	CI, FW, OL, RD	S, W	1.09	0.00
PAR	PA-RO-124A	44.9	New	Permanent	Private	14	16	Gr	AG	S, W	0.01	0.01
TAR	TA-RO-125	45	New	Temporary	Private	25	227	Gr	AG, FW	S, W	0.14	0.00
TAR	TA-RO-126	45.3	Existing	Temporary	Private	25	2,268	D	AG, FW, OL, RD	S, W	1.31	0.00
TAR	TA-RO-127	46.1 RR	Existing	Temporary	Private	25	2,745	G, D	AG, CI, FW, OL, RD	S, W	1.59	0.00
TAR	TA-RO-129	46.7	Existing	Temporary	Private	25	1,542	G, D	AG, CI, FW, OL	S, W	0.91	0.00
TAR	TA-RO-130	47.3	Existing	Temporary	Private	25	2,200	G, D	CI, FW, OL, RD	S, W	1.27	0.00
TAR	TA-RO-131A	48.4	New	Temporary	Private	25	30	Gr	AG, CI	S, W	0.03	0.00
TAR	TA-RO-131B	48.4	New	Temporary	Private	25	18	Gr	AG, CI	S, W	0.02	0.00
TAR	TA-RO-134	48.9	Existing	Temporary	Private	34	26	G	CI	S, W	0.03	0.00
TAR	TA-RO-135	49.2	Existing	Temporary	Private	25	446	D	CI, OL	S, W	0.27	0.00
TAR	TA-RO-136A	49.5	New	Temporary	Private	25	19	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-RO-136B	49.5	New	Temporary	Private	25	20	Gr	CI, FW	S, W	0.02	0.00
TAR	TA-RO-138	49.8 RR	Existing	Temporary	Private	25	785	D, Gr	CI, FW, OL	S, W	0.46	0.00
TAR	TA-RO-139	50.3 RR	Existing	Temporary	Private	25	2,779	D	AG, FW, OL	S, W	1.60	0.00
TAR	TA-RO-140	51.4 RR	Existing	Temporary	Private	25	871	D	AG, CI, FW, OL	S, W	0.51	0.00
TAR	TA-RO-141	51.6 RR	Existing	Temporary	Private	25	438	D	AG, OL	S, W	0.26	0.00
TAR	TA-RO-142	51.8	Existing	Temporary	Private	25	668	D	AG, CI, OL	S, W	0.39	0.00
TAR	TA-RO-144	52.1 RR	Existing	Temporary	Private	25	525	D	AG, CI, FW, OL	S, W	0.31	0.00
TAR	TA-RO-144A	52.2 RR	Existing	Temporary	Private	25	461	D	FW, OL	S, W	0.28	0.00
TAR	TA-RO-145	52.3	Existing	Temporary	Private	25	533	D	FW, OL	S, W	0.32	0.00
TAR	TA-AL-147	53	Existing	Temporary	Private	25	116	D	CI, FW, OL, RD	S, W	0.08	0.00
TAR	TA-AL-149A	53.3	New	Temporary	Private	25	18	Gr	CI, OL	S, W	0.01	0.00

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-AL-149B	53.3	New	Temporary	Private	25	15	Gr	OL	S, W	0.02	0.00
TAR	TA-AL-153	53.8	Existing	Temporary	Private	25	1,411	D	AG, OL	S, W	0.82	0.00
TAR	TA-AL-154	54.2	Existing	Temporary	Private	25	1,227	D	AG, FW, OL	S, W	0.72	0.00
TAR	TA-AL-155	54.7	Existing	Temporary	Private	25	3,468	D	AG, CI, FW, OL, OW	S, W	2.02	0.00
PAR	PA-AL-155A	55.1	New	Permanent	Private	12.5	40	Gr	AG, OL	S, W	0.02	0.02
PAR	PA-AL-155B	55.1	New	Permanent	Private	12.5	16	Gr	CI, OL	S, W	0.01	0.01
TAR	TA-AL-156	55.5	Existing	Temporary	Private	25	599	D	AG, FW, OL	S, W	0.34	0.00
TAR	TA-AL-157	55.6	Existing	Temporary	Private	25	427	D	FW, OL	S, W	0.28	0.00
TAR	TA-AL-159B	56.8	Existing	Temporary	Private	25	212	G, D, Gr	CI, OL	S, W	0.13	0.00
TAR	TA-AL-159A	56.9	Existing	Temporary	Private	25	1,816	A, G, Gr	CI, OL	S, W	1.07	0.00
TAR	TA-AL-161	57.7	New	Temporary	Private	25	651	G, Gr	CI, FW, OL, RD	S, W	0.38	0.00
TAR	TA-AL-162	58.1	Existing	Temporary	Private	25	993	Gr, D	AG, FW, OL	S, W	0.58	0.00
TAR	TA-AL-163	58.4	Existing	Temporary	Private	25	1,032	OL, G	CI, OL	S, W	0.60	0.00
TAR	TA-AL-165A	60	New	Temporary	Private	25	17	Gr	OL	S, W	0.02	0.00
TAR	TA-AL-165B	60	New	Temporary	Private	25	16	Gr	OL	S, W	0.02	0.00
TAR	TA-AL-166A	60.2	New	Temporary	Private	12.5	16	Gr	CI, OL	S, W	0.01	0.00
TAR	TA-AL-166B	60.2	New	Temporary	Private	12.5	16	Gr	CI, OL	S, W	0.01	0.00
PAR	PA-AL-166	60.3	Existing	Permanent	Private	25	144	Gr	CI, OL	S, W	0.09	0.09
TAR	TA-AL-167	61.2	Existing	Temporary	Private	25	757	D	AG, CI, FW, OL	S, W	0.44	0.00
TAR	TA-AL-168	61.6	Existing	Temporary	Private	25	578	G, Gr	AG, CI, FW, OL	S, W	0.36	0.00
TAR	TA-AL-169	62.5	Existing	Temporary	Private	25	1,431	D	OL, RD	S, W	0.83	0.00
TAR	TA-AL-171A	63.3 RR	New	Temporary	Private	25	269	Gr	AG, FW	S, W	0.16	0.00
TAR	TA-AL-172	63.7	New	Temporary	Private	25	2,384	Gr	CI, FW, OL, SC	S, W	1.38	0.00
TAR	TA-AL-175A	64.8	New	Temporary	Private	12.5	60	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-AL-172A	64.8	New	Temporary	Private	25	20	Gr	CI, FW, OL	S, W	0.01	0.00
TAR	TA-AL-172B	64.8	New	Temporary	Private	25	22	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-AL-179B	67.2 RR	Existing	Temporary	Private	25	1,878	G	CI, OL	S, W	1.09	0.00
TAR	TA-AL-180	67.4 RR	New	Temporary	Private	25	1,906	G, Gr	AG, CI, FW, OL, RD	S, W	1.12	0.00

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Proposed New, Improved, and Private Access Roads for the MVP Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-AL-181	68	Existing	Temporary	Private	25	1,527	G, D	CI, FW, OL, RD	S, W	0.88	0.00
TAR	TA-AL-181A	68.2	Existing	Temporary	Private	25	1,991	G	CI, OL, RD	S, W	1.16	0.00
PAR	PA-AL-182	68.7	New	Permanent	Private	12.5	220	Gr	CI, FW, OL	S, W	0.07	0.07
TAR	TA-AL-185	68.9	Existing	Temporary	Private	25	1,586	Gr	FW, OL, RD	S, W	0.92	0.00
TAR	TA-AL-186	69.2	Existing	Temporary	Private	45	11	G, Gr	FW, RD	S, W	0.02	0.00
TAR	TA-AL-187B	69.8 RR	Existing	Temporary	Private	25	302	G	CI	S, W	0.18	0.00
TAR	TA-AL-187A	69.9 RR	Existing	Temporary	Private	20	1,087	G	CI, FW, OL	S, W	0.65	0.00
TAR	TA-AL-188	70.9	Existing	Temporary	Private	25	784	C, D	CI, FW, OL	S, W	0.45	0.00
TAR	TA-AL-189	71.2	Existing	Temporary	Private	25	2,151	Gr	FW, OL	S, W	1.32	0.00
TAR	TA-AL-190	71.5	Existing	Temporary	Alamance Community College	25	1,512	A, G, Gr	CI, FW, OL	S, W	0.89	0.00
TAR	TA-AL-192	72.2	Existing	Temporary	Private	25	1,275	G, D, Gr	CI, FW, OL, RD	S, W	0.74	0.00
TAR	TA-AL-193	72.4	Existing	Temporary	Private	25	1,262	Gr	CI, FW, OL	S, W	0.73	0.00
TAR	TA-AL-193A	72.9 RR	Existing	Temporary	Private	25	67	Gr	CI, OL	S, W	0.05	0.00
PAR	PA-AL-194	73.17 RR	Existing	Permanent	Transcontinental Gas Pipeline Company, LLC Public Service Company Of North Carolina, Inc. Private	20	205	G	CI, FW, OL	S	0.12	0.12
										North Carolina Subtotal	**61.78**	**3.36**
										Project Access Roads Total	**99.50**	**5.70**

Note: The totals shown in this table may not equal the sum of addends due to rounding.

a/ TAR=Temporary, PAR=Permanent Access Road.

b/ Milepost (MP) at final intersection of access road with construction workspace. Approximate MP rounded to the nearest tenth.

c/ Dominant surface condition provided. A=Asphalt, C=Concrete, G=Gravel, D=Dirt, Gr=Greenfield.

d/ AG = Agricultural; CI = Commercial / Industrial; FW = Upland Forest / Woodland; OL = Upland Open Land; OW = Open Water; RD = Residential; SC = Silviculture; WL = Wetland. Where wetlands (WL) are identified within permanent access roads, permanent impacts are not anticipated. PA-RO-113A has been removed from the Project.

e/ P=Paving, G=Grading, S=Stone, C=Culverts, W=Widening, R=Realignment. No improvements to occur within WLs crossed by the access road.

f/ Does not include area overlapping with pipeline, aboveground facility, or contractor/pipe storage yard construction workspaces.

g/ Does not include area overlapping with pipeline permanent right-of-way or aboveground facility permanent facility boundary (fence line/footprint). Only PARs will have an operational area impact.

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State, County	**Milepost**	**Type (Gas/Electric/Other)**	**Owner**
Virginia			
H-605 Pipeline			
Pittsylvania	0.3	Gas	Williams Transco
Pittsylvania	0.3	Gas	Williams Transco
Pittsylvania	0.3	Gas	Williams Transco
Pittsylvania	0.3	Gas	Williams Transco
H-650 Pipeline			
Pittsylvania	0.6	Electric	Appalachian Power Co.
Pittsylvania	2.9	Unknown	Unknown
Pittsylvania	2.9	Electric	Dominion
Pittsylvania	3.0	Electric	Appalachian Power Co.
Pittsylvania	3.3	Electric	Unknown
Pittsylvania	4.3	Electric	VEPCO
Pittsylvania	4.4	Electric	C&PVA
Pittsylvania	6.1	Electric	Dominion
Pittsylvania	7.2	Fiber Optic	C & P Telephone
Pittsylvania	7.2	Electric	Danville Utilities
Pittsylvania	7.2	Electric	Danville Utilities
Pittsylvania	7.4	Water	Unknown
Pittsylvania	7.4	Electric	Enerco
Pittsylvania	9.3	Gas	Columbia Gas
Pittsylvania	9.3	Electric	Enerco
Pittsylvania	10.2	Electric	Enerco
Pittsylvania	10.4	Electric	Unknown
Pittsylvania	10.7	Electric	Danville Utilities
Pittsylvania	10.7	Fiber Optic	C&P Telephone
Pittsylvania	10.8	Fiber Optic	C&P Telephone
Pittsylvania	10.8	Electric	Danville Utilities
Pittsylvania	12.3	Electric	Danville Utilities
Pittsylvania	12.4	Fiber Optic	Unknown
Pittsylvania	13.2	Electric	Duke
Pittsylvania	14.9	Electric	City of Danville
Pittsylvania	15.9	Electric	Enerco
Pittsylvania	15.9	Electric	Unknown
Pittsylvania	16.4	Electric	VPCO
Pittsylvania	16.7	Electric	Duke Power Co
Pittsylvania	16.7	Electric	VPCO
Pittsylvania	16.7	Electric	Duke Power Co
Pittsylvania	18.3	Electric	City of Danville
Pittsylvania	18.3	Electric	Danville Utilities
Pittsylvania	18.3	Electric	Danville Utilities
Pittsylvania	18.8	Electric	VEPCO
Pittsylvania	19.05	Electric	Duke Power Co
Pittsylvania	19.2	Electric	Duke Power Co
Pittsylvania	19.2	Electric	Duke Power Co
Pittsylvania	19.3	Electric	Enerco
Pittsylvania	19.4	Gas	Williams Transco
Pittsylvania	19.4	Gas	Williams Transco
Pittsylvania	19.4	Gas	Williams Transco
Pittsylvania	19.4	Gas	Williams Transco
Pittsylvania	19.5	Electric	Danville Utilities
Pittsylvania	19.5	Electric	Danville Utilities
Pittsylvania	19.6	Electric	Danville Utilities
Pittsylvania	19.6	Electric	Danville Utilities
Pittsylvania	19.7	Sewer	City
Pittsylvania	19.9	Gas	Williams Transco
Pittsylvania	19.9	Gas	Williams Transco
Pittsylvania	19.9	Gas	Williams Transco
Pittsylvania	19.9	Gas	Williams Transco
Pittsylvania	19.9	Electric	City of Danville
Pittsylvania	20.0	Electric	Centel
Pittsylvania	20.2	Electric	Duke Power Co
Pittsylvania	22.1	Electric	Danville Utilities
Pittsylvania	22.4	Gas	Williams Transco
Pittsylvania	22.4	Gas	Williams Transco
Pittsylvania	22.4	Gas	Williams Transco
Pittsylvania	22.4	Gas	Williams Transco
Pittsylvania	23.7 RR	Electric	Unknown
Pittsylvania	23.8 RR	Gas	Southwestern Virginia Gas

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State, County	**Milepost**	**Type (Gas/Electric/Other)**	**Owner**
Pittsylvania	23.8 RR	Gas	Southwestern Virginia Gas
Pittsylvania	23.9	Gas	Williams Transco
Pittsylvania	23.9	Gas	Williams Transco
Pittsylvania	23.9	Gas	Williams Transco
Pittsylvania	23.9	Gas	Williams Transco
Pittsylvania	24.7	Electric	APCO
Pittsylvania	25.95	Electric	Enerco
North Carolina			
Rockingham	26.5	Electric	Duke Power
Rockingham	26.9	Electric	Duke Power
Rockingham	27.1 RR	Gas	Williams Transco
Rockingham	27.1 RR	Gas	Williams Transco
Rockingham	27.1 RR	Gas	Williams Transco
Rockingham	27.1 RR	Gas	Williams Transco
Rockingham	28.2 RR	Gas	Williams Transco
Rockingham	28.2 RR	Electric	Duke Power
Rockingham	28.3 RR	Gas	Williams Transco
Rockingham	28.3 RR	Gas	Williams Transco
Rockingham	28.3 RR	Gas	Williams Transco
Rockingham	30.3 RR	Gas	Williams Transco
Rockingham	30.3	Gas	Williams Transco
Rockingham	30.5	Electric	Duke Power Co
Rockingham	30.7	Electric	Duke Power Co
Rockingham	31.6	Electric	Duke Power Co
Rockingham	31.6	Electric	Duke Power Co
Rockingham	32.0	Electric	Duke Power Co
Rockingham	34.2 RR	Electric	Duke Power Co
Rockingham	34.2 RR	Electric	Duke Power Co
Rockingham	34.2 RR	Electric	Duke Power Co
Rockingham	34.2 RR	Electric	Duke Power Co
Rockingham	35.0	Electric	Duke Power Co
Rockingham	35.0	Electric	Duke Power Co
Rockingham	35.0	Electric	Duke Power Co
Rockingham	35.0	Electric	Duke Power Co
Rockingham	35.5	Electric	Duke Power Co
Rockingham	35.7	Electric	Duke Power Co
Rockingham	36.2	Electric	Duke Power Co
Rockingham	36.6	Electric	Enerco
Rockingham	37.8	Gas	Colonial Pipeline
Rockingham	37.8	Gas	Colonial Pipeline
Rockingham	38.3	Electric	Duke Power Co
Rockingham	38.3	Electric	Duke Power Co
Rockingham	38.3	Electric	Duke Power Co
Rockingham	38.3	Electric	Duke Power Co
Rockingham	38.3	Electric	Duke Power Co
Rockingham	38.8	Electric	Duke Power Co
Rockingham	39.4	Electric	Duke Power Co
Rockingham	39.4	Electric	Duke Power Co
Rockingham	39.7	Electric	Duke Power Co
Rockingham	40.1	Electric	Duke Power Co
Rockingham	40.4 RR	Electric	Duke Power Co
Rockingham	40.4 RR	Electric	Duke Power Co
Rockingham	41.6	Electric	Duke Power Co
Rockingham	41.6	Electric	Duke Power Co
Rockingham	41.6	Electric	Duke Power Co
Rockingham	41.6	Electric	Duke Power Co
Rockingham	41.7	Electric	Duke Power Co
Rockingham	41.7	Electric	Duke Power Co
Rockingham	41.7	Electric	Duke Power Co
Rockingham	41.7	Electric	Duke Power Co
Rockingham	41.9	Electric	Duke Power Co
Rockingham	41.9	Electric	Duke Power Co
Rockingham	41.9	Electric	Duke Power Co
Rockingham	41.9	Electric	Duke Power Co
Rockingham	42.2	Electric	Duke Power Co
Rockingham	42.2	Fiber Optic	Unknown
Rockingham	42.2	Telephone	Unknown
Rockingham	42.2	Telephone	Unknown

REVISED [Oct 2019] - Appendix 1-J Foreign Utility Lines Crossed by the MVP Southgate Project			
State, County	**Milepost**	**Type (Gas/Electric/Other)**	**Owner**
Rockingham	42.2	Fiber Optic	Unknown
Rockingham	42.2	Electric	Unknown
Rockingham	43.1	Electric	Duke Power Co
Rockingham	44.8	Electric	Duke Power Co
Rockingham	44.8	Electric	Duke Power Co
Rockingham	44.8	Electric	Duke Power Co
Rockingham	44.8	Electric	Duke Power Co
Rockingham	44.9	Electric	Duke Power Co
Rockingham	48.4	Electric	Duke Power Co
Rockingham	49.0	Electric	Duke Power Co
Rockingham	49.0	Electric	Duke Power Co
Rockingham	49.0	Electric	Duke Power Co
Rockingham	49.1	Electric	Duke Power Co
Rockingham	49.1	Electric	Duke Power Co
Rockingham	49.1	Electric	Duke Power Co
Rockingham	49.5	Electric	Duke Power Co
Rockingham	49.7	Electric	Duke Power Co
Rockingham	49.7	Electric	Duke Power Co
Rockingham	49.7	Electric	Duke Power Co
Rockingham	49.7	Electric	Duke Power Co
Rockingham	51.0 RR	Gas	Plantation Pipeline
Rockingham	52.3	Electric	Duke Power Co
Rockingham	52.3	Electric	Duke Power Co
Rockingham	52.3	Electric	Duke Power Co
Rockingham	52.3	Electric	Duke Power Co
Alamance	53.1	Electric	Duke Power Co
Alamance	53.3	Electric	Duke Power Co
Alamance	53.5	Electric	Duke Power Co
Alamance	53.5	Electric	Duke Power Co
Alamance	53.5	Electric	Duke Power Co
Alamance	53.5	Electric	Duke Power Co
Alamance	54.1	Electric	Unknown
Alamance	55.1	Electric	Duke Power Co
Alamance	55.6	Electric	Duke Power Co
Alamance	55.6	Electric	Duke Power Co
Alamance	55.6	Electric	Duke Power Co
Alamance	55.6	Electric	Duke Power Co
Alamance	55.7	Electric	Bell south
Alamance	55.8	Electric	Duke Power Co
Alamance	56.1	Fiber Optic	AT&T
Alamance	56.4	Electric	Duke Power Co
Alamance	57.5	Electric	Duke Power Co
Alamance	57.7	Water	Private
Alamance	57.8	Electric	Duke Power Co
Alamance	57.8	Electric	Duke Power Co
Alamance	57.8	Electric	Duke Power Co
Alamance	57.8	Electric	Duke Power Co
Alamance	57.8	Electric	Duke Power Co
Alamance	57.9	Electric	Duke Power Co
Alamance	58.0	Fiber Optic	AT&T
Alamance	58.3	Electric	Duke Power Co
Alamance	58.3	Electric	Duke Power Co
Alamance	58.3	Electric	Duke Power Co
Alamance	58.3	Electric	Duke Power Co
Alamance	60.0	Electric	Unknown
Alamance	61.4	Electric	Duke Power Co
Alamance	62.8	Electric	Duke Power Co
Alamance	62.8	Fiber Optic	AT&T
Alamance	63.0 RR	Electric	Unknown
Alamance	64.3	Electric	Duke Power Co
Alamance	64.8	Electric	Duke Power Co
Alamance	65.3 RR	Electric	Duke Power Co
Alamance	65.5	Electric	Duke Power Co
Alamance	66.1 RR	Electric	Duke Power Co
Alamance	66.4 RR	Electric	Duke Power Co
Alamance	67.2 RR	Electric	Unknown
Alamance	67.2 RR	Electric	Unknown
Alamance	68.6	Telephone	Unknown

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State, County	**Milepost**	**Type (Gas/Electric/Other)**	**Owner**
Alamance	68.7	Electric	Bell south
Alamance	68.8	Electric	Duke Power Co
Alamance	68.8	Electric	Duke Power Co
Alamance	69.5	Electric	Duke Power Co
Alamance	69.6 RR	Electric	Duke Power Co
Alamance	69.6 RR	Electric	Duke Power Co
Alamance	69.7 RR	Electric	Unknown
Alamance	69.8 RR	Electric	Unknown
Alamance	69.8 RR	Sewer	City
Alamance	69.8 RR	Sewer	City
Alamance	69.9 RR	Electric	Unknown
Alamance	70.6	Fiber Optic	AT&T
Alamance	70.6	Fiber Optic	AT&T
Alamance	70.8	Electric	Duke Power Co
Alamance	70.8	Electric	Duke Power Co
Alamance	70.8	Electric	Duke Power Co
Alamance	70.9	Sewer	City
Alamance	71.3	Fiber Optic	Unknown
Alamance	71.6	Sewer	City
Alamance	71.7	Sewer	City
Alamance	72.9 RR	Electric	ENERCO
Alamance	72.9 RR	Electric	Unknown
Alamance	72.9 RR	Gas	Cardinal Pipeline
Alamance	73.0 RR	Gas	Piedmont Natural Gas Pipeline
Alamance	73.2 RR	Gas	PSNC
Alamance	73.2 RR	Gas	Cardinal Pipeline
Alamance	73.2 RR	Gas	PSNC

MVP Southgate Project

Docket No. CP19-14-000

MVP Southgate Project, Wetland and Waterbody Construction and Mitigation Procedures

October 2019

MOUNTAIN VALLEY PIPELINE, LLC

MVP SOUTHGATE PROJECT

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

OCTOBER 2019

Mountain Valley PIPELINE LLC

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

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WETLAND AND WATERBODY
CONSTRUCTION AND MITIGATION PROCEDURES (PROCEDURES)

I. APPLICABILITY

A. The intent of these Procedures is to assist Mountain Valley Pipeline, LLC (the Project) by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. The Project shall specify in their applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. The Project shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, the Project can request further changes as variances to the measures in these Procedures (or the applicant's approved procedures). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the Project's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of these Procedures is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Alternative Measures to the FERC Procedures requested by the Project are summarized in the table below.

FERC Procedures Section	FERC Measure	Alternative Measure	Justification
V.B.1.b.	Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows: b. coolwater and warmwater fisheries – June 1 through November 30.	Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows: b. Virginia – July 16 through April 14; North Carolina – no restriction (see Section V.B.1.b. below)	The proposed timing windows are equally as protective based on state agency consultations.
V.B.2.a.	Locate all extra work areas at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.	The Project is requesting FERC to approve Alternative Measures to Section B.2.a of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix A.	The proposed extra work areas within 50 feet of waterway's are equally protective as the Project will adhere to the Project's Erosion and Sediment Control Plans (E&SCPs).
V.B.3.c	Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.	The Project is requesting FERC to approve Alternative Measures to Section V.B.3.c of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix C.	The proposed areas where less than 15 feet of undisturbed vegetation is proposed between the parallel waterbody and the construction right-of-way are equally protective as the Project will adhere to the Project's E&SCPs.

FERC Procedures Section	FERC Measure	Alternative Measure	Justification
VI.A.3.	Limit the width of the construction right-of-way to 75 feet or less.	The Project is requesting FERC to approve Alternative Measures to Section VI.A.3 of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix B.	The proposed areas where the construction right-of-way is greater than 75 feet in non-agricultural wetlands are equally as protective as the Project will adhere to the will adhere to the Project's E&SCPs.
VI.B.1.a.	Locate all extra work areas at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.	The Project is requesting FERC to approve Alternative Measures to Section VI.B.1.a of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix A.	The proposed extra work areas within 50 feet of wetlands are equally protective as the Project will adhere to the will adhere to the Project's E&SCPs.

Project-related impacts on non-wetland areas are addressed in the Project's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

B. DEFINITIONS

1. “Waterbody” includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:

   a. “minor waterbody” includes all waterbodies less than or equal to 10 feet wide at the water’s edge at the time of crossing;

   b. “intermediate waterbody” includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing; and

   c. “major waterbody” includes all waterbodies greater than 100 feet wide at the water’s edge at the time of crossing.

2. “Wetland” includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

1. site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland (Please refer to Appendix A); and

2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands (Please refer to Appendix B).

B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations:

1. Spill Prevention and Response Procedures specified in section IV.A;

2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. The Project will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;

4. site-specific plans for major waterbody crossings, described in section V.B.9;

5. a wetland delineation report as described in section VI.A.1, if applicable; and

6. the hydrostatic testing information specified in section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

IV. PRECONSTRUCTION PLANNING

A. The Project shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

1. It shall be the responsibility of the Project and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The Project and its contractors must, at a minimum, ensure that:

a. all employees handling fuels and other hazardous materials are properly trained;

b. all equipment is in good operating order and inspected on a regular basis;

c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the Project and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the Project and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. The Project and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the Project and its contractors must:

a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and

d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The Project must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

The Project is requesting FERC to approve Alternative Measures to Section V.B.1.b of the FERC (2013) Procedures as identified below:

The Project consulted with the Virginia Department of Game and Inland Fisheries (VDGIF) regarding time of year restrictions (TOYRs) for waterbodies crossed by the Project in Virginia. Based on the results of consultation and the results of aquatic surveys (provided to VDGIF in May 2019), Mountain Valley intends to adhere to the Virginia Department of Game and Inland Fisheries (VDGIF) warmwater fishery restrictions (April 15-July 15).

The Project consulted with the North Carolina Wildlife Resources Commission (NCWRC) regarding TOYRs for waterbodies crossing by the Project in North Carolina. Based on the proposed stream crossing methods and anticipated Best Management Practices, the NCWRC is not imposing any TOYRs at any waterbody crossings.

In-stream work, except that required to install or remove equipment bridges, must occur during the following time windows:

a. Coldwater fisheries – There are no coldwater fisheries habitat streams affected by the Project – Not Applicable.

b. Warmwater fisheries

- Virginia – July 16 through April 14

  If in-stream work in Virginia is necessary outside of this construction timing window, the Project will obtain approval from the Virginia Department of Game and Inland Fisheries prior to initiating the in-stream work.

- North Carolina – permitted in-stream activities can occur at any time of year within the waterbodies crossed by the Project in North Carolina.

2. Extra Work Areas

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

The Project is requesting FERC to approve Alternative Measures to Section V.B.2.a of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix A.

b. The Project shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected. Please refer to Appendix A.

c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

a. Comply with the COE, or its delegated agency, permit terms and conditions.

b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

The Project is requesting FERC to approve Alternative Measures to Section V.B.3.c of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix C.

d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the Project must comply with all applicable Procedure requirements for "waterbodies" as defined in section I.B.1.

4. Spoil Pile Placement and Control

a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas as described in section V.B.2.

b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

(1) equipment pads and culvert(s);
(2) equipment pads or railroad car bridges without culverts;
(3) clean rock fill and culvert(s); and
(4) flexi-float or portable bridges.

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

d. Design and maintain equipment bridges to prevent soil from entering the waterbody.

e. Remove temporary equipment bridges as soon as practicable after permanent seeding.

f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
(iii) screen pump intakes to minimize entrainment of fish;
(iv) prevent streambed scour at pump discharge; and
(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) install flume pipe after blasting (if necessary), but before any trenching;

(2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);
(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and

(5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours. Streambanks and unconsolidated streambeds may require additional restoration after this period;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

Before construction, the Project shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, herbaceous species, or other native vegetation similar in composition and density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.

   In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody’s mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in section VII.A.5 of MVP's Plan (April 1 – October 14 of any year) apply to routine mowing and clearing of riparian areas.

VI. WETLAND CROSSINGS

A. GENERAL

1. The Project shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

This report shall identify:

a. by milepost all wetlands that would be affected;

b. the National Wetlands Inventory (NWI) classification for each wetland;

c. the crossing length of each wetland in feet; and

d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the Project is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

   The Project is requesting FERC to approve Alternative Measures to Section VI.A.3 of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix B.

4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

5. Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the Project must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:

   a. spoil control;

   b. equipment bridges;

   c. restoration of waterbody banks and wetland hydrology;

   d. timing of the waterbody crossing;

   e. method of crossing; and

   f. size and location of all extra work areas.

6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

The Project is requesting FERC to approve Alternative Measures to Section VI.B.1.a of the FERC (2013) Procedures in several locations. Locations where Alternative Measures are Requested are included in Appendix A.

b. The Project shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected. Please refer to Appendix A.

c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

a. Comply with COE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use "push-pull" or "float" techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

   The Project can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.

6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with native wetland plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 1 – October 14 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.

   For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.

3. The Project shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.

APPENDIX A -

Revised [Oct 2019] - Appendix 2-F - ATWS Within 50 feet of Wetland or Waterbody

Mountain Valley PIPELINE LLC

REVISED [Oct 2019] - Appendix 2-F

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Within 50 feet of a Wetland	Within 50 feet of a Waterbody	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)
Virginia, Pittsylvania County							
1052	5.2	X		W-D18-1	0	ATWS situated in this location to support conventional bore and associated equipment.	Y
1088B	9.8	X		W-F18-58	47	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland crossing and point of intersect.	N
1136C	17.7 RR		X	S-A19-295	1	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.	Y
			X	S-E18-44	49		
		X		W-A19-296	0		
1173D	22.7 RR		X	S-A19-317	0	ATWS situated in this location for storage of material, pumps, mats, pipe for stream crossing.	Y
North Carolina, Rockingham County							
1213	27.0 RR	X		W-A18-44	0	This ATWS is in an agriculture field and will be used for pipeline crossing.	N
1213A	27.0 RR	X		W-A18-44	6	This ATWS is in an agriculture field and will be used for pipeline crossing.	N
1213D	27.3	X		W-A18-44	0	ATWS in this location to be used for support during stream crossing	Y
1222	27.6	X		W-A19-274	0	ATWS in this location to be used for support during stream crossing.	Y
1244	29.9	X		W-A18-18	0	ATWS situated in this location to support HDD and associated equipment.	Y

Mountain Valley PIPELINE

REVISED [Oct 2019] - Appendix 2-F

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Within 50 feet of a Wetland	Within 50 feet of a Waterbody	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)
1244A	29.9	X		W-A18-18	2	ATWS situated in this location to support HDD and associated equipment	Y
1251A	30.3	X		W-B18-34	0	Staging of mats / equipment needed to perform foreign line crossings, then used for as needed for parking, materials, pipe, and equipment to support Dan River HDD, and also to support connection point between spreads.	N
				W-B18-36	0		
1249	30.4	X	X	S-B18-38	0	ATWS situated in this location to support HDD and associated equipment	Y
				W-B18-34	0	ATWS situated in this location to support HDD and associated equipment	Y
				AW-B18-36 / W-B18-36	0	ATWS situated in this location to support HDD and associated equipment// hydrostatic testing equipment.	Y
1250	30.5	X		W-B18-34	0	ATWS situated in this location to support conventional bore and associated equipment.	Y
1251	30.4	X		W-B18-36	0	ATWS situated in this location to support HDD and associated equipment.	Y
1368	41.5		X	S-B18-44	15	ATWS situated in this location to support conventional bore and associated equipment.	Y
1396	43.8		X	S-A18-106	41	ATWS to be reduced, to be provided in Implementation Plan	N

Mountain Valley PIPELINE

REVISED [Oct 2019] - Appendix 2-F

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Within 50 feet of a Wetland	Within 50 feet of a Waterbody	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)
North Carolina, Alamance County							
1577D	63.4 RR		X	S-B18-12	49	ATWS to be reduced, to be provided in Implementation Plan	N
1581A	63.4 RR		X	S-B18-12	46	ATWS to be reduced, to be provided in Implementation Plan	N
1588A	64.4		X	S-A19-350	35	ATWS to be moved, to be provided in Implementation Plan	N
1588A	64.4		X	S-A19-351	0	ATWS to be moved, to be provided in Implementation Plan	N
1588B	64.5		X	S-A19-350	27	ATWS to be moved, to be provided in Implementation Plan	N
1653G	69.7 RR		X	S-C18-70	0	ATWS required in this location to facilitate storage of materials and equipment for stream crossing in a congested area.	Y
1681	71.9		X	AS-A19-337	44	ATWS to be reduced, to be provided in Implementation Plan	N
1692A	73.0 RR	X		W-A18-111	0	ATWS situated in this location to support conventional bore and associated equipment.	Y
1692	73.1RR	X	X	AS-B18-58 / SB18-58	43	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area	Y
				S-B19-150	0	ATWS situated in this location to support conventional bore and associated equipment / hydrostatic test support equipment.	Y

Mountain Valley PIPELINE LLC

REVISED [Oct 2019] - Appendix 2-F ATWS Within 50 feet of Wetland or Waterbody							
ATWS ID	**Milepost**	**Within 50 feet of a Wetland**	**Within 50 feet of a Waterbody**	**Feature ID**	**Distance from Resource Area (feet) a/**	**Justification**	**Variance Required (Y/N)**
				W-B19-151	0	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area.	Y

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.
a/ Distance from resource area of 0 feet indicate the wetland or waterbody is located within the ATWS.

APPENDIX B -

Revised [Oct 2019] – Locations Where the Construction Right-of-way is Greater than 75 feet wide at Wetland Crossings

Mountain Valley PIPELINE LLC

REVISED [Oct 2019] - Locations Where the Construction Right-of-way is Greater than 75 feet wide at Wetland Crossings		
Resource ID	**MP**	**Justification**
W-A18-44 (PEM)	27.0RR – 27.3	Major foreign line crossing and paralleling foreign line corridor reduces ability to stockpile materials on southeast side of ROW.
W-A19-274 (PEM)	27.6	Large stream crossing requires additional temporary workspace on either side in conjunction with paralleling foreign line corridor.
W-A18-18 (PFO)	29.7 – 29.9	Full construction ROW required for pullback activities during the HDD of the Dan River.
W-A18-83 (PEM)	53.4	Full temporary work space required to safely cross Lee Lewis Rd.
W-B19-151 (PEM)	72.9RR	Major road crossing across East Harden Street in conjunction with multiple foreign line crossings in this area require additional temporary work space.

APPENDIX C -

Revised [Oct 2019] – Table 2.3-9 – Construction Workspace Parallels Waterbody (or associated wetland) within 15 feet

REVISED [Oct 2019] - Table 2.3-9 Construction Workspace Parallels Waterbody (or associated Wetland) within 15 feet			
Resource ID	**MP**	**Length of Route within 15 Feet of Resource (feet)**	**Justification**
S-F18-10 / W-F18-11	0.2	48 / 46	Collocation as route exits Lambert Compressor Station.
S-F18-17	9.9	60	Crossing location avoids sensitive resource site. Minimizes impact to wetlands. Constructability to avoid side slope construction.
S-F18-28 / W-F18-29	11.4	20 / 70	Collocation and constructability to avoid side slope construction.
S-D18-37	15.6	60	Collocation and constructability to avoid side slope construction.
S-D18-37	15.7	56	Collocation and constructability to avoid side slope construction.
W-A18-204 / S-A16-205	22.0	187	Collocation and constructability, to avoid residence and to support road bore.
S-E18-35 / W-E18-33	23.9	14 / 39	Collocation and constructability to avoid side slope construction.
S-A18-143	31.9	22	Collocation and constructability to avoid side slope construction.
S-A18-151	32.7	90	Constructability to avoid side slope construction.
S-A18-154	33.0	38	Constructability to avoid side slope construction.
S-A18-94 / W-A18-95	37.0	40 / 61	Constructability to avoid side slope construction.
S-A18-4	38.5	180	Collocation.
S-B18-44	41.6	52	Maintains collocation and supports space required for highway crossing
S-A18-212	45.7	29	Maintaining collocation
S-A18-218	52.2RR	37	Support perpendicular stream crossing
S-A18-87	53.7	43	Collocation.
S-B18-14	63.2RR	55	Collocation and constructability to avoid side slope construction.
W-B19-161	65.5	81	Constructability, to avoid residences
S-A19-353	66.58RR	59	Supports request of Landowner on route placement
S-B18-9	68.8	45	Constructability to avoid side slope construction.
S-B18-11	68.9	31	Route location dictated by major road bores north and south of stream
S-A18-116	70.0RR	24	Route location dictated by alignment around Town of Haw River
S-C18-82	70.4	93	Constructability to avoid side slope construction.

MVP Southgate Project

Docket No. CP19-14-000

MVP Southgate Project, Upland Erosion Control, Revegetation, and Maintenance Plan

October 2019

MOUNTAIN VALLEY PIPELINE, LLC

MVP SOUTHGATE PROJECT

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

OCTOBER 2019

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

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UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN (PLAN)

I. APPLICABILITY

A. The intent of this Plan is to assist project sponsors by identifying baseline mitigation measures for minimizing erosion and enhancing revegetation. Project sponsors shall specify in their applications for a new FERC authorization and in prior notice and advance notice filings, any individual measures in this Plan they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in this Plan (or the applicant's approved plan). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of this Plan is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Alternative Measures to the FERC Plan requested by the Project are summarized in the table below.

FERC Plan Section	FERC Measure	Alternative Measure	Justification
II.B.13. b.	Inspecting and ensuring the maintenance of temporary erosion control measures at least: b. on a weekly basis in areas with no construction or equipment operation.	Inspecting and ensuring the maintenance of temporary erosion control measures at least b. in non-(total maximum daily load) TMDL watersheds: on a weekly basis in areas with no construction or equipment operation; c. in TMDL watersheds: enhanced inspection frequency per State requirements.	The enhanced frequency in TMDL watersheds is more protective than the FERC Plan.
IV.F.1.b.	Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary): Slope % Spacing (feet) 5-15 300 >15-30 200 >30 100	Temporary slope breakers must be installed on slopes greater than 2 percent where the base of the slope is less than 25 feet from a waterbody, wetland, and road crossings at the following spacing (see Section IV.F.1.b below).	The Project spacing is more protective than the FERC Plan.
VII.A.5	In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.	In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 1 and October 14 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.	The adjusted routine mowing timing restriction provides equal protection to migratory bird nesting per agency consultation.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on wetland and waterbody systems are addressed in the staff's Wetland and Waterbody Construction and Mitigation Procedures (Procedures).

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

2. Environmental Inspectors shall have peer status with all other activity inspectors.

3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Plan, the Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.

2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;

4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

5. Identifying erosion/sediment control and soil stabilization needs in all areas;

6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;

7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

10. Ensuring restoration of contours and topsoil;

11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;

12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

13. **The Project is requesting FERC to approve Alternative Measures to Section II.B.13.b of the FERC (2013) Plan as identified below.**

    Inspecting and ensuring the maintenance of temporary erosion control measures at least:

    a. on a daily basis in areas of active construction or equipment operation;

b. In non-TMDL watersheds: on a weekly basis in areas with no construction or equipment operation;

c. In TMDL watersheds: enhanced inspection frequency per State requirements

d. within 24 hours of each 0.5 inch of rainfall;

14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;

15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the project sponsor in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;

16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and

17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

The project sponsor shall do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.

2. Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.

3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

1. Attempt to locate existing drain tiles and irrigation systems.

2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.

3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.

4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available.

C. GRAZING DEFERMENT

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in this Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.

2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities.

3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.

4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas.

G. SPILL PREVENTION AND RESPONSE PROCEDURES

The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, project sponsors shall: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC’s regulations.

The plan shall address:

1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

2. 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

3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project-related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.

2. The typical construction right-of-way width for the Project shall not exceed 100 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of- way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

   Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:

a. the location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;

b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

c. a statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the authorized construction right-of-way width would be expanded by more than 25 feet.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

   a. cultivated or rotated croplands, and managed pastures;

   b. residential areas;

   c. hayfields; and

   d. other areas at the landowner's or land managing agency's request.

2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.

3. Where topsoil segregation is required, the project sponsor must:

   a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and

   b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.

6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.

2. Probe all drainage tile systems within the area of disturbance to check for damage.

3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction.

2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.

3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers

a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.

b. **The Project is requesting FERC to approve Alternative Measures to Section IV.F.1.b of the FERC (2013) Plan as identified below:**

Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 2 percent where the base of the slope is less than 25 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary):

PROPOSED MINIMUM SPACING FOR TEMPORARY WATER BARS	
PIPELINE GRADE	DISTANCE (FEET)
<2%	— [1,2]
2–5%	400
6–15%	200
16–30%	100
>31%	50 [3]

(1) TEMPORARY RIGHT-OF-WAY DIVERSIONS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.

(2) TEMPORARY RIGHT-OF-WAY DIVERSIONS WILL BE INSTALLED 25 FEET FROM EACH WATER BODY BOUNDARY REGARDLESS OF SLOPE CONDITIONS.

(3) SLOPES GREATER THAN 65% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY SOUTHGATE DESIGN ENGINEERING AND SOUTHGATE ENVIRONMENTAL INSPECTOR.

c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.

d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.

b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 2 percent where the base of the slope is less than 25 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.

b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch all disturbed upland areas (except cultivated cropland) <u>before</u> seeding if:

(1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or

(2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching <u>before</u> seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.

g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. RESTORATION

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

   If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.

3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

4. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.

5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.

6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.

7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers

   a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

   b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.

   c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.

   d. At a minimum, install a trench breaker at the base of slopes greater than 2 percent where the base of the slope is less than 25 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland.

2. Permanent Slope Breakers

   a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

   b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

RECOMMENDED MINIMUM SPACING FOR PERMANENT SLOPE BREAKERS	
PIPELINE GRADE	DISTANCE (FEET)
<2%	- [1,2]
2-5%	400
6-15%	200
16-30%	100
>31%	50 [3]

1. PERMANENT SLOPE BREAKERS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.
2. PERMANENT SLOPE BREAKERS WILL BE INSTALLED 25 FEET FROM EACH WATERBODY BOUNDARY REGARDLESS OF SLOPE CONDITIONS.
3. SLOPES GREATER THAN 65% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY MVP DESIGN ENGINEERING AND MVP ENVIRONMENTAL INSPECTOR.

c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.

d. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.

   If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.

b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.

b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.

c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.

d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.

e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.

f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

A. signs;

B. fences with locking gates;

C. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and

D. conifers or other appropriate trees or shrubs across the right-of-way.

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.

2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

   Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.

4. Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agencyper section V.A.6), revegetation is successful, and proper drainage has been restored.

5. **The Project is requesting FERC to approve Alternative Measures to Section VII.A.5 of the FERC (2013) Plan as identified below:**

   Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 1 and October 14 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.

6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

B. REPORTING

1. The project sponsor shall maintain records that identify by milepost:

   a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

   b. acreage treated;

   c. dates of backfilling and seeding;

   d. names of landowners requesting special seeding treatment and a description of the follow-up actions;

   e. the location of any subsurface drainage repairs or improvements made during restoration; and

   f. any problem areas and how they were addressed.

2. The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

   The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations.

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 2 Table Updates

October 2019

LIST OF TABLES

REVISED [Oct 2019] - Table 2.2-1

Aquifers Crossed by the MVP Southgate Project Pipeline

Facility / State / County	Approximate Mileposts	Aquifer System Name	Dominant Lithology
Virginia			
H-605 Pipeline			
Pittsylvania	0.0 – 0.5	Early Mesozoic basin aquifers	Sandstone aquifers
H-650 Pipeline			
Pittsylvania	0.0RR - 4.3	Early Mesozoic basin aquifers	Sandstone aquifers
	4.3 - 4.6	Piedmont and Blue Ridge Crystalline-rock aquifers	Igneous and metamorphic-rock aquifers
	4.6 - 26.1	Early Mesozoic basin aquifers	Sandstone aquifers
North Carolina			
Rockingham	26.1 - 32.5	Early Mesozoic basin aquifers	Sandstone aquifers
	32.5 - 52.6	Piedmont and Blue Ridge Crystalline-rock aquifers	Igneous and metamorphic-rock aquifers
Alamance	52.6 - 73.2 RR	Piedmont and Blue Ridge Crystalline-rock aquifers	Igneous and metamorphic-rock aquifers

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

Source: USGS, 2000

REVISED [Oct 2019] - Table 2.2-2 Private Wells and Springs within 150 feet of the MVP Southgate Project Construction Workspace a/				
State, County, Milepost	**Line List Number**	**Status (active, inactive, plugged, etc.)**	**Use (irrigation, monitoring, domestic, etc.)**	**Distance from Project Construction Workspace (Feet) b/**
Virginia				
Pittsylvania				
H-605 Pipeline				
No private wells located within 150 feet of workspace areas				
H-650 Pipeline				
4.3	VA-PI-030.000	Active	TBD	0
4.6	VA-PI-033.100	TBD	TBD	16
6.2	VA-PI-036.000	Active	Ground Water Testing	0
6.2	VA-PI-036.000	Active	Ground Water Testing	0
6.2	VA-PI-036.000	Active	Ground Water Testing	0
6.2	VA-PI-036.000	Active	Ground Water Testing	0
6.2	VA-PI-036.000	Active	Ground Water Testing	0
6.2	VA-PI-036.000	Active	Ground Water Testing	5
6.3	VA-PI-037.000	Active	TBD	22
6.3	VA-PI-037.000	Active	TBD	127
6.3	VA-PI-037.000	Active	TBD	0
6.3	VA-PI-037.000	Active	TBD	0
6.5	VA-PI-037.000	Active	TBD	86
6.5	VA-PI-037.000	Active	TBD	0
6.5	VA-PI-037.000	Active	TBD	96
14.8	Pittsylvania, Virginia	TBD	TBD	113
19.6	VA-PI-140.000	TBD	TBD	12
21.9	VA-PI-167.000	Active	TBD	99
North Carolina				
Rockingham				
43.15	NC-RO-117.250	TBD	TBD	12
43.9	NC-RO-133.100.AR	Active	TBD	31
45.0	NC-RO-139.000	TBD	TBD	39
Alamance				
52.9	NC-AL-000.035	TBD	TBD	25
52.9	NC-AL-000.030	TBD	TBD	65
53.5	NC-AL-000.060 NC-AL-000.065	TBD	TBD	145
59.5 RR	NC-AL-062.000	Active	TBD	45
65.0 RR	MVF-NC-AL-007.000	TBD	TBD	41
65.1 RR	MVF-NC-AL-007.000	Active	TBD	117
65.2 RR	MVF-NC-AL-007.000	TBD	TBD	65
65.2 RR	MVF-NC-AL-010.000	TBD	TBD	71
69.1	NC-AL-150.000	TBD	TBD	4
69.9 RR	NC-AL-184.00	TBD	Monitoring	3
69.9 RR	NC-AL-184.000	TBD	TBD	14

REVISED [Oct 2019] - Table 2.2-2

Private Wells and Springs within 150 feet of the MVP Southgate Project Construction Workspace a/

State, County, Milepost	Line List Number	Status (active, inactive, plugged, etc.)	Use (irrigation, monitoring, domestic, etc.)	Distance from Project Construction Workspace (Feet) b/
70.0 RR	NC-AL-184.000	TBD	TBD	39
72.8 RR	NC-AL-203.000	TBD	TBD	67

Note: The Southgate Project is currently working with landowners to identify the status and use of wells within 150 feet. The status and type of well will be determined during easement negotiations with the landowner. TBD = To Be Determined.

a/ Private wells identified by civil survey where access has been granted. No springs have been identified within 150 feet of the Project construction workspace on parcels surveyed through August 24, 2019.

b/ Wells with a distance of 0 feet from Southgate Project Construction Workspace are located within the current construction workspace.

REVISED [Oct 2019] - Table 2.3-2 FEMA 100-year Flood Zones crossed by the MVP Southgate Project				
State/County	**Flood Zone a/**	**Entry Mile Post**	**Exit Mile Post**	**Length Crossed (feet)**
Virginia				
H-605 Pipeline				
Pittsylvania	No Flood Zones Crossed			
H-650 Pipeline				
Pittsylvania	A	0.3	0.4	556
	AE	1.4	2.2	4,357
	AE	4.8	5.1	1,260
	AE	5.1	5.2	771
	AE	6.6	6.6	174
	A	8.5	8.6	266
	A	9.9	9.9	220
	AE	12.7	12.8	210
	AE	13.4	13.5RR	322
	A	15.7	15.7	172
	AE	17.6RR	17.8RR	250
	A	23.2RR	23.2RR	57
North Carolina				
Rockingham	AE	27.1	27.8	3,761
	AE	27.8	27.8	22
	AE	27.9	28.1	770
	AE	28.3RR	28.4RR	201
	AE	29.6	29.6	22
	AE	29.6	30.5	4,741
	AE	30.5	30.6	315
	AE	30.7	30.7	150
	AE	30.7	30.9	941
	AE	32.1	32.2	37
	AE	32.2	32.2	196
	AE	32.2	32.2	10
	AE	32.6	32.7	526
	AE	33.0	33.1	470
	AE	33.1	33.1	32
	AE	38.6	38.8	886
	AE	41.1	41.2	320
	AE	43.2	43.3	551
	AE	46.4	46.5	88
	AE	46.9	47.0	341

REVISED [Oct 2019] - Table 2.3-2 FEMA 100-year Flood Zones crossed by the MVP Southgate Project				
State/County	**Flood Zone a/**	**Entry Mile Post**	**Exit Mile Post**	**Length Crossed (feet)**
	AE	48.6	48.7	353
	AE	50.8RR	50.8RR	264
Alamance	AE	53.6	53.7	198
	AE	54.6	54.6	125
	AE	56.4	56.4	125
	AE	56.7RR	56.7RR	68
	AE	57.0	57.0	304
	AE	57.9	57.9	8
	AE	58.7RR	58.7RR	188
	AE	60.7	60.7	31
	AE	63.6	63.6	4
	AE	63.6	63.6	350
	AE	63.8	63.9	100
	AE	64.0RR	64.1RR	271
	AE	65.6	65.6	115
	AE	67.6RR	67.6RR	153
	AE	69.1	69.1	222
	AE	69.1	69.3	894
	AE	69.1	69.1	222
	AE	70.2RR	70.3	243
	AE	70.7	70.8	254
	AE	70.9	70.9	253
	AE	70.9	71.0	115
	AE	71.3	71.3	328
	AE	71.3	71.8	2,536
	AE	72.5	72.7	1,279
	AE	72.9RR	73.1RR	1,077
Note: Mileposts with an “RR” indicate locations where a re-route was incorporated into the pipeline alignment. a/ Flood Zone A – Areas subject to inundation by the 1-percent annual chance flood event determined using approximate methodologies. Flood Zone AE – Areas subject to inundation by the 1-percent annual chance flood event determined by detailed methods.				

REVISED [Oct 2019] - Table 2.3-3 Permanent Impacts within the 100-year Flood Zone	
Facility	**Impact (acre)**
T-15 Dan River Interconnect/ MLV 4	0.8
PA-RO-082	0.1
PA-RO-082A	0.1
Total	**1.0**
NOTE: Totals may not equal the sum of addends due to rounding. Addends consists of 6-decimal digits.	

REVISED [Oct 2019] - Table 2.3-4

Summary of Waterbodies Crossed by the Pipeline of the MVP Southgate Project a/

Facility, State	Flow Type	Number of Waterbodies Crossed
H-605 Pipeline		
Virginia	Ephemeral	0
	Intermittent	1
	Perennial	0
	H-605 Pipeline Virginia Total	**1**
H-650 Pipeline		
Virginia	Ephemeral	3
	Intermittent	20
	Perennial	38
	Pond	1
	H-650 Pipeline Virginia Total	**62**
North Carolina	Ephemeral	15
	Intermittent	58
	Perennial	85
	Pond	2
	H-650 Pipeline North Carolina Total	**160**
	Project Total	**223**

a/ Based on data from field delineation as of August 24, 2019 where access has been obtained to the pipeline corridor, approximated and NHD data elsewhere. Table only includes waterbodies that cross the centerline of the Southgate Project.

REVISED [Oct 2019] - Table 2.3-5

Summary of FERC Classification of Waterbody Crossings by the Pipeline of the MVP Southgate Project a/

State	Minor b/	Intermediate c/	Major d/	Total
Virginia	42	20	1	**63**
North Carolina	121	36	3	**160**
Total	**163**	**56**	**4**	**223**

a/ Based on data from field delineation as of August 24, 2019 where access has been obtained to the pipeline corridor, approximated and NHD data elsewhere. Table only includes waterbodies that cross the centerline of the Southgate Project.

b/ FERC classified Minor Waterbodies – waterbodies less than or equal to 10 feet wide at the water's edge

c/ FERC classified Intermediate Waterbodies – waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge

d/ FERC classified Major Waterbodies – waterbodies greater than 100 feet wide at the water's edge

REVISED [Oct 2019] - Table 2.3-7

Proposed Hydrostatic Test Water Use Summary

Anticipate Year of Construction	Construction Spread	Segment Name	Beginning MP	Ending MP	Length of Section (feet)	Required Water (gal)	Proposed Water Source			Proposed Test Water Discharge Location		
							MP	Water Source	Watershed	MP	Watershed	Volume
2020	1	1	0.0RR	30.4	162,800	3,600,000	30.1	Dan River (Primary) / Municipal (Secondary)	NA	30.1	Cape Fear River Basin	3,600,000
2020	2	2	30.4	73.2RR	232,130	2,300,000	30.1	Dan River (Primary) / Municipal (Secondary)	NA	30.1	Cape Fear River Basin	2,300,000
Hydrostatic Test Water Total						**5,900,000**						

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

REVISED [Oct 2019] - Table 2.3-8 Estimated Water Usage for the MVP Southgate Project HDDs				
State, HDD Name	**MP (Ending) of the HDD**	**Maximum Estimated Volume (gallons)**		**Water Source**
		Hydrostatic Test Water	**HDD Operations**	
North Carolina				
Dan River HDD	30.4	60,000	105,000	Dan River (Primary) / Municipal (Secondary)
Stony Creek Reservoir HDD	63.8	16,500	105,000	Municipal (Primary) / Dan River (Secondary)

REVISED [Oct 2019] - Table 2.3-9

Construction Workspace Parallels Waterbody (or associated Wetland) within 15 feet

Resource ID	MP	Length of Route within 15 Feet of Resource (feet)	Justification
S-F18-10 / W-F18-11	0.2	48 / 46	Collocation as route exits Lambert Compressor Station.
S-F18-17	9.9	60	Crossing location avoids sensitive resource site. Minimizes impact to wetlands. Constructability to avoid side slope construction.
S-F18-28 / W-F18-29	11.4	20 / 70	Collocation and constructability to avoid side slope construction.
S-D18-37	15.6	60	Collocation and constructability to avoid side slope construction.
S-D18-37	15.7	56	Collocation and constructability to avoid side slope construction.
W-A18-204 / S-A16-205	22.0	187	Collocation and constructability, to avoid residence and to support road bore.
S-E18-35 / W-E18-33	23.9	14 / 39	Collocation and constructability to avoid side slope construction.
S-A18-143	31.9	22	Collocation and constructability to avoid side slope construction.
S-A18-151	32.7	90	Constructability to avoid side slope construction.
S-A18-154	33.0	38	Constructability to avoid side slope construction.
S-A18-94 / W-A18-95	37.0	40 / 61	Constructability to avoid side slope construction.
S-A18-4	38.5	180	Collocation.
S-B18-44	41.6	52	Maintains collocation and supports space required for highway crossing
S-A18-212	45.7	29	Maintaining collocation
S-A18-218	52.2RR	37	Support perpendicular stream crossing
S-A18-87	53.7	43	Collocation.
S-B18-14	63.2RR	55	Collocation and constructability to avoid side slope construction.
W-B19-161	65.5	81	Constructability, to avoid residences
S-A19-353	66.58RR	59	Supports request of Landowner on route placement
S-B18-9	68.8	45	Constructability to avoid side slope construction.
S-B18-11	68.9	31	Route location dictated by major road bores north and south of stream
S-A18-116	70.0RR	24	Route location dictated by alignment around Town of Haw River
S-C18-82	70.4	93	Constructability to avoid side slope construction.

REVISED [Oct 2019] - Table 2.3-11

Waterbodies Crossed by the Pipeline in Karst Areas a/

State/County	Milepost	Waterbody Name	Flow Type
Karst features are not present along the Project alignment – See Karst Hazards Assessment, Version 3.0 Revised April 2019 (FERC Accession No. 20190522-5174).			

REVISED [Oct 2019] - Table 2.4-1 Summary of Wetlands Crossed by the MVP Southgate Project				
State / County	**Wetland Type**	**Length of Pipeline Crossing (Feet)**	**Acres Impacted a/**	
			Construction	**Operation**
Virginia				
Pittsylvania	PEM	3,133	6.25	0.74
	PFO	3,253	5.06	1.94
	PSS	472	0.69	0.08
	Virginia Total	***6,858***	***11.99***	***2.76***
North Carolina				
Rockingham	PEM	1,962	5.26	0.41
	PFO	2,266	4.46	1.46
	PSS	193	0.42	0.05
Alamance	PEM	535	1.21	0.12
	PFO	1,234	2.07	0.81
	PSS	52	0.14	0.01
Caswell	PSS	0	0.00	0.00
	North Carolina Total	***6,242***	***13.55***	***2.87***
	Project Total	***13,100***	***25.55***	***5.63***

a/ Construction impacts are impacts associated with all areas within the construction workspace limits, temporary and permanent. Operation impacts are impacts associated with vegetation maintenance (10 feet in PEM and PSS wetlands and 30 feet in PFO wetlands). Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
Virginia									
Pittsylvania									
H-605 Pipeline									
S-F18-6	0.1	Trib. To Little Cherrystone Creek	Intermittent	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
H-650 Pipeline									
S-F18-65	0.4	Little Cherrystone Creek	Perennial	22	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-63	0.6	Trib. To Sandy Creek	Intermittent	14	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-18	1.1	Trib. To Cherrystone Creek	Perennial	5	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-56	1.4	Trib. To Cherrystone Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-18	1.7	Cherrystone Creek	Perennial	29	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-2	3.2	Trib. To Banister River	Intermittent	8	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-6	3.6	Trib. To Banister River	Intermittent	9	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-10	4.0	Trib. To Banister River	Intermittent	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-9	4.1	Trib. To Banister River	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-4	4.8	Trib. To Banister River	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-3	4.9	Banister River	Perennial	48	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-2	5.0	White Oak Creek	Perennial	33	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-2	5.1	White Oak Creek	Perennial	23	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-36	6.6	Trib. To White Oak Creek	Intermittent	5	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-7	7.0	Trib. To White Oak Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-6	7.0	Trib. To White Oak Creek	Intermittent	5	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-13	7.6	Trib. To White Oak Creek	Perennial	3	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-13	8.0	Trib. To White Oak Creek	Intermittent	9	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-16	8.5	Trib. To White Oak Creek	Intermittent	8	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-14	8.6	Trib. To White Oak Creek	Perennial	9	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
WB-E18-24	9.0	Trib. To White Oak Creek	Pond	23	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-15	9.9	Trib. To White Oak Creek	Perennial	3	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-17	9.9	White Oak Creek	Perennial	14	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-20	11.0	Trib. To Sandy Creek	Perennial	40	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-22	11.0	Trib. To Sandy Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	July 16 – April 14	N/A
S-F18-28	11.4	Trib. To Sandy Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	July 16 – April 14	N/A
S-F18-20	11.4	Trib. To Sandy Creek	Perennial	12	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-C18-85	11.6	Trib. To Sandy Creek	Perennial	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-C18-86	11.9	Trib. To Sandy Creek	Perennial	23	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-21	12.8	Sandy Creek	Perennial	15	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-27	13.4	Trib. To Sandy Creek	Perennial	11	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-22	14.3 RR	Trib. To Sandy Creek	Perennial	10	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-47	14.7	Trib. To Sandy Creek	Perennial	3	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-188	15.2	Trib. To Silver Creek	Perennial	5	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-37	15.7	Trib. To Silver Creek	Perennial	24	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-190	15.9	Trib. To Silver Creek	Intermittent	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-194	16.0	Trib. To Silver Creek	Perennial	7	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-195	16.2	Trib. To Silver Creek	Perennial	3	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-G18-10	16.2	Trib. To Silver Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	July 16 – April 14	N/A
S-C18-97	16.8	Trib. To Sandy River	Intermittent	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-B18-202	17.0	Trib. To Sandy River	Perennial	3	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-51	17.3	Trib. To Sandy River	Perennial	12	Intermediate	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-44	17.7 RR	Sandy River	Perennial	113	Major	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A19-292	17.8 RR	Trib. To Sandy River	Perennial	6	Minor	WWH	AL,R,W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-42	18.0	Trib. To Hardys Creek	Perennial	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-38	19.4	Trib. To Sandy River	Ephemeral	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-50	19.7	Trib. To Sandy River	Perennial	9	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-52	20.4	Trib. To Trayner Branch	Perennial	13	Intermediate	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-E18-54	20.6	Trib. To Trayner Branch	Perennial	6	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-34	21.0	Trayner Branch	Perennial	7	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-D18-40	21.2	Trib. To Trayner Branch	Perennial	5	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-C18-94	21.7	Trib. To Trotters Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	July 16 – April 14	N/A
WB-C18-93	21.9	Trib. To Trotters Creek	Pond	0	N/A	WWH	AL, R, FC, W	July 16 – April 14	N/A
S-A18-205	22.0	Trib. To Trotters Creek	Intermittent	19	Intermediate	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-203	22.1	Trib. To Trotters Creek	Intermittent	1	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A18-206	22.2	Trib. To Trotters Creek	Intermittent	9	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A19-315	22.5 RR	Trib. To Trotters Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-A19-317	22.7 RR	Trib. To Trotters Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-42	23.2 RR	Trib. To Trotters Creek	Ephemeral	6	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-40	23.2 RR	Trotters Creek	Perennial	25	Intermediate	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-38	23.6 RR	Trib. To Dan River	Perennial	8	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-F18-35	23.9 RR	Trib. To Dan River	Perennial	10	Minor	WWH	AL, R, FC, W	July 16 – April 14	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-E18-34	23.9	Trib. To Dan River	Intermittent	0	N/A	WWH	AL, R, FC, W, PWS	July 16 – April 14	N/A
S-F18-34	24.4	Trib. To Dan River	Ephemeral	7	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
AS-F18-33 / S-F18-33	24.8	Trib. To Dan River	Perennial	9	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-C18-89	25.1	Trib. To Dan River	Perennial	19	Intermediate	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-C18-90	25.7	Trib. To Dan River	Perennial	11	Intermediate	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
S-C18-92	25.9	Trib. To Dan River	Intermittent	7	Minor	WWH	AL, R, FC, W, PWS	July 16 – April 14	Open Cut - Dam and pump, Flume
North Carolina									
Rockingham									
S-B18-99	26.5	Trib. To Cascade Creek	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-42	27.3	Trib. To Cascade Creek	Intermittent	20	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-40	27.5	Cascade Creek	Perennial	108	Major	WWH	Class C	N/A	Conventional Bore
S-A19-273	27.5	Dry Creek	Perennial	29	Intermediate	WWH	Class C	N/A	Conventional Bore
S-A18-31	28.3 RR	Trib. To Dan River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-34	28.4 RR	Trib. To Dan River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-32	28.4 RR	Trib. To Dan River	Perennial	14	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-36	28.4 RR	Trib. To Dan River	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-37	28.6 RR	Trib. To Dan River	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-49	28.8	Trib. To Dan River	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-47	29.6	Trib. To Dan River	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-17	30.1	Dan River	Perennial	248	Major	WWH	Class C	N/A	HDD
S-B18-38	30.3	Trib. To Dan River	Ephemeral	3	Minor	WWH	Class C	N/A	HDD
S-B18-104	30.8	Trib. To Rock Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B19-153	30.9	Trib. To Rock Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-105	31.1	Trib. To Rock Creek	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-102	31.1	Trib. To Rock Creek	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-95	31.3	Rock Creek	Perennial	28	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-120	31.7	Trib. To Machine Creek	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-A18-143	31.9	Trib. To Machine Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-140	31.9	Trib. To Machine Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-144	32.0	Trib. To Machine Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-140	32.0	Trib. To Machine Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-147	32.2	Machine Creek	Perennial	20*	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-153	32.6	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-151	32.7	Town Creek	Perennial	55	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-A18-151	33.0	Town Creek	Perennial	48	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-154	33.0	Trib. To Town Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-154	33.0	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-154	33.0	Trib. To Town Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-220	33.3	Trib. To Town Creek	Ephemeral	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-221	33.3	Trib. To Town Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-52	33.4	Trib. To Town Creek	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-51	33.5	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-223	33.7	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-225	33.7	Trib. To Town Creek	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-49	33.9	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-38	34.2 RR	Trib. To Town Creek	Perennial	33	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-39	34.5	Trib. To Town Creek	Ephemeral	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-38	34.6	Trib. To Town Creek	Perennial	17	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-53	34.7	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-38	34.8	Trib. To Town Creek	Perennial	23	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-74	34.8	Trib. To Town Creek	Ephemeral	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-38	35.0	Trib. To Town Creek	Perennial	8	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-57	35.1	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-35	36.0	Trib. To Town Creek	Perennial	10	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-94	37.0	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-97	37.2	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-101	37.3	Trib. To Wolf Island Creek	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B19-157	37.6	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-B18-117	37.7	Trib. To Wolf Island Creek	Perennial	12	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-2	38.2	Trib. To Wolf Island Creek	Perennial	20	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-9	38.4	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-4	38.5	Trib. To Wolf Island Creek	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-4	38.5	Trib. To Wolf Island Creek	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-8	38.8	Wolf Island Creek	Perennial	53	Intermediate	WWH	Class C	N/A	Conventional Bore
S-A19-269	38.8	Trib. To Wolf Island Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-72	39.0	Trib. To Wolf Island Creek	Ephemeral	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-74	39.1	Trib. To Wolf Island Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-74	39.6	Trib. To Wolf Island Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-B18-108	40.2	Trib. To Lick Fork	Perennial	27	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-210	40.5 RR	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-210	40.5 RR	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-51	40.6	Trib. To Lick Fork	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-52	40.7	Trib. To Lick Fork	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-57	41.1	Trib. To Lick Fork	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-56	41.2	Lick Fork	Perennial	39	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-171	41.2	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-B18-44	41.6	Trib. To Lick Fork	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-B18-44	41.7	Trib. To Lick Fork	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-41	41.8	Trib. To Lick Fork	Perennial	20	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-89	42.3	Trib. To Jones Creek	Ephemeral	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-256	42.9	Trib. To Jones Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-92	43.1	Trib. To Jones Creek	Perennial	12	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-176	43.3	Jones Creek	Perennial	26	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-181	43.3	Trib. To Jones Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-80	43.7	Trib. To Jones Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-105	43.7	Trib. To Jones Creek	Perennial	53	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-25	44.1	Trib. To Jones Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-102	44.1	Trib. To Jones Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-228	44.5	Trib. To Jones Creek	Ephemeral	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-213	45.7	Trib. To Hogans Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-B18-71	45.7	Trib. To Hogans Creek	Perennial	23	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-68	45.8	Trib. To Hogans Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-345	46.1 RR	Trib. To Hogans Creek	Ephemeral	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-344	46.2 RR	Trib. To Hogans Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-231	46.4	Trib. To Hogans Creek	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-A18-235	46.5	Trib. To Hogans Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-234	46.5	Trib. To Hogans Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-76	47.0	Hogans Creek	Perennial	19	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-79	47.4	Trib. To Hogans Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-90	47.6	Trib. To Hogans Creek	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B19-167	47.7	Trib. To Hogans Creek	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-242	47.7	Trib. To Hogans Creek	Perennial	19	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-A18-60	48.7	Giles Creek	Perennial	4	Minor	WWH	Class C, WS-IV, NSW	N/A	Open Cut - Dam and pump, Flume
S-A18-55	49.3	Trib. To Giles Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-183	49.9 RR	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-185	49.9 RR	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-A18-182	49.9 RR	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-244	50.2 RR	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-289	50.7 RR	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A19-286	50.8 RR	Trib. To Haw River	Perennial	43*	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-285	51.2 RR	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-C18-22	51.3 RR	Trib. To Haw River	Ephemeral	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
WB-C18-19	51.4 RR	Trib. To Haw River	Pond	0	N/A	WWH	Class C	N/A	N/A
S-C18-21	51.4 RR	Trib. To Haw River	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-C18-15	52.2 RR	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-219	52.4 RR	Trib. To Haw River	Perennial	9	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
Alamance									
S-B18-94	52.7	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-84	53.7	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-87	53.7	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-89	54.0	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-C18-63	54.5	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-62	54.6	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-60	54.9	Trib. To Haw River	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-143	54.9	Trib. To Haw River	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-B18-142	54.9	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-61	54.9	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-68	55.3 RR	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-59	55.6 RR	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-65	56.4 RR	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-120	56.4 RR	Trib. To Haw River	Perennial	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
WB-A18-121	56.5	Trib. To Haw River	Pond	31	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-123	56.6 RR	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-129	56.6 RR	Trib. To Haw River	Ephemeral	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
WB-A18-128	56.7 RR	Trib. To Haw River	Pond	68	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-132	57.1	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-C18-2	57.9	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-11	58.7 RR	Trib. To Haw River	Perennial	31	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-C18-12	58.7 RR	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
AS-NHD-1549	59.6	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-30	60.7	Trib. To Haw River	Intermittent	16	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-28	60.8 RR	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-340	61.3	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-339	61.4	Trib. To Haw River	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-A18-78	61.8	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-70	62.5	Trib. To Haw River	Perennial	13	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-24	63.0 RR	Trib. To Stony Creek	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-14	63.2 RR	Trib. To Stony Creek	Ephemeral	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-113	63.3 RR	Trib. To Stony Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-12	63.4 RR	Trib. To Stony Creek	Perennial	18	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-15	63.5	Trib. To Stony Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-B18-16	63.6	Stony Creek Reservoir	Perennial	296	Major	WWH	Class C, WS-II, HQW, NSW, CA	N/A	HDD
S-B18-20	63.8	Trib. To Deep Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-331	64.1 RR	Deep Creek	Perennial	34	Intermediate	WWH	Class C, WS-II, HQW, NSW, CA	N/A	Conventional Bore
S-A19-351	64.4	Trib. To Deep Creek	Ephemeral	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-350	64.5	Trib. To Deep Creek	Perennial	13	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-319	65.0 RR	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-321	65.1 RR	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-324	65.2 RR	Trib. To Boyds Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-251	65.6	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-250	65.6	Trib. To Boyds Creek	Perennial	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-A19-353	66.5 RR	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-NHD-3025	66.8 RR	Trib. To Boyds Creek	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-A18-177	67.3 RR	Trib. To Boyds Creek	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-A18-180	67.3 RR	Trib. To Boyds Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-B18-80	67.3 RR	Trib. To Boyds Creek	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-233	67.6	Boyds Creek	Perennial	24	Intermediate	WWH	Class C, WS-V, NSW	N/A	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/
S-A19-335	67.9	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-336	68.1	Trib. To Boyds Creek	Intermittent	8	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-7	68.4	Trib. To Boyds Creek	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-NHD-1552	68.6	Trib. To Boyds Creek	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-8	68.8	Trib. To Haw River	Intermittent	12	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-11	68.9	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-15	69.2	Trib. To Haw River	Intermittent	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-B18-132	69.5	Trib. To Haw River	Perennial	8	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-70	69.7 RR	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-115	70.0 RR	Trib. To Haw River	Perennial	6	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-133	70.3	Trib. To Haw River	Perennial	11	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-82	70.4	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-C18-81	70.7	Trib. To Haw River	Perennial	24	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-109	70.9	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-108	71.0	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-107	71.0	Trib. To Haw River	Ephemeral	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-64	71.5	Trib. To Haw River	Perennial	26	Intermediate	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-65	71.6	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-68	71.8	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-A19-337 / S-A19-337	71.9	Trib. To Haw River	Ephemeral	4	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A19-338	72.0	Trib. To Haw River	Ephemeral	2	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
AS-NHD-1560	72.1	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-A18-207	72.2	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-B18-125	72.4	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B18-127	72.5	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	N/A	Open Cut - Dam and pump, Flume
S-B19-150	73.0 RR	Trib. To Back Creek	Perennial	0	N/A	WWH	Class C	N/A	N/A
Aboveground Facilities									
North Carolina									
Rockingham									
S-B18-38 - T-15 Dan River Interconnect	30.3	Trib. To Dan River	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
Access Roads									
Virginia									
Pittsylvania									

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S-D18-20 - TA-PI-005	2.2	Trib. To Cherrystone Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	N/A	N/A
S-F18-61 - TA-PI-035	14.3 RR	Trib. To Sandy Creek	Perennial	7	Minor	WWH	AL, R, FC, W	N/A	Bridge or Flume
S-F18-47 - TA-PI-043	17.2	Trib. To Sandy River	Intermittent	0	N/A	WWH	AL, R, FC, W	N/A	N/A
S-E18-41 - TA-PI-061	22.7 RR	Trib. To Trotters Creek	Ephemeral	0	N/A	WWH	AL, R, FC, W	N/A	N/A
S-E18-39 - TA-PI-061	22.6 RR	Trib. To Trotters Creek	Perennial	4	Minor	WWH	AL, R, FC, W	N/A	Bridge or Flume
S-E18-38 - TA-PI-061	22.6 RR	Trib. To Trotters Creek	Intermittent	0	N/A	WWH	AL, R, FC, W	N/A	N/A
S-E18-32 - TA-PI-063	24.0	Trib. To Dan River	Intermittent	4	Minor	WWH	AL, R, FC, W	N/A	Bridge or Flume
S-C18-88 - TA-PI-067	25.0	Trib. To Dan River	Intermittent	0	N/A	WWH	AL, R, FC, W	N/A	N/A
North Carolina									
Rockingham									
S-A18-23 - TA-RO-076	28.3 RR	Trib. To Dan River	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-27 - TA-RO-076	28.4 RR	Trib. To Dan River	Intermittent	1	Minor	WWH	Class C	N/A	Bridge or Flume
S-A18-19 - TA-RO-080	29.7	Trib. To Dan River	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-19 - TA-RO-080	29.8	Trib. To Dan River	Perennial	0	N/A	WWH	Class C	N/A	N/A
S-A18-1 - TA-RO-103	38.1	Trib. To Wolf Island Creek	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-B18-42 - TA-RO-113A	41.8	Trib. To Lick Fork	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-239 - TA-RO-129	46.7	Trib. To Hogans Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-A18-238 - TA-RO-129	46.7	Trib. To Hogans Creek	Intermittent	0	N/A	WWH	Class C	N/A	N/A
S-C18-71 - TA-RO-139	50.2 RR	Trib. To Haw River	Ephemeral	0	N/A	WWH	Class C	N/A	N/A
S-C18-15 - TA-RO-144A	52.2 RR	Trib. To Haw River	Intermittent	0	N/A	WWH	Class C	N/A	N/A
Alamance									
S-A18-215 - TA-AL-155	54.6	Trib. To Haw River	Perennial	11	Intermediate	WWH	Class C	N/A	Bridge or Flume
S-A18-216 - TA-AL-155	54.6	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	N/A	Bridge or Flume
S-B18-138 - TA-AL-172	63.7	Trib. To Stony Creek	Perennial	3	Minor	WWH	Class C	N/A	Bridge or Flume
S-B18-137 - TA-AL-172	63.7	Trib. To Stony Creek	Intermittent	2	Minor	WWH	Class C	N/A	Bridge or Flume
S-A19-308 - TA-AL-195	71.2	Trib. To Back Creek	Perennial	0	N/A	WWH	Class C	N/A	N/A

a/ Data is based on waterbody field delineations completed through August 24, 2019 where access has been obtained, National Hydrography Database (NHD), and desktop analysis of approximated resources. "S" indicates stream, "WB" indicates pond, "AS" indicates approximate stream or pond. Approximated streams are also indicated with "*".

b/ MP is closest milepost to waterbody. Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.

c/ Perennial: flowing throughout the year for all or most years, Intermittent: flowing water during certain times of the year, Ephemeral: flowing water only during short periods of the year. For delineated waterbodies, flow type in North Carolina was determined using the NCDWQ Stream Identification Form Version 4.11 and flow type in Virginia has been field estimated. For approximated waterbodies, flow type was estimated based on aerial imagery unless the approximated stream is directly associated with a delineated waterbody in which the approximated waterbody was assigned the same flow type as the associated delineated waterbody.

d/ Crossing width is the intersection of the waterbody and the centerline of the pipeline or access road (unless followed by "*" which indicates the stream width for a parallel pipeline crossing). For approximated streams, the crossing width was measure using aerial imagery if wide enough to discern, and defaulted to 5 feet if too narrow to be measured using aerial imagery. If the crossing width is "0", the waterbody is not crossed by the centerline.

e/ FERC Classification from the 2013 FERC Procedures. Minor (<10 feet); Intermediate (>10 - <100 feet); Major (>100 feet).

f/ WWH - Warm Water Habitat.

g/ Virginia Water Quality Designations (VADEQ, 2016b). North Carolina Water Quality Classifications (NCDEQ, 2018d). In Virginia AL = Aquatic Life, R = Recreation, W = Wildlife, FC = Fish Consumption, PWS = PUBLIC Water Source. In North Carolina WS-II = Water Supply II, WA-IV = Water Supply IV, WS-V = Water Supply V, HQW = High Quality Waters, NSW = Nutrient Sensitive Waters.

REVISED [Oct 2019] - Appendix 2A

Waterbodies Crossed by MVP Southgate Project

Facility / State / County / Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designation g/	Construction Timing Windows h/	Crossing Method i/

h/ Construction timing windows are dependent on state permit approval conditions. Mountain Valley intends to adhere to the Virginia Department of Game and Inland Fisheries (VDGIF) warmwater fishery restrictions (April 15-July 15). Based on consultation with North Carolina Wildlife Resource Commission, no timing restrictions are required for warmwater fisheries crossed in North Carolina. Mountain Valley has requested an alternative measure from FERC's Procedures (Section V.B.1.b.) in the MVP Procedures. Construction timing windows for mussels may be applicable depending on final consultation with the applicable agencies.

i/ HDD: Horizontal Directional Drill. Conventional Crossing will only be used when there is no discernable flow within the waterbody at the time of crossing. Dry Crossing will consist of either Flume, Dam and Pump, or Cofferdam. N/A indicates that the waterbody is not crossed by centerline.

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
Virginia						
Pittsylvania						
H-605 Pipeline						
W-F18-7	PEM	0.1	11	<0.01	<0.01	Open-cut
H-650 Pipeline						
W-F18-11	PFO	0.2	57	0.12	0.04	Open-cut
W-F18-66	PEM	0.4	356	0.48	0.08	Open-cut
W-F18-66	PFO	0.4	0	0.14	0.00	Workspace Only
W-F18-64	PEM	0.6	225	0.36	0.05	Open-cut
W-G18-2	PEM	1.0	13	0.04	<0.01	Open-cut
W-G18-2	PFO	1.0	0	<0.01	<0.01	Workspace Only
W-F18-57	PEM	1.1	0	<0.01	0.00	Workspace Only
W-F18-57	PEM	1.1	0	<0.01	0.00	Workspace Only
W-F18-5	PFO	1.4	156	0.16	0.10	Open-cut
W-F18-5	PEM	1.4	0	0.01	<0.01	Workspace Only
W-F18-5	PFO	1.4	11	0.01	<0.01	Open-cut
W-F18-5	PFO	1.4	255	0.39	0.16	Open-cut
W-F18-5	PEM	1.6	770	1.25	0.18	Open-cut
W-F18-5	PSS	1.5	0	0.14	0.00	Workspace Only
W-F18-5	PEM	1.7	55	0.07	0.01	Open-cut
W-F18-5	PSS	1.8	362	0.45	0.08	Open-cut
W-F18-5	PEM	2.1	1,470	2.90	0.34	Open-cut
W-F18-5	PFO	1.9	290	0.34	0.20	Open-cut
W-D18-5	PFO	3.6	44	0.07	0.02	Open-cut

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-D18-5	PFO	3.6	2	<0.01	<0.01	Open-cut
W-D18-11	PFO	4.0	0	<0.01	0.00	Workspace Only
W-D18-11	PFO	4.0	5	<0.01	<0.01	Open-cut
W-D18-7	PFO	4.9	373	0.46	0.25	Open-cut
W-D18-7	PEM	4.9	9	0.20	0.01	Open-cut
W-D18-1	PFO	5.0	14	0.02	<0.01	Open-cut
W-D18-1	PFO	5.0	123	0.18	0.07	Open-cut
W-D18-1	PFO	5.1	87	0.15	0.05	Open-cut
W-D18-1	PFO	5.2	309	0.51	0.21	Open-cut
W-D18-1	PFO	5.2	0	0.06	0.00	Workspace Only
W-D18-1	PFO	5.2	113	0.31	0.08	Open-cut
W-D18-1	PFO	5.2	10	0.00	0.00	Conventional Bore
W-D18-10	PFO	6.5	0	0.01	0.00	Workspace Only
W-D18-10	PEM	6.6	0	0.14	<0.01	Workspace Only
W-D18-10	PFO	6.6	53	0.10	0.04	Open-cut
W-D18-8	PEM	7.0	0	<0.01	0.00	Workspace Only
W-D18-8	PEM	7.0	0	<0.01	0.00	Workspace Only
W-D18-14	PEM	7.6	0	<0.01	0.00	Workspace Only
W-D18-14	PFO	7.6	0	<0.01	0.00	Workspace Only
W-F18-14	PEM	8.0	0	<0.01	0.00	Workspace Only
W-F18-14	PEM	8.0	0	<0.01	0.00	Workspace Only
W-F18-14	PFO	8.0	3	0.01	<0.01	Open-cut
W-F18-14	PEM	8.0	0	0.01	<0.01	Workspace Only
W-F18-14	PFO	8.0	5	<0.01	<0.01	Open-cut

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-E18-17	PEM	8.4	98	0.16	0.02	Open-cut
W-E18-13	PFO	8.5	94	0.15	0.05	Open-cut
W-E18-13	PEM	8.5	0	0.02	0.00	Workspace Only
W-E18-13	PFO	8.6	32	0.05	0.01	Open-cut
W-E18-13	PEM	8.6	0	0.01	0.00	Workspace Only
W-E18-13	PFO	8.6	47	0.07	0.03	Open-cut
W-E18-13	PEM	8.6	0	0.01	0.00	Workspace Only
W-E18-24	PFO	9.0	0	0.01	<0.01	Workspace Only
W-E18-24	PEM	9.1	0	0.09	0.00	Workspace Only
W-F18-58	PFO	9.7	393	0.46	0.24	Open-cut
W-F18-16	PFO	9.9	27	0.05	0.01	Open-cut
W-F18-18	PFO	9.9	0	0.01	<0.01	Workspace Only
W-F18-18	PFO	9.9	0	<0.01	0.00	Workspace Only
W-F18-18	PFO	9.9	40	0.06	0.03	Open-cut
W-E18-23	PEM	10.1	0	<0.01	0.00	Workspace Only
W-E18-23	PFO	10.1	4	0.01	<0.01	Open-cut
W-F18-24	PFO	11.0	0	0.03	0.00	Workspace Only
W-F18-21	PFO	11.0	0	<0.01	0.00	Workspace Only
W-F18-21	PFO	11.1	0	<0.01	0.00	Workspace Only
W-F18-29	PFO	11.4	0	0.01	0.00	Workspace Only
W-F18-27	PFO	11.4	0	<0.01	<0.01	Workspace Only
W-C18-84	PFO	11.6	29	0.06	0.01	Open-cut
W-C18-84	PFO	11.6	20	0.02	<0.01	Open-cut
W-F18-53	PFO	12.8	8	<0.01	<0.01	Open-cut

REVISED [Oct 2019] - Appendix 2B

Wetlands Crossed by the MVP Southgate Project

Facility / State / County / Wetland ID a/	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-F18-53	PFO	12.8	0	<0.01	0.00	Workspace Only
W-F18-53	PFO	12.8	6	<0.01	<0.01	Open-cut
W-F18-53	PFO	12.8	0	<0.01	0.00	Workspace Only
W-E18-28	PFO	13.4	64	0.11	0.03	Open-cut
W-E18-28	PFO	13.4	0	<0.01	0.00	Workspace Only
W-E18-28	PFO	13.5 RR	26	0.06	0.02	Open-cut
W-E18-28	PFO	13.5 RR	23	0.04	0.02	Open-cut
W-D18-23	PFO	14.3 RR	61	0.11	0.04	Open-cut
W-E18-45	PEM	14.7	0	<0.01	0.00	Workspace Only
W-E18-45	PEM	14.7	0	<0.01	0.00	Workspace Only
W-E18-45	PEM	14.7	3	<0.01	<0.01	Open-cut
W-E18-45	PEM	14.7	0	<0.01	0.00	Workspace Only
W-A18-198	PEM	16.2	39	0.03	0.01	Open-cut
W-A18-198	PFO	16.2	0	<0.01	0.00	Workspace Only
W-A18-200	PSS	16.7	0	0.05	0.00	Workspace Only
W-A18-201	PEM	16.7	0	0.02	0.00	Workspace Only
W-A18-201	PEM	16.8	0	0.02	<0.01	Workspace Only
W-A19-296	PFO	17.7 RR	34	0.16	0.02	Open-cut
W-E18-43	PEM	18.0	0	0.01	0.00	Workspace Only
W-E18-43	PFO	18.0	0	<0.01	0.00	Workspace Only
W-E18-43	PFO	18.0	0	<0.01	0.00	Workspace Only
W-D18-42	PEM	19.4	0	0.03	0.00	Workspace Only
W-F18-51	PFO	19.7	0	<0.01	0.00	Workspace Only
W-E18-53	PEM	20.4	0	0.04	0.00	Workspace Only

REVISED [Oct 2019] - Appendix 2B

Wetlands Crossed by the MVP Southgate Project

Facility / State / County / Wetland ID a/	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-E18-53	PEM	20.4	0	<0.01	0.00	Workspace Only
W-E18-53	PEM	20.4	0	<0.01	0.00	Workspace Only
W-E18-53	PEM	20.4	0	<0.01	0.00	Workspace Only
W-E18-53	PEM	20.4	6	<0.01	<0.01	Open-cut
W-E18-53	PEM	20.4	0	<0.01	0.00	Workspace Only
W-E18-53	PEM	20.4	3	<0.01	<0.01	Open-cut
W-E18-55	PEM	20.6	0	<0.01	0.00	Workspace Only
W-E18-55	PEM	20.6	3	<0.01	<0.01	Open-cut
W-D18-35	PFO	21.0	54	0.08	0.04	Open-cut
W-D18-35	PEM	21.0	0	0.04	0.00	Workspace Only
W-D18-41	PEM	21.2	47	0.09	0.01	Open-cut
W-D18-41	PFO	21.2	7	0.01	<0.01	Open-cut
W-D18-41	PFO	21.2	75	0.09	0.04	Open-cut
W-D18-41	PEM	21.3	8	0.09	0.02	Open-cut
W-C18-95	PEM	21.7	0	0.03	0.00	Workspace Only
W-A18-204	PFO	22.0	0	<0.01	0.00	Workspace Only
W-A18-204	PFO	22.0	2	0.02	<0.01	Open-cut
W-A18-204	PFO	22.0	40	0.10	0.03	Open-cut
W-A18-204	PEM	22.1	0	0.02	0.00	Workspace Only
W-A18-204	PEM	22.1	0	0.01	0.00	Workspace Only
W-A18-204	PFO	22.1	18	0.02	0.01	Open-cut
W-A19-316	PFO	22.5 RR	0	<0.01	0.00	Workspace Only
W-A19-318	PFO	23.1 RR	20	0.03	0.01	Open-cut
W-A19-314	PFO	23.8 RR	0	<0.01	0.00	Workspace Only

REVISED [Oct 2019] - Appendix 2B

Wetlands Crossed by the MVP Southgate Project

Facility / State / County / Wetland ID a/	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-E18-33	PFO	23.9	0	<0.01	0.00	Workspace Only
W-E18-33	PFO	23.9	0	0.01	0.00	Workspace Only
W-A19-297	PEM	24.6	0	0.01	0.00	Workspace Only
W-C18-91	PFO	25.9	18	0.04	0.01	Open-cut
W-C18-91	PFO	25.8	3	<0.01	0.00	Open-cut
W-C18-96	PEM	26.1	0	0.03	<0.01	Workspace Only
W-C18-96	PFO	26.1	97	0.08	0.05	Open-cut
		Virginia Subtotal	**6,630**	**11.85**	**2.76**	
North Carolina						
Rockingham						
W-C18-96	PFO	26.1	0	<0.01	<0.01	Workspace Only
W-B18-98	PFO	26.5	15	0.03	0.01	Open-cut
W-A18-22	PEM	26.7 RR	72	0.15	0.02	Open-cut
W-A18-44	PEM	27.0 RR	0	<0.01	0.00	Workspace Only
W-A18-44	PEM	27.1	1,197	3.07	0.27	Open-cut
W-A18-44	PFO	27.3	38	0.05	0.01	Open-cut
W-A19-274	PEM	27.6	42	0.19	0.01	Open-cut
W-A19-274	PEM	27.6	38	0.04	0.01	Open-cut
W-A19-274	PEM	27.6	0	0.17	0.00	Workspace Only
W-A18-39	PEM	28.0 RR	0	0.02	0.00	Workspace Only
W-A18-26	PEM	28.1 RR	24	0.06	0.01	Open-cut
W-A18-30	PEM	28.3 RR	26	0.03	0.01	Open-cut
W-A18-30	PFO	28.3 RR	18	0.01	0.01	Open-cut
W-A18-38	PEM	28.6 RR	0	0.02	<0.01	Workspace Only

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-A18-38	PFO	28.6 RR	41	0.04	0.03	Open-cut
W-B18-48	PFO	29.1	23	0.05	0.02	Open-cut
W-B18-48	PEM	29.1	0	0.01	<0.01	Workspace Only
W-A18-18	PFO	29.8	935	2.33	0.64	Open-cut
W-A18-18	PEM	29.9	50	0.07	0.01	Open-cut
W-B18-39	PEM	30.2	25	<0.01	0.00	HDD
W-B18-39	PEM	30.2	40	<0.01	0.00	HDD
W-B18-39	PEM	30.2	30	<0.01	0.00	HDD
W-B18-39	PEM	30.2	32	<0.01	0.00	HDD
W-B18-36	PEM	30.2	36	<0.01	0.00	HDD
W-B18-36	PEM	30.3	16	<0.01	0.00	HDD
W-B18-36	PFO	30.3	32	<0.01	0.00	HDD
W-B18-36	PEM	30.3	18	<0.01	0.00	HDD
W-B18-36	PEM	30.4	0	0.00	0.00	HDD
W-B18-36	PEM	30.4	27	0.03	0.01	Open-cut
W-B18-36	PEM	30.4	0	<0.01	0.00	Workspace Only
W-B18-36	PFO	30.3	0	0.01	0.00	Workspace Only
W-B18-36	PFO	30.4	0	<0.01	0.00	Workspace Only
W-B18-36	PFO	30.4	0	0.01	0.00	Workspace Only
W-B18-34	PFO	30.4	0	0.01	0.00	Workspace Only
W-B18-34	PFO	30.5	180	0.45	0.12	Open-cut
W-A18-54	PEM	30.7	11	0.01	<0.01	Open-cut
W-B18-103	PEM	31.1	0	<0.01	0.00	Workspace Only
W-A18-141	PFO	32.0	183	0.34	0.13	Open-cut

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-A18-141	PEM	32.0	0	0.02	0.00	Workspace Only
W-A18-149	PSS	32.2	51	0.07	0.01	Open-cut
W-A18-149	PEM	32.2	52	0.16	0.01	Open-cut
W-A18-152	PEM	32.6	21	0.06	0.01	Open-cut
W-A18-152	PFO	32.6	29	0.03	0.02	Open-cut
W-A18-155	PEM	33.1	0	0.06	0.00	Workspace Only
W-A18-155	PSS	33.1	0	<0.01	0.00	Workspace Only
W-A18-155	PSS	33.1	68	0.16	0.02	Open-cut
W-A18-222	PFO	33.4	43	0.08	0.03	Open-cut
W-A18-222	PEM	33.4	0	<0.01	0.00	Workspace Only
W-A18-224	PFO	33.7	10	0.02	0.01	Open-cut
W-A18-224	PEM	33.7	0	<0.01	0.00	Workspace Only
W-C18-40	PEM	34.6	0	<0.01	0.00	Workspace Only
W-A18-95	PEM	37.0	8	0.02	<0.01	Open-cut
W-A18-98	PFO	37.2	0	0.01	0.00	Workspace Only
W-S18-1	PFO	37.3	8	0.01	0.01	Open-cut
W-A18-6	PFO	38.5	130	0.15	0.08	Open-cut
W-A18-6	PFO	38.5	0	<0.01	0.00	Workspace Only
W-A18-6	PFO	38.5	92	0.09	0.06	Open-cut
W-A18-6	PEM	38.5	46	0.09	0.01	Open-cut
W-A18-7	PFO	38.6	0	<0.01	0.00	Workspace Only
W-A18-7	PEM	38.6	76	0.18	0.02	Open-cut
W-A18-7	PSS	38.6	34	0.08	0.01	Open-cut
W-A18-7	PEM	38.6	0	<0.01	0.00	Workspace Only

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-A18-7	PEM	38.7	17	0.05	<0.01	Open-cut
W-A18-7	PEM	38.7	28	0.07	0.01	Open-cut
W-A18-7	PEM	38.7	16	0.04	<0.01	Open-cut
W-A19-270	PFO	38.8	0	0.02	<0.01	Workspace Only
W-B18-78	PFO	39.7	56	0.06	0.03	Open-cut
W-B18-112	PEM	40.1	0	0.01	0.00	Workspace Only
W-B18-110	PFO	40.2	0	0.02	0.01	Workspace Only
W-B18-55	PEM	41.1	0	<0.01	0.00	Workspace Only
W-B18-55	PFO	41.1	84	0.13	0.06	Open-cut
W-B18-46	PFO	41.7	6	0.02	0.01	Open-cut
W-A19-346	PEM	46.1 RR	0	<0.01	0.00	Workspace Only
W-A19-343	PFO	46.2 RR	0	0.02	<0.01	Workspace Only
W-C18-77	PFO	46.0	46	0.08	0.03	Open-cut
W-B18-139	PFO	48.5	24	0.03	0.02	Open-cut
W-A18-62	PSS	48.6	40	0.11	0.01	Open-cut
W-A18-62	PSS	48.6	0	<0.01	0.00	Workspace Only
W-A18-61	PEM	48.7	1	0.01	<0.01	Open-cut
W-A18-184	PEM	49.9 RR	0	0.01	0.00	Workspace Only
W-A18-184	PEM	49.9 RR	0	0.01	0.00	Workspace Only
W-A18-184	PFO	49.9 RR	39	0.06	0.03	Open-cut
W-A19-284	PSS	51.2 RR	0	0.01	0.00	Workspace Only
W-C18-20	PFO	51.4 RR	19	0.02	0.01	Open-cut
W-C18-20	PFO	51.4 RR	135	0.21	0.09	Open-cut
W-C18-20	PEM	51.4 RR	0	<0.01	0.00	Workspace Only

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
		Rockingham County Subtotal	**4,328**	**9.52**	**1.92**	
Alamance						
W-A18-83	PEM	53.3	26	0.06	0.01	Open-cut
W-A18-85	PEM	53.6	9	0.03	<0.01	Open-cut
W-A18-85	PSS	53.7	0	0.04	0.00	Workspace Only
W-A18-85	PEM	53.7	0	<0.01	0.00	Workspace Only
W-C18-67	PFO	54.3	103	0.26	0.07	Open-cut
W-B18-60	PSS	55.6 RR	0	0.02	0.00	Workspace Only
W-B18-60	PSS	55.6 RR	0	0.01	0.00	Workspace Only
W-B18-61	PEM	55.5	39	0.06	0.01	Open-cut
W-A18-119	PFO	56.4 RR	90	0.12	0.06	Open-cut
W-A18-119	PEM	56.4 RR	0	0.02	0.00	Workspace Only
W-A18-119	PFO	56.5	63	0.09	0.05	Open-cut
W-A18-119	PEM	56.5	0	0.02	0.00	Workspace Only
W-A18-119	PFO	56.6 RR	0	0.01	0.00	Workspace Only
W-A18-119	PFO	56.6 RR	77	0.16	0.06	Open-cut
W-A18-127	PFO	56.6 RR	128	0.14	0.07	Open-cut
W-A18-127	PFO	56.7 RR	0	0.02	0.00	Workspace Only
W-A18-130	PEM	56.8	0	0.01	0.00	Workspace Only
W-A18-130	PFO	56.9	17	0.09	0.03	Open-cut
W-A18-133	PFO	57.1	56	0.10	0.04	Open-cut
W-A18-133	PEM	57.1	0	0.02	0.00	Workspace Only
W-A18-133	PEM	57.1	0	0.01	0.00	Workspace Only
W-A18-135	PFO	57.2	146	0.20	0.10	Open-cut

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
W-A18-135	PEM	57.2	0	0.02	0.00	Workspace Only
W-A18-254	PFO	57.6	154	0.22	0.10	Open-cut
W-C18-3	PEM	57.8	13	0.04	<0.01	Open-cut
W-C18-3	PFO	57.9	0	0.00	0.00	Workspace Only
W-C18-3	PEM	57.9	13	0.02	<0.01	Open-cut
W-C18-3	PFO	57.9	8	0.01	0.01	Open-cut
W-C18-5	PSS	58.0	52	0.07	0.01	Open-cut
W-C18-5	PEM	58.0	0	0.03	<0.01	Workspace Only
W-C18-29	PFO	60.7	116	0.20	0.07	Open-cut
W-C18-29	PFO	60.8 RR	33	0.07	0.02	Open-cut
W-A18-79	PFO	61.8	0	<0.01	0.00	Workspace Only
W-A18-74	PFO	62.5	8	0.01	0.01	Open-cut
W-A18-80	PEM	62.7	64	0.09	0.01	Open-cut
W-B18-32	PEM	62.9	0	<0.01	0.00	Workspace Only
W-A19-348	PFO	63.0 RR	24	0.02	0.02	Open-cut
W-B18-19	PFO	63.8	63	0.11	0.04	Open-cut
W-A19-332	PFO	64.1 RR	49	0.08	0.02	Conventional Bore
W-A19-320	PEM	65.0 RR	69	0.10	0.02	Open-cut
W-A19-326	PFO	65.2 RR	6	0.02	0.01	Open-cut
W-B19-168	PEM	65.6	0	0.05	0.00	Workspace Only
W-A19-352	PFO	66.5 RR	0	<0.01	0.00	Workspace Only
*AW-A19-352	PFO	66.5 RR	0	0.04	0.00	Workspace Only
W-B19-164	PFO	66.6 RR	34	0.04	0.02	Open-cut
W-B18-5	PFO	68.4	16	0.02	0.01	Open-cut

REVISED [Oct 2019] - Appendix 2B

Wetlands Crossed by the MVP Southgate Project

Facility / State / County / Wetland ID a/	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-A18-67	PFO	71.8	0	<0.01	0.00	Workspace Only
W-A18-67	PFO	71.8	43	0.04	0.03	Open-cut
W-A18-208	PEM	72.2	0	<0.01	0.00	Workspace Only
W-B19-151	PEM	72.9 RR	258	0.56	0.06	Open-cut
W-A18-111	PEM	73.0 RR	0	0.04	0.00	Workspace Only
W-B19-151	PEM	73.0 RR	45	0.04	0.01	Open-cut
Alamance County Subtotal			**1,822**	**3.42**	**0.95**	
North Carolina Subtotal			**6,150**	**12.94**	**2.87**	
Pipeline Subtotal			**12,780**	**24.79**	**5.63**	
Aboveground Facilities						
Virginia						
Pittsylvania						
None						
North Carolina						
Rockingham						
W-B18-36 - T-15 Dan River Interconnect	PEM	30.3	0	0.47	0.00	Workspace Only
*AW-B18-36 - T-15 Dan River Interconnect	PEM	30.3	0	<0.01	0.00	Workspace Only
W-B18-36 - T-15 Dan River Interconnect	PEM	30.3	0	<0.01	0.00	Workspace Only
W-B18-36 - T-15 Dan River Interconnect	PEM	30.4	0	0.05	0.00	Workspace Only
W-B18-36 - T-15 Dan River Interconnect	PEM	30.4	0	0.01	0.00	Workspace Only
W-B18-36 - T-15 Dan River Interconnect	PEM	30.4	0	<0.01	0.00	Workspace Only
Aboveground Facilities Subtotal			**0**	**0.54**	**0.00**	
Cathodic Protection Groundbeds						

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
			0	**0.00**	**0.00**	
Temporary Access Roads g/						
Virginia						
Pittsylvania						
W-F18-1 - TA-PI-011	PSS	5.2	110	0.05	0.00	Workspace Only
W-F18-62 - TA-PI-035	PEM	14.3 RR	1	<0.01	0.00	Workspace Only
W-F18-62 - TA-PI-035	PEM	14.3 RR	16	0.01	0.00	Workspace Only
W-F18-54 - TA-PI-052	PEM	20.5	0	<0.01	0.00	Workspace Only
W-E18-37 - TA-PI-061	PFO	22.6 RR	0	<0.01	0.00	Workspace Only
W-E18-37 - TA-PI-061	PFO	22.6 RR	0	<0.01	0.00	Workspace Only
W-C18-87 - TA-PI-067	PFO	25.0	106	0.08	0.00	Workspace Only
W-C18-87 - TA-PI-067	PFO	25.0	0	<0.01	0.00	Workspace Only
Virginia Access Roads Subtotal			**233**	**0.15**	**0.00**	
North Carolina						
Rockingham						
W-A18-39 - TA-RO-075	PEM	28.1 RR	0	<0.01	0.00	Workspace Only
W-B18-34 - TA-RO-083	PFO	30.4	82	0.04	0.00	Workspace Only
W-B18-36 - TA-RO-083	PFO	30.4	0	<0.01	0.00	Workspace Only
W-A18-39 - TA-RO-075	PEM	27.9 RR	14	0.01	0.00	Workspace Only
W-B18-43 - TA-RO-113A	PEM	41.8	0	<0.01	0.00	Workspace Only
W-B18-43 - TA-RO-113A	PEM	41.8	0	0.01	0.00	Workspace Only
Alamance						
None						
North Carolina Access Roads Subtotal			**96**	**0.06**	**0.00**	

REVISED [Oct 2019] - Appendix 2B Wetlands Crossed by the MVP Southgate Project						
Facility / State / County / Wetland ID a/	**Wetland Type b/**	**Approx. MP**	**Crossing Length (feet) c/**	**Total Construction Impacts (acres) d/**	**Total Operation Impacts (acres) e/**	**Construction Crossing Method f/**
Temporary Access Roads Subtotal			**328**	**0.21**	**0.00**	
Permanent Access Roads g/						
North Carolina						
Rockingham						
W-A19-280 - PA-RO-000	PEM	28.7	0	0.00	0.00	Use existing gravel road
W-A19-280 - PA-RO-000	PEM	28.7	0	0.00	0.00	Use existing gravel road
W-B18-34 - PA-RO-082	PFO	30.5	0	0.00	0.00	Use existing gravel road
Permanent Access Roads Subtotal h/			**0**	**0.00**	**0.00**	
Project Wetlands Total			**13,108**	**25.55**	**5.63**	

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.
a/ Data is based on wetland field delineations completed through August 24, 2019 where access has been obtained, National Wetland Inventory (NWI) data, and desktop analysis of approximated resources. Wetland IDs starting with "W" have been field delineated and wetland ID starting with "AW" are approximated based on NWI data and desktop analysis. Approximated wetlands are also indicated by "*". Environmental survey is complete for the Contractor Yards (i.e., CY-01, CY-03, CY-05, CY-08, CY-19, CY-22, CY-25A, CY-25B, CY-26A, CY-26B). Limits of disturbance for contractor yards have been adjusted to avoid impacting wetlands.
b/ Wetland Classifications PEM = palustrine emergent wetland, PSS = palustrine scrub shrub wetland, PFO = palustrine forested wetland.
c/ Crossing length is measured at the intersection of the wetland and centerline of the pipeline or center of the access road. Crossing length of "0" indicates the wetland is not crossed by the centerline of the pipeline, but is located within the construction workspace. Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.
d/ Total construction impacts include all wetland impacts (PEM, PFO, PSS) associated with the construction workspace. Wetland impacts of "<0.01" indicates the impact is less than 0.01 acre, but the impact is included in the project totals. Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.
e/ Total operation vegetation impacts include PEM, PSS and PFO impacts for vegetation maintenance. Operational vegetation impacts for PEM and PSS wetlands include a 10-foot-wide vegetation maintenance corridor; operational vegetation maintenance impacts for PFO wetlands include a 30-foot-wide vegetation maintenance corridor (i.e., 10-foot-wide cleared corridor and selective removal of trees within 15 feet of the pipeline). Wetland impacts of "<0.01" indicates the impact is less than 0.01 acre, but the impact is included in the project totals. Minor discrepancies in totals are due to rounding.
f/ Construction crossing method will ultimately be determined based on field conditions observed during construction. "Workspace Only" indicates that the wetland is not crossed by the pipeline but is located within construction workspace.
g/ The Project will not import fill into wetlands to improve temporary or permanent access roads.

REVISED [Oct 2019] - Appendix 2-F ATWS Within 50 feet of Wetland or Waterbody							
ATWS ID	**Milepost**	**Within 50 feet of a Wetland**	**Within 50 feet of a Waterbody**	**Feature ID**	**Distance from Resource Area (feet) a/**	**Justification**	**Variance Required (Y/N)**
Virginia, Pittsylvania County							
1052	5.2	X		W-D18-1	0	ATWS situated in this location to support conventional bore and associated equipment.	Y
1088B	9.8	X		W-F18-58	47	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland crossing and point of intersect.	N
1136C	17.7 RR		X	S-A19-295	1	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.	Y
			X	S-E18-44	49		
		X		W-A19-296	0		
1173D	22.7 RR		X	S-A19-317	0	ATWS situated in this location for storage of material, pumps, mats, pipe for stream crossing.	Y
North Carolina, Rockingham County							
1213	27.0 RR	X		W-A18-44	0	This ATWS is in an agriculture field and will be used for pipeline crossing.	N
1213A	27.0 RR	X		W-A18-44	6	This ATWS is in an agriculture field and will be used for pipeline crossing.	N
1213D	27.3	X		W-A18-44	0	ATWS in this location to be used for support during stream crossing	Y
1222	27.6	X		W-A19-274	0	ATWS in this location to be used for support during stream crossing.	Y

REVISED [Oct 2019] - Appendix 2-F ATWS Within 50 feet of Wetland or Waterbody							
ATWS ID	**Milepost**	**Within 50 feet of a Wetland**	**Within 50 feet of a Waterbody**	**Feature ID**	**Distance from Resource Area (feet) a/**	**Justification**	**Variance Required (Y/N)**
1244	29.9	X		W-A18-18	0	ATWS situated in this location to support HDD and associated equipment.	Y
1244A	29.9	X		W-A18-18	2	ATWS situated in this location to support HDD and associated equipment	Y
1251A	30.3	X		W-B18-34	0	Staging of mats / equipment needed to perform foreign line crossings, then used for as needed for parking, materials, pipe, and equipment to support Dan River HDD, and also to support connection point between spreads.	N
				W-B18-36	0		
1249	30.4	X	X	S-B18-38	0	ATWS situated in this location to support HDD and associated equipment	Y
				W-B18-34	0	ATWS situated in this location to support HDD and associated equipment	Y
				AW-B18-36 / W-B18-36	0	ATWS situated in this location to support HDD and associated equipment// hydrostatic testing equipment.	Y
1250	30.5	X		W-B18-34	0	ATWS situated in this location to support conventional bore and associated equipment.	Y
1251	30.4	X		W-B18-36	0	ATWS situated in this location to support HDD and associated equipment.	Y

REVISED [Oct 2019] - Appendix 2-F ATWS Within 50 feet of Wetland or Waterbody							
ATWS ID	**Milepost**	**Within 50 feet of a Wetland**	**Within 50 feet of a Waterbody**	**Feature ID**	**Distance from Resource Area (feet) a/**	**Justification**	**Variance Required (Y/N)**
1368	41.5		X	S-B18-44	15	ATWS situated in this location to support conventional bore and associated equipment.	Y
1396	43.8		X	S-A18-106	41	ATWS to be reduced, to be provided in Implementation Plan	N
North Carolina, Alamance County							
1577D	63.4 RR		X	S-B18-12	49	ATWS to be reduced, to be provided in Implementation Plan	N
1581A	63.4 RR		X	S-B18-12	46	ATWS to be reduced, to be provided in Implementation Plan	N
1588A	64.4		X	S-A19-350	35	ATWS to be moved, to be provided in Implementation Plan	N
1588A	64.4		X	S-A19-351	0	ATWS to be moved, to be provided in Implementation Plan	N
1588B	64.5		X	S-A19-350	27	ATWS to be moved, to be provided in Implementation Plan	N
1653G	69.7 RR		X	S-C18-70	0	ATWS required in this location to facilitate storage of materials and equipment for stream crossing in a congested area.	Y
1681	71.9		X	AS-A19-337	44	ATWS to be reduced, to be provided in Implementation Plan	N
1692A	73.0 RR	X		W-A18-111	0	ATWS situated in this location to support conventional bore and associated equipment.	Y

REVISED [Oct 2019] - Appendix 2-F ATWS Within 50 feet of Wetland or Waterbody							
ATWS ID	Milepost	Within 50 feet of a Wetland	Within 50 feet of a Waterbody	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)
1692	73.1RR	X	X	AS-B18-58 / SB18-58	43	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area	Y
				S-B19-150	0	ATWS situated in this location to support conventional bore and associated equipment / hydrostatic test support equipment.	Y
				W-B19-151	0	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area.	Y

Note: Mileposts with an "RR" indicate locations where a re-route was incorporated into the pipeline alignment.
a/ Distance from resource area of 0 feet indicate the wetland or waterbody is located within the ATWS.

REVISED [Oct 2019] - Table

Waterbodies with a Virginia PWS Designation Crossed by the MVP Southgate Project

Impact ID	Milepost	Waterbody Name	Waterbody Type	Latitude	Longitude
S-E18-52	20.4	Tributary to Trayner Branch	Perennial	36.60595	-79.5681
S-E18-54	20.6	Tributary to Trayner Branch	Perennial	36.60326	-79.5704
S-D18-34	21.0	Trayner Branch	Perennial	36.5989	-79.5742
S-D18-40	21.2	Tributary to Trayner Branch	Perennial	36.59583	-79.5771
S-A18-205	22.0	Tributary to Trotters Creek	Intermittent	36.58751	-79.5862
S-A18-203	22.1	Tributary to Trotters Creek	Intermittent	36.58684	-79.5869
S-A18-206	22.2	Tributary to Trotters Creek	Intermittent	36.58562	-79.5882
S-F18-40	23.2 RR	Trotters Creek	Perennial	36.57402	-79.5997
S-F18-38	23.6 RR	Tributary to Dan River	Perennial	36.57034	-79.6034
S-E18-34	23.9	Tributary to Dan River	Intermittent	36.56585	-79.6078
S-F18-34	24.4	Tributary to Dan River	Ephemeral	36.56087	-79.6129
AS-F18-33 / S-F18-33	24.8	Tributary to Dan River	Perennial	36.55637	-79.6179
S-C18-89	25.1	Tributary to Dan River	Perennial	36.55252	-79.6218
S-C18-90	25.7	Tributary to Dan River	Perennial	36.54597	-79.6284
S-C18-92	25.9	Tributary to Dan River	Intermittent	36.54432	-79.63

MVP Southgate Project

Docket No. CP19-14-000

Deep Creek Site-specific Plan

October 2019

FERC Environmental Condition #15

Prior to construction, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, a final crossing plan for Deep Creek that outlines the crossing method and any proposed mitigation measures to minimize waterbody impacts at the crossing (4.3.2.2).

MVP Southgate Project Response

The Project is providing a final crossing plan for Deep Creek that outlines the conventional bore crossing method that will be utilized to cross the waterbody. The utilization of conventional bore crossing techniques will avoid direct impacts to the waterbody bed and bank. In addition, the Project has located its proposed bore pits outside the limits of the adjacent riparian wetland, further reducing impact to the resources in this area.

The Project performed a detailed site review of the Deep Creek crossing on June 16, 2019 with senior construction personnel to evaluate the feasibility of the auger bored crossing as submitted to FERC. It was determined that the alignment crossed Deep Creek in a location that was not ideal for an auger bore crossing due to the existence of a moderately inclined rock face with significant elevation change on the south side of Deep Creek. The elevation differential would have required an engineered bore pit to be excavated in hard rock and the steep slope would have been difficult to reclaim to original contour. Therefore, the Project rerouted the Deep Creek crossing to a location that was absent of the steep rocky slope which shortened the proposed bore and the duration of the construction activities at the crossing.

The Deep Creek Conventional Bore Crossing Detail site-specific drawing is contained within this supplemental filing (see Horizontal Direction Drill and Bore Drawings).

MVP Southgate Project

Docket No. CP19-14-000

Hydrostatic/HDD Testing Sources

October 2019

FERC Environmental Condition #16

Prior to construction, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, its final list of water sources to be used for the Project (dust control, hydrostatic testing, and HDD operations), including intake location, waterbody name, withdrawal rate and method, and measures to minimize entrainment of fish (4.3.2.7).

MVP Southgate Project Response

The Project is providing a final list of water sources to be used for the Project for hydrostatic testing and HDD operations in *REVISED Table 2.3-7 (Proposed Hydrostatic Test Water Use Summary) and 2.3-8 (Estimated Water Usage for the MVP Southgate Project HDDs)* as part of this filing (see Resource Report 2 Table Updates). Information pertaining to dust control measures was provided as part of the Project's response to Environmental Information Requests ("EIR"), filed on October 18, 2019 (EIR #12). A Water Withdrawal-Floating Pump Intake with Hose Environmental Typical [Drawing No. MVP-SG-ES63 (NC and VA)] which provided specifications for withdrawal rate and method, and measures to minimize the entrainment of fish was also provided as part of the Project's response to EIR, filed on October 18, 2019 (EIR #12, Attachment 12-1).

MVP Southgate Project

Docket No. CP19-14-000

North Carolina Wetland and Waters Delineation Report – Addendum #2

(Provided Under Separate Cover)

October 2019

MVP Southgate Project

Docket No. CP19-14-000

Virginia Wetland and Waters Delineation Report
Addendum #2
(Provided Under Separate Cover)

October 2019

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 3 Table Updates

October 2019

LIST OF TABLES

REVISED [Oct 2019] - Table 3.2-2

Fisheries of Special Concern Crossed by the MVP Southgate Project a/

State	County	MP	Waterbody ID	Stream Name	Proposed Crossing Method	Source of Concern b/	Restricted In-stream Construction Window c/
Virginia	Pittsylvania	4.9	S-E18-3	Banister River	Dry Crossing	Potential Freshwater Mussel Stream	July 16 – April 14 (warmwater fisheries)
Virginia	Pittsylvania	17.7RR	S-E18-44	Sandy River	Dry Crossing	Potential Freshwater Mussel Steam	July 16 – April 14 (warmwater fisheries)
North Carolina	Rockingham	27.3	S-A18-42	Trib. To Cascade Creek	Dry Crossing	Potential Occurrence of Protected Mussel and Fish Species (per Agency guidance)	None
North Carolina	Rockingham	27.5	S-A18-40	Cascade Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per Agency guidance)	None
North Carolina	Rockingham	27.5	S-A19-273	Dry Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per Agency guidance)	None
North Carolina	Rockingham	30.1	S-A18-17	Dan River	HDD	Potential Occurrence of Protected Mussel and Fish Species (per Agency guidance)	None
North Carolina	Rockingham	31.3	S-B18-95	Rock Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	32.2	S-A18-147	Machine Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	32.7	S-A18-151	Town Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	32.7	S-A18-151	Town Creek	Dry Crossing	Potential Freshwater Mussel Stream	None

REVISED [Oct 2019] - Table 3.2-2

Fisheries of Special Concern Crossed by the MVP Southgate Project a/

State	County	MP	Waterbody ID	Stream Name	Proposed Crossing Method	Source of Concern b/	Restricted In-stream Construction Window c/
North Carolina	Rockingham	38.8	S-A18-8	Wolf Island Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per Agency guidance)	None
North Carolina	Rockingham	41.2	S-B18-56	Lick Fork	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	43.3	S-A18-176	Jones Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	47.0	S-C18-76	Hogans Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	48.7	S-A18-60	Giles Creek	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Rockingham	52.7	S-B18-94	Trib. To Haw River	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Alamance	53.7	S-A18-84	Trib To Haw River	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Alamance	58.7RR	S-C18-11	Trib To Haw River	Dry Crossing	Potential Freshwater Mussel Stream	None
North Carolina	Alamance	63.6	S-B18-16	Stony Creek Reservoir	HDD	Potential Freshwater Mussel Stream	None
North Carolina	Alamance	64.1RR	S-A19-331	Deep Creek	Conventional Bore	Potential Freshwater Mussel Stream	None
North Carolina	Alamance	67.6	S-A18-233	Boyds Creek	Dry Crossing	Potential Freshwater Mussel Stream	None

Note: MP listed for access roads is nearest pipeline MP.

a/ Consultations are ongoing with USFWS, VDGIF and NCWRC to determine which waterbodies are to be deemed fisheries of special concern based on potential presence of listed species, including fish, mussels and crayfish. Therefore, this table will be updated to reflect the consultations as they are completed.

REVISED [Oct 2019] - Table 3.2-2

Fisheries of Special Concern Crossed by the MVP Southgate Project a/

State	County	MP	Waterbody ID	Stream Name	Proposed Crossing Method	Source of Concern b/	Restricted In-stream Construction Window c/

b/ Sources of concern include the continued consultation with USFWS, VDGIF, and North Carolina agencies and the waterbodies with potential for mussels, crayfish, and fish.

c/ The Project will continue consultation with the agencies to determine applicable avoidance, minimization, or mitigation strategies (i.e. relocation surveys, time of year restrictions) to eliminate or reduce negative impacts to fisheries per correspondence with NCWRC and reference to VDGIF Time-of-Year Restrictions and other Guidance (https://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf)

Sources: VDGIF Time-of-Year Restrictions and other Guidance (http://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf); ; Agency Consultations (see Resource Report 1, Appendix 1-K)

REVISED [Oct 2019] - Table 3.3-2

Significant or Sensitive Wildlife Habitats within One Mile of the MVP Southgate Project

County / State	Milepost / Facility	Name of Area	Land Ownership/ Management	Construction Impact (acres)	Operation Impact (acres)	Habitat Types Affected	Comments
Pittsylvania, VA	0	Transco Road Net Conservation Site	VDCR	0.0	0.0	N/A	Easement direct adjacent to route. Impacts have been avoided.
Pittsylvania, VA	0.0 RR and 1.3 RR	White Oak Mountain Wildlife Management Area	VA Dept of Game and Inland Fisheries	0.0	0.0	N/A	Areas is located 0.99 miles southeast of ATWS-1001E. No impacts.
Pittsylvania, VA	3.4	VA Conservation Easements	Blue Ridge Land Conservancy	0.0	0.0	N/A	Area is located is 0.76 miles northwest of access road TA-PI-006. No Impacts
Pittsylvania, VA	14.2 RR	VA Conservation Easements	VA Outdoors Foundation	0.0	0.0	N/A	The Project proposes to utilize an existing access road on the edge of this easement area. No impacts are anticipated
Pittsylvania, VA & Rockingham, NC	25.2 - 26.3	ROA/Dan River Aquatic Habitat	Public Waters	0.0	0.0	Riverine	Located within 1-mile of the Project. No Impacts.
Rockingham, NC	26.1 to 36.3	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	188.3	60.1	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.
Rockingham, NC	28.2 RR	NC Natural Areas: Fitzgerald Woodland	Private	0.0	0.0	NA	Located 0.55 miles northwest of PA-RO-000.
Rockingham, NC	29.4 RR	NC Natural Areas: Wide Mouth Creek Conglomerate Exposure	Private	0.0	0.0	NA	Located 0.84 miles southeast of workspace.
Rockingham, NC	27.3 - 31.6 (Crossing at 30.1)	ROA/Dan River Aquatic Habitat	Public Waters	0.0	0.0	Riverine	The Dan River has been ranked as exceptional for containing high quality examples of globally ranked species and habitats. The Dan River is proposed to be crossed utilizing HDD and therefore, no impacts are anticipated.

REVISED [Oct 2019] - Table 3.3-2

Significant or Sensitive Wildlife Habitats within One Mile of the MVP Southgate Project

County / State	Milepost / Facility	Name of Area	Land Ownership/ Management	Construction Impact (acres)	Operation Impact (acres)	Habitat Types Affected	Comments
Rockingham, NC	37.7-38	Piedmont Land Conservancy Easement	Piedmont Land Conservancy	0.3	0.1	Scrub-shrub land, forest edge, and open water	The Project crosses through the corner of the easement. Impacts have been minimized to include only edge habitat.
Rockingham, NC	42.2 to 48.4	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	103.6	36.8	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.
Alamance, NC	63.8	NC Natural Areas: Stony Creek Forest	Private	0.0	0.0	N/A	The Project has implemented a route change in this area to avoid impacts to the Stony Creek Forest.
Alamance, NC	71.6 (177 feet west)	NC Clean Water Management Trust Fund Easement	State	0.0	0.0	Various	Located within 1 mile of Project. No Impacts.
Alamance, NC	71.8 (446 feet west)	NC Clean Water Management Trust Fund Easement	State	0.0	0.0	Various	Located within 1 mile of Project. No Impacts.
Rockingham, NC	CY-05	NC Natural Areas: Roundhouse Road Forest	Private	0.0	0.0	N/A	Located 0.46 miles north of CY-05. No impacts
Rockingham, NC	CY-05	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	13.7	0.0	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.
Rockingham, NC	CY-08 (TA-RO-000A)	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	0.04	0.0	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.
Caswell, NC	CY-025	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	24.9	0.0	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.

REVISED [Oct 2019] - Table 3.3-2 Significant or Sensitive Wildlife Habitats within One Mile of the MVP Southgate Project							
County / State	**Milepost / Facility**	**Name of Area**	**Land Ownership/ Management**	**Construction Impact (acres)**	**Operation Impact (acres)**	**Habitat Types Affected**	**Comments**
Caswell, NC	CY-025 (TA-CA-105)	Forest Legacy Areas: Northern Tier / Roanoke River / Great Dismal Swamp	NC Forest Service - voluntary management with landowners	1.3	0.0	Various	Forest clearing has been reduced to the extent practicable. Any landowners active in the Forest Legacy Program will be identified by the Project.

Note: Identified through consultation with VDCR-DNH and NCNHP (see Resource Report 1, Appendix 1-K)

Other sources: NCFS, 2010; NCNHP, 2018 and VDCR-DNH, 2017.

REVISED [Oct 2019] - Table 3.4-1

Vegetation Acreage Affected by Construction and Operation of the Proposed MVP Southgate Project Pipeline

Facility County, State	Agricultural Land a/		Upland Forest / Woodland b/						Open Upland c/		Wetland d/				Total Vegetation Acreage e/	
			Deciduous		Evergreen		Mixed		Upland Herbaceous / Scrub-Shrub		Herbaceous / Scrub Shrub Wetland		Forested Wetland			
	Construction	Operation	Construction j/	Operation k/	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction f/	Operational g
H-605 Pipeline Right-of-Way h/	**1.1**	**0.6**	**2.4**	**1.1**	**1.2**	**0.6**	**0.0**	**0.0**	**0.7**	**0.4**	**<0.1**	**<0.1**	**0.0**	**0.0**	**5.3**	**2.6**
Pittsylvania, VA	1.1	0.6	2.4	1.1	1.2	0.6	0.0	0.0	0.7	0.4	<0.1	<0.1	0.0	0.0	**5.3**	**2.6**
Additional Temporary Workspace	**0.0**	**0.0**	**0.7**	**0.0**	**1.7**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.5**	**0.0**
Pittsylvania, VA	<0.1	0.0	0.7	0.0	1.7	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	**2.5**	**0.0**
H-650 Pipeline Right-of-Way h/	**118.6**	**59.9**	**315.1**	**162.5**	**63.0**	**31.6**	**72.7**	**37.9**	**248.2**	**123.0**	**12.5**	**1.4**	**10.3**	**4.2**	**840.5**	**420.5**
Pittsylvania, VA	51.3	25.8	77.2	38.5	25.9	12.6	36.8	18.7	97.8	49.4	6.9	0.8	4.7	1.9	**300.6**	**147.8**
Rockingham, NC	33.0	17.2	125.1	65.0	26.6	13.7	33.0	17.7	72.7	34.4	4.5	0.5	3.5	1.5	**298.3**	**149.9**
Alamance, NC	34.3	16.9	112.8	59.0	10.4	5.3	2.9	1.5	77.7	39.1	1.2	0.1	2.1	0.8	**241.5**	**122.8**
Additional Temporary Workspace i/	**56.4**	**0.0**	**96.6**	**0.0**	**21.6**	**0.0**	**22.5**	**0.0**	**87.4**	**0.0**	**0.8**	**0.0**	**1.2**	**0.0**	**286.4**	**0.0**
Pittsylvania, VA	15.4	0.0	25.3	0.0	9.2	0.0	10.6	0.0	31.2	0.0	0.0	0.0	0.2	0.0	**91.9**	**0.0**
Rockingham, NC	25.6	0.0	36.5	0.0	8.6	0.0	11.2	0.0	25.0	0.0	0.7	0.0	0.9	0.0	**108.5**	**0.0**
Alamance, NC	15.4	0.0	34.9	0.0	3.8	0.0	0.7	0.0	31.2	0.0	0.1	0.0	0.0	0.0	**86.0**	**0.0**
Cathodic Protection Groundbeds	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**1.7**	**1.7**	**0.0**	**0.0**	**0.0**	**0.0**	**1.8**	**1.8**

REVISED [Oct 2019] - Table 3.4-1

Vegetation Acreage Affected by Construction and Operation of the Proposed MVP Southgate Project Pipeline

Facility County, State	Agricultural Land a/		Upland Forest / Woodland b/						Open Upland c/		Wetland d/				Total Vegetation Acreage e/	
			Deciduous		Evergreen		Mixed		Upland Herbaceous / Scrub-Shrub		Herbaceous / Scrub Shrub Wetland		Forested Wetland			
	Construction	Operation	Construction j/	Operation k/	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction f/	Operational g
Pittsylvania, VA	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	1.1	1.1	0.0	0.0	0.0	0.0	**1.1**	**1.1**
Rockingham, NC	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**<0.1**	**<0.1**
Alamance, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	**0.6**	**0.6**
Permanent Aboveground Facilities	**13.1**	**4.9**	**5.2**	**3.3**	**0.0**	**0.0**	**<0.1**	**<0.1**	**11.5**	**2.6**	**0.5**	**0.0**	**0.0**	**0.0**	**30.3**	**10.9**
Pittsylvania, VA	**13.0**	**4.9**	**4.9**	**3.1**	**0.0**	**0.0**	**<0.1**	**<0.1**	**1.3**	**0.7**	**0.0**	**0.0**	**0.0**	**0.0**	**19.1**	**8.6**
Lambert Compressor Station & Interconnect / MLV 1	13.0	4.8	4.9	3.1	0.0	0.0	<0.1	<0.1	1.3	0.7	0.0	0.0	0.0	0.0	**19.1**	**8.6**
MLV 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
MLV 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Rockingham, NC	**0.1**	**0.0**	**0.3**	**0.2**	**<0.1**	**0.0**	**0.0**	**0.0**	**8.9**	**1.4**	**0.5**	**0.0**	**0.0**	**0.0**	**9.8**	**1.6**
LN 3600 Interconnect	0.0	0.0	0.3	0.2	<0.1	0.0	0.0	0.0	4.3	0.7	0.0	0.0	0.0	0.0	**4.6**	**0.9**
T-15 Dan River Interconnect / MLV 4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.8	0.5	0.0	0.0	0.0	**5.2**	**0.8**

REVISED [Oct 2019] - Table 3.4-1 Vegetation Acreage Affected by Construction and Operation of the Proposed MVP Southgate Project Pipeline																
Facility County, State	**Agricultural Land a/**		**Upland Forest / Woodland b/**						**Open Upland c/**		**Wetland d/**				**Total Vegetation Acreage e/**	
			Deciduous		**Evergreen**		**Mixed**		**Upland Herbaceous / Scrub-Shrub**		**Herbaceous / Scrub Shrub Wetland**		**Forested Wetland**			
	Construction	**Operation**	**Construction j/**	**Operation k/**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction f/**	**Operational g**
<u>*MLV 5*</u>	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**<0.1**	**<0.1**
Alamance, NC	**<0.1**	**<0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.3**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	**0.6**
<u>*T-21 Haw River Interconnect / MLV 8*</u>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.6	0.0	0.0	0.0	0.0	**1.3**	**0.6**
<u>*MLV 6*</u>	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**<0.1**	**<0.1**
<u>*MLV 7*</u>	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**<0.1**	**<0.1**
Contractor Yards	**0.0**	**0.0**	**3.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**143.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**147.0**	**0.0**
Pittsylvania, VA	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	84.8	0.0	0.0	0.0	0.0	0.0	**87.9**	**0.0**
Rockingham, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	0.0	0.0	0.0	0.0	0.0	**12.2**	**0.0**
Alamance, NC	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	21.9	0.0	0.0	0.0	0.0	0.0	**22.1**	**0.0**
Caswell, NC	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	24.8	0.0	0.0	0.0	0.0	0.0	**24.9**	**0.0**
Temporary and Permanent Access Roads h/	**10.1**	**0.7**	**7.9**	**0.3**	**2.3**	**<0.1**	**2.3**	**0.1**	**56.1**	**3.8**	**0.1**	**0.0**	**0.1**	**0.0**	**78.8**	**4.9**
Pittsylvania, VA	4.3	0.7	2.4	0.2	1.3	<0.1	1.2	0.1	21.2	0.7	0.1	0.0	0.1	0.0	**30.7**	**1.7**

REVISED [Oct 2019] - Table 3.4-1

Vegetation Acreage Affected by Construction and Operation of the Proposed MVP Southgate Project Pipeline

Facility County, State	Agricultural Land a/		Upland Forest / Woodland b/						Open Upland c/		Wetland d/				Total Vegetation Acreage e/	
			Deciduous		Evergreen		Mixed		Upland Herbaceous / Scrub-Shrub		Herbaceous / Scrub Shrub Wetland		Forested Wetland			
	Construction	Operation	Construction j/	Operation k/	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction f/	Operational g/
Rockingham, NC	4.0	<0.1	2.1	<0.1	0.3	0.0	0.7	0.0	25.7	2.9	<0.1	0.0	<0.1	0.0	**32.8**	**2.9**
Alamance, NC	1.8	0.0	2.9	0.1	0.7	0.0	0.4	0.0	8.7	0.1	0.0	0.0	0.0	0.0	**14.4**	**0.2**
Caswell, NC	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	**0.9**	**0.0**
Vegetation Acres Total	**199.3**	**66.1**	**431.0**	**167.2**	**89.8**	**32.2**	**97.5**	**38.0**	**549.5**	**131.5**	**14.0**	**1.4**	**11.6**	**4.2**	**1,392.6**	**440.6**

Source: Project aerial photography April 2018.

Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreages calculations for the pig launchers and receivers are included with those facilities. Mainline valves (MLVs) 1, 4, and 8 will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreage calculations for MLVs 1, 4, and 8 are included with those facilities.

a/ Cultivated land (e.g., tobacco, soybeans, hay, corn).

b/ Upland forest and wooded lands, including those being managed for forest products (i.e., silviculture).

c/ Utility rights-of-way, grasslands, open fields, vacant land, herbaceous and scrub uplands, non-forested lands, golf courses, and municipal land.

d/ Palustrine emergent, palustrine scrub-shrub and palustrine forested wetlands as identified in Resource Report 2. Includes data from field delineation where access is available and NWI where survey access not available.

e/ Sums of addends may not equal totals due to rounding.

f/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points are not included in this acreage. Acreage includes a 3-foot path between the HDD entry and exit workspace areas to allow for placement of the HDD guide wire

g/ Includes only the operation footprint of the Project facilities, the 50-foot-wide permanent pipeline right-of-way in uplands, except in wetland areas where the operation width has been reduced to 10 feet in emergent wetlands, scrub shrub wetlands, and within 25 feet of waterbodies; and 30 feet in forested wetlands.

REVISED [Oct 2019] - Table 3.4-1

Vegetation Acreage Affected by Construction and Operation of the Proposed MVP Southgate Project Pipeline

Facility County, State	Agricultural Land a/		Upland Forest / Woodland b/						Open Upland c/		Wetland d/				Total Vegetation Acreage e/	
			Deciduous		Evergreen		Mixed		Upland Herbaceous / Scrub-Shrub		Herbaceous / Scrub Shrub Wetland		Forested Wetland			
	Construction	Operation	Construction j/	Operation k/	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction f/	Operational g/

The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points and within railroad rights-of-way are not included in this acreage.

h/ Includes the 50-foot-wide permanent right-of-way and temporary workspace areas.

i/ Includes ATWS areas for both the H-605 and H-650 pipelines. ATWS areas to be used for construction of aboveground facilities are included in the acreage calculations for the applicable aboveground facilities.

REVISED [Oct 2019] - Table 3.4-2 Acreage of Forest Interior and Forest Edge Affected by Construction and Operation of the MVP Southgate Project																
Facility County, State	**Interior Forest a/**								**Forest Edge**							
	Deciduous		**Evergreen b/**		**Mixed**		**Forested Wetland e/**		**Deciduous**		**Evergreen b/**		**Mixed**		**Forested Wetland e/**	
	Construction c/	**Operation d/**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction c/**	**Operation d/**	**Construction**	**Operation**	**Construction**	**Operation**	**Construction**	**Operation**
H-605 Pipeline Right-of-Way l/	**1.1**	**0.5**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**1.3**	**0.6**	**1.0**	**0.5**	**0.0**	**0.0**	**0.0**	**0.0**
Pittsylvania, VA	1.1	0.5	0.2	0.1	0.0	0.0	0.0	0.0	1.3	0.6	1.0	0.5	0.0	0.0	0.0	0.0
Additional Temporary Workspace	**0.4**	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.0**	**1.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Pittsylvania, VA	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.4	0.0	0.0	0.0	0.0	0.0
H-650 Pipeline Right-of-Way l/	**25.8**	**13.1**	**7.1**	**3.6**	**3.1**	**1.4**	**0.1**	**0.0**	**289.3**	**149.4**	**46.9**	**23.5**	**69.7**	**36.5**	**10.2**	**4.2**
Pittsylvania, VA	2.6	1.3	0.0	0.0	0.1	0.0	0.1	0.0	74.6	37.2	24.4	11.9	36.7	18.7	4.7	1.9
Rockingham, NC	7.6	3.8	6.4	3.3	1.3	0.6	0.0	0.0	117.5	61.2	17.4	9.0	31.7	17.1	3.5	1.5
Alamance, NC	15.6	8.0	0.6	0.3	1.7	0.8	0.0	0.0	97.2	51.0	5.1	2.6	1.3	0.7	2.1	0.8
Additional Temporary Workspace	**7.7**	**0.0**	**2.3**	**0.0**	**0.5**	**0.0**	**0.1**	**0.0**	**88.9**	**0.0**	**16.5**	**0.0**	**22.0**	**0.0**	**1.1**	**0.0**
Pittsylvania, VA	1.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	24.1	0.0	8.8	0.0	10.6	0.0	0.2	0.0
Rockingham, NC	3.1	0.0	2.3	0.0	0.5	0.0	0.0	0.0	33.4	0.0	6.2	0.0	10.7	0.0	0.9	0.0
Alamance, NC	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.4	0.0	1.5	0.0	0.7	0.0	0.0	0.0

REVISED [Oct 2019] - Table 3.4-2

Acreage of Forest Interior and Forest Edge Affected by Construction and Operation of the MVP Southgate Project

Facility County, State	Interior Forest a/								Forest Edge							
	Deciduous		Evergreen b/		Mixed		Forested Wetland e/		Deciduous		Evergreen b/		Mixed		Forested Wetland e/	
	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation
Cathodic Protection Groundbeds	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Pittsylvania, VA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockingham, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alamance, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Aboveground Facilities	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**5.2**	**3.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Pittsylvania, VA	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.9**	**3.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Lambert Compressor Station & Interconnect / MLV 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	3.1	0.0	0.0	0.0	0.0	0.0	0.0
MLV 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLV 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockingham, NC	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
LN 3600 Interconnect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
T-15 Dan River Interconnect / MLV 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Facility County, State	Interior Forest a/								Forest Edge							
	Deciduous		Evergreen b/		Mixed		Forested Wetland e/		Deciduous		Evergreen b/		Mixed		Forested Wetland e/	
	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation
MLV 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alamance, NC	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
T-21 Haw River Interconnect / MLV 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLV 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLV 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Contractor Yards	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Pittsylvania, VA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockingham, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alamance, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caswell, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temporary and Permanent Access Roads h/	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**7.9**	**0.3**	**1.7**	**0.0**	**2.3**	**0.1**	**0.1**	**0.0**
Pittsylvania, VA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.2	1.3	0.0	1.2	0.1	0.1	0.0
Rockingham, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.3	0.0	0.7	0.0	0.0	0.0
Alamance, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.1	0.1	0.0	0.4	0.0	0.0	0.0

REVISED [Oct 2019] - Table 3.4-2

Acreage of Forest Interior and Forest Edge Affected by Construction and Operation of the MVP Southgate Project

Facility County, State	Interior Forest a/								Forest Edge							
	Deciduous		Evergreen b/		Mixed		Forested Wetland e/		Deciduous		Evergreen b/		Mixed		Forested Wetland e/	
	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation	Construction c/	Operation d/	Construction	Operation	Construction	Operation	Construction	Operation
Caswell, NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Interior and Forest Edge Total	**34.9**	**13.6**	**9.9**	**3.7**	**3.5**	**1.4**	**0.2**	**0.0**	**396.1**	**153.6**	**67.5**	**24.0**	**93.9**	**36.6**	**11.4**	**4.2**

Source: Project aerial photography April 2018.
Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreages calculations for the pig launchers and receivers are included with those facilities. Mainline valves (MLVs) 1, 4, and 8 will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreage calculations for MLVs 1, 4, and 8 are included with those facilities.
a/ Interior forest is defined as the area within a forested tract greater than 300 feet from the forest edge.
b/ Silviculture is excluded in this analysis, accounting for the approximate 12.4 and 4.5-acre reduction in construction and operation evergreen totals, respectively, compared to Table 3.4-1.
c/ Construction acres include the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points and railroad rights-of-way are not included in this acreage. Acreage includes a five-foot path between the HDD entry and exit workspace areas to allow for placement of the HDD guide wire.
d/ Includes only the operation footprint of the Project facilities, the 50-foot-wide permanent pipeline right-of-way in uplands, except in wetland areas where the operation width has been reduced to 10 feet in emergent wetlands, scrub shrub wetlands, and within 25 feet of waterbodies; and 30 feet in forested wetlands. The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points and within railroad rights-of-way are not included in this acreage.
e/ Includes the 50-foot-wide permanent right-of-way and temporary workspace areas.
f/ Includes ATWS areas for both the H-605 and H-650 pipelines. ATWS areas to be used for construction of aboveground facilities are included in the acreage calculations for the applicable aboveground facilities.
g/ Sums may not equal the total of addends due to rounding.

REVISED [Oct 2019] - Table 3.4-3 Significant or Sensitive Vegetation Areas Within One Mile of the MVP Southgate Project				
Species/Community	**County**	**Consulting Agency**	**Survey Status**	**Proposed Avoidance or Minimization**
Piedmont Barbara's-button	Pittsylvania, VA	VDCR	Surveys complete, consultation with VDCR ongoing	Low potential habitat identified within the Project area, no plants identified. Impacts will be avoided by implementing Plan & Procedures and Invasive Species Plan.
Downy phlox	Pittsylvania, VA	VDCR	Surveys complete, consultation with VDCR ongoing	Low potential habitat identified within the Project area, no plants identified. Impacts will be avoided by implementing Plan & Procedures and Invasive Species Plan.
American Bluehearts	Pittsylvania, VA	VDCR	Surveys complete, consultation with VDCR ongoing	Low potential habitat identified within the Project area, no plants identified. Impacts will be avoided by implementing Plan & Procedures and Invasive Species Plan.
Small whorled pogonia	Rockingham and Alamance, NC	NCWRC/USFWS	Surveys in progress, consultation with NCWRC/USFWS ongoing	Suitable potential habitat identified within the Project area, no plants identified to date, surveys and consultation regarding mitigation measures are ongoing. If plants are documented, MVP will consult with agencies regarding appropriate avoidance and minimization measures.
Smooth coneflower	Rockingham and Alamance, NC	NCWRC/USFWS	Surveys in progress, consultation with NCWRC/USFWS ongoing	No known populations within the Project area, no plants identified to date, surveys and consultation regarding mitigation measures are ongoing. If plants are documented, MVP will consult with agencies regarding appropriate avoidance and minimization measures.
Cliff Stonecrop	Rockingham, NC	NCNHP	No survey required	No survey requested or planned. Potential impacts will be avoided by implementing Plan & Procedures and Invasive Species Plan.
Dry-Mesic Oak-Hickory Forest (Piedmont Subtype)	Rockingham and Alamance, NC	NCNHP	Not Applicable	The Project has collocated with existing easement and will follow FERC guidance to minimize forested impacts.
Mesic Mixed Hardwood Forest (Piedmont Subtype)	Rockingham and Alamance, NC	NCNHP	Not Applicable	The Project has collocated with existing easement and will follow FERC guidance to minimize forested impacts.
Wide Mouth Creek Conglomerate Exposure	Rockingham, NC	NCNHP	Not Applicable	Outside of Project Area. No impact expected.
Rocky Branch Conglomerate Exposure	Rockingham, NC	NCNHP	Not Applicable	Outside of Project Area. No impact expected.
NC Clean Water Management Trust Fund Easement	Alamance, NC	NCNHP	Not Applicable	Outside of Project Area. No impact expected.

REVISED [Oct 2019] - Table 3.4-3 Significant or Sensitive Vegetation Areas Within One Mile of the MVP Southgate Project				
Species/Community	**County**	**Consulting Agency**	**Survey Status**	**Proposed Avoidance or Minimization**
NC Division of Mitigation Services Easement	Alamance, NC	NCNHP	Not Applicable	Outside of Project Area. No impact expected.
Mountains-to-Sea Trail	Alamance, NC	NCNHP	Not Applicable	Outside of Project Area. No impact expected.
Sources: Consultation with VDCR-DNH and NCNHP (see Resource Report 1, Appendix 1-K); VDCR-DNH, 2017, and NCNHP, USFWS, and NCWRC, 2018				

REVISED [Oct 2019] - Table 17-1 North Carolina Forest Legacy Forested Area affected by the MVP Southgate Project		
Legacy Forest Area	**Construction Acres**	**Operational Acres**
NC Legacy Forested MP 26.1-36.3		
Forested Deciduous	45.5	18.8
Forested Evergreen	15.8	6.1
Forested Mixed	24.8	9.6
Wetland Forested (PFO)	3.5	1.0
Subtotal	**89.6**	**35.6**
NC Legacy Forested MP 42.2-48.4		
Forested Deciduous	45.9	18.4
Forested Evergreen	11.7	4.5
Forested Mixed	5.0	1.8
Wetland Forested (PFO)	0.1	0.0
Subtotal	**62.8**	**24.7**
CY 25 & TA-CA-105		
Forested Deciduous	**0.5**	**0.0**
Total	**152.9**	**60.3**

REVISED [Oct 2019] - Table 47-1

Land cover and potential breeding habitat of Project-specific Migratory Bird Species

Land Class / Vegetation Type a/	Land Class / Vegetation Type Definition	MBSC with Preferred Breeding Habitat in Land Class / Vegetation Type b/	# of MBSC by Land Class / Vegetation Type	Project Affected Acres within the Virginia Piedmont Forest Block Complex Important Bird Area (IBA)		Project Affected Acres – Total e/	
				Construction / Temporary (acres) c/	Operation / Permanent (acres) d/	Construction / Temporary (acres) c/	Operation / Permanent (acres) d/
Upland Forest / Woodland - Deciduous	Areas of upland deciduous forest are dominated by trees generally greater than 15 feet tall and contain greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change. A variety of upland deciduous forest vegetation communities are crossed by the pipeline alignment. The dominant type is oak-hickory forest, followed by beech-maple forest.	AMWO, BAEA, EWPW, KEWA, PRAW, PROW, RHWO, WOTH	8	18.2	6.4	431.0	167.2
Upland Forest / Woodland - Evergreen	Areas dominated by trees generally greater than 15 feet tall, and contain greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year, thus ensuring the canopy is never without green foliage. This subtype includes cultivated crops such as areas devoted to perennial wooded lands being managed for forest products, i.e., pine plantations. The most common evergreen species observed within the Project area included Virginia pine, Loblolly pine (*Pinus taeda*), and pitch pine.	BAEA, BHNU, PRAW	3	8.7	3.5	89.8	32.2
Upland Forest / Woodland - Mixed	Areas dominated by trees generally greater than 15 feet tall and contain greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover. Mixed deciduous-evergreen forests can contain a mixture of the dominant canopy, sub-canopy, shrub, and herbaceous species described above for deciduous and evergreen forests. The mixed forests within the Project area harbored species listed in the other upland forest categories.	AMWO, BAEA, BHNU, EWPW, KEWA, PRAW, PROW, RHWO, WOTH	9	13.3	5.0	97.5	38.0

REVISED [Oct 2019] - Table 47-1 Land cover and potential breeding habitat of Project-specific Migratory Bird Species							
Land Class / Vegetation Type a/	**Land Class / Vegetation Type Definition**	**MBSC with Preferred Breeding Habitat in Land Class / Vegetation Type b/**	**# of MBSC by Land Class / Vegetation Type**	**Project Affected Acres within the Virginia Piedmont Forest Block Complex Important Bird Area (IBA)**		**Project Affected Acres – Total e/**	
				Construction / Temporary (acres) c/	**Operation / Permanent (acres) d/**	**Construction / Temporary (acres) c/**	**Operation / Permanent (acres) d/**
Open Upland Herbaceous / Scrub-shrub	Utility rights-of-way, grasslands, open fields, vacant land, herbaceous and scrub uplands, non-forested lands, golf courses, and municipal land.	GRSP, NOBO	2	19.8	1.8	549.5	131.5
Wetland – Forested (PFO)	PFO wetlands are characterized by woody vegetation that is 6 meters in height or taller. The woody angiosperms (i.e., trees or shrubs) in this broad leaved deciduous community have relatively wide, flat leaves that are shed annually during the cold or dry season.	PROW, YCNH	2	0.1	0.0	11.6	4.2
Wetland – Emergent and Scrub-shrub (PEM / PSS)	PEM wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. PSS wetlands are characterized by woody vegetation that is generally less than 6 meters (~20 feet) tall. The woody angiosperms (i.e., small trees or shrubs) in this broad leaved deciduous community have relatively wide, flat leaves that are shed annually during the cold or dry season.	LEBI, PROW, WIFL, YCNH	4	<0.1	0.0	14.0	1.4
Agricultural land	Cultivated land (e.g., tobacco, soybeans, hay, corn).	GRSP, NOBO	2	0.0	0.0	199.3	66.1
Open Water	Field delineated waterbodies with a bank width of greater than six feet, and waterbodies visible on aerial photography where field delineation has not been completed.	None	0	0.1	0.0	3.5	0.0
Commercial / Industrial	Manufacturing or industrial plants, paved areas, landfills, mines, quarries, electric power or natural gas utility facilities; developed areas, roads, railroads and railroad yards, and commercial or retail facilities.	None	0	0.1	<0.1	51.8	6.5

REVISED [Oct 2019] - Table 47-1

Land cover and potential breeding habitat of Project-specific Migratory Bird Species

Land Class / Vegetation Type a/	Land Class / Vegetation Type Definition	MBSC with Preferred Breeding Habitat in Land Class / Vegetation Type b/	# of MBSC by Land Class / Vegetation Type	Project Affected Acres within the Virginia Piedmont Forest Block Complex Important Bird Area (IBA)		Project Affected Acres – Total e/	
				Construction / Temporary (acres) c/	Operation / Permanent (acres) d/	Construction / Temporary (acres) c/	Operation / Permanent (acres) d/
Residential	Existing developed residential areas and planned residential developments. This may include large developments, low, medium, and high density residential neighborhoods, urban and suburban residential, multi-family residences, ethnic villages, residentially zoned areas that have been developed or short segments of the route at road crossings with homes near the route alignment.	None	0	0.0	0.0	18.1	2.9
Total Acres within the Piedmont Forest Block Complex IBA:				**60.4**	**16.7**	**1,465.9**	**450.0**

a/ Source: Project aerial photography April 2018 and field verification through January 22, 2019.
b/ Four-letter alpha codes for birds in accordance with the 59th American Ornithologists' Union Supplement (2018): AMWO – American woodcock; BAEA – bald eagle; BHNU – brown-headed nuthatch; EWPW – eastern whip-poor-will; GRSP – grasshopper sparrow; KEWA – Kentucky warbler; LEBI – least bittern; NOBO – northern bobwhite; PRAW – prairie warbler; PROW – prothonotary warbler; RHWO – red-headed woodpecker; WOTH – wood thrush; WIFL – willow flycatcher; YCNH – yellow-crowned night-heron.
c/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points are not included in this acreage. Acreage includes a five-foot path between the HDD entry and exit workspace areas to allow for placement of the HDD guide wire.
d/ Includes only the operation footprint of the Project facilities, the 50-foot-wide permanent pipeline right-of-way in uplands, except in wetland areas where the operation width has been reduced to 10 feet in emergent wetlands, scrub shrub wetlands, and within 25 feet of waterbodies; and 30 feet in forested wetlands. The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points and within railroad rights-of-way are not included in this acreage.
e/ Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

Mountain Valley PIPELINE

MVP Southgate Project

Docket No. CP19-14-000

Exotic and Invasive Plant Species and Control Plan

October 2019

Mountain Valley PIPELINE LLC

MVP Southgate Project

Exotic and Invasive Plant Species Control Plan

October 22, 2019

Revision 1

Mountain Valley Pipeline, LLC ("Mountain Valley") developed an upland exotic and invasive plant species control plan for the MVP Southgate ("Project"). Invasive species are defined in Federal Executive Order ("EO") 13112(1999), as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health". The intent of EO 13112 is to "prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause", and directs federal agencies to prevent, detect, respond to, monitor, and research invasive species. The purpose of this plan is to identify potential undesirable vegetation associated with the Project and outline methods to prevent recruitment and spread of exotic and invasive species.

Searches for terrestrial invasive plants along the right-of-way were directed to species with a high likelihood of occurring in the geographical region. Species search lists were populated with information available through the Virginia Department of Conservation and Recreation and the North Carolina Native Plant Society (Table 1). Species identified in Table 1 as invasive in the state of Virginia are considered to pose a low, moderate, or high risk in the Piedmont Region. Invasive species with a Rank 1 rating (severe threat) in North Carolina are also addressed in Table 1.

Table 1

An Inventory of Non-native Invasive Plant Species with Potential to Occur Along the Project Route and Notation of Species Presence During Survey.

Scientific Name	Common Name	Growth Form
Virginia Species - High Rank Category[a]		
Ailanthus altissima	Tree of heaven[b]	Tree
Alliaria petiolata	Garlic mustard[b]	Herb
Ampelopsis brevipedunculata	Porcelain berry[b]	Shrub
Celastrus orbiculatu	Oriental bittersweet[b]	Vine
Centaurea stoebe ssp. *Micranthos*	Spotted knapweed[b]	Herb
Cirsium arvense	Canada thistle	Herb
Dioscorea polystachya	Cinnamon vine	Vine
Elaeagnus umbellata	Autumn olive[b]	Tree
Euonymus alatus	Winged euonymus	Shrub
Ficaria verna	Lesser celandine	Herb
Hydrilla verticillata	Hydrilla	Herb, aquatic
Iris pseudacorus	Yellow flag	Herb
Lespedeza cuneata	Chinese lespedeza[b]	Herb
Ligustrum sinense	Chinese privet[b]	Shrub
Lonicera japonica	Japanese honeysuckle[b]	Vine
Lonicera maackii	Amur honeysuckle[b]	Shrub
Lonicera morrowii	Morrow's honeysuckle	Shrub
Lythrum salicaria	Purple loosestrife	Herb
Microstegium vimineum	Japanese stiltgrass[b]	Grass
Murdannia keisak	Marsh dewflower[b]	Herb
Myriophyllum aquaticum	Parrot feather	Herb, aquatic
Myriophyllum spicatum	Eurasian milfoil	Herb, aquatic
Persicaria perfoliate	Mile a minute[b]	Vine
Phragmites australis ssp. australis	Common reed	Herb, aquatic
Pueraria montana var. lobata	Kudzu[b]	Vine
Reynoutria japonica	Japanese knotweed	Herb
Rosa multiflora	Multiflora rose[b]	Vine/shrub
Rubus phoenicolasius	Rubus	Vine/shrub

Table 1

An Inventory of Non-native Invasive Plant Species with Potential to Occur Along the Project Route and Notation of Species Presence During Survey.

Scientific Name	Common Name	Growth Form
Sorghum halepense	Johnson grass[b]	Grass
Urtica dioica	Stinging European nettle	Herb
Virginia Species - Medium Rank Category[a]		
Acer platanoides	Norway maple	Tree
Agrostis capillaris	Colonial bent grass	Grass
Akebia quinata	Five leaf akebia	Vine
Albizia julibrissin	Mimosa[b]	Tree
Arthraxon hispidus var. *hispidus*	Joint head grass[b]	Grass
Berberis thunbergii	Japanese barberry	Shrub
Cirsium vulgare	Bull thistle[b]	Herb
Dipsacus fullonum	Wild teasel	Herb
Egeria densa	Brazilian waterweed	Herb, aquatic
Euonymus fortunei	Winter creeper	Vine
Glechoma hederacea	Gill-over-the-ground	Vine
Hedera helix	English ivy[b]	Vine
Holcus lanatus	Common velvet grass	Grass
Ligustrum obtusifolium var. *obtusifolium*	Border privet[b]	Shrub
Lonicera tatarica	Tartarian honeysuckle	Shrub
Lysimachia nummularia	Moneywort[b]	Herb
Miscanthus sinensis	Chinese silvergrass	Grass
Najas minor	Brittle naiad	Herb
Paulownia tomentosa	Royal paulowina[b]	Tree
Persicaria longiseta	Long-bristled smartweed[b]	Herb
Phyllostachys aurea	Golden bamboo	Grass
Poa compressa	Flat-stemmed bluegrass	Grass
Poa trivialis	Rough bluegrass	Grass
Pyrus calleryana	Callery pear[b]	Tree
Rhodotypos scandens	Jetbead	Shrub
Rumex acetosella	Sheep sorrel[b]	Herb
Spiraea japonica	Japanese spiraea	Herb
Stellaria media	Common chickweed	Herb
Veronica hederifolia	Ivy-leaved speedwell	Herb
Viburnum dilatatum	Linden arrow wood[b]	Shrub
Wisteria sinensis	Chinese wisteria[b]	Vine
Virginia Species - Low Rank Category[a]		
Commelina communis	Asiatic dayflower	Herb
Elaeagnus pungens	Thorny olive	Shrub
Lespedeza bicolor	Shrubby bushclover	Shrub
Lonicera fragrantissima	Winter honeysuckle	Vine
Melia azedarach	Chinaberry	Shrub
Morus alba	White mulberry	Shrub
Perilla frutescens	Beefsteak plant	Herb
Phleum pratense	Timothy	Grass
Populus alba	Silver poplar	Tree
Rumex crispus ssp. crispus	Curly dock	Herb
Securigera varia	Crown-vetch	Vine
Ulmus pumila	Siberian elm	Tree

Table 1

An Inventory of Non-native Invasive Plant Species with Potential to Occur Along the Project Route and Notation of Species Presence During Survey.

Scientific Name	Common Name	Growth Form
Vinca major	Greater periwinkle	Vine
Vinca minor	Periwinkle	Vine
Wisteria floribunda	Japanese wisteria	Tree/Vine
North Carolina - Severe Threat Ranking[a]		
Ailanthus altissima	Tree of heaven[b]	Tree
Albizia julibrissin	Mimosa[b]	Tree
Alliaria petiolata	Garlic mustard[b]	Herb
Celastrus orbiculatus	Asian bittersweet[b]	Vine
Elaeagnus umbellata	Autumn olive[b]	Tree
Hedera helix	English ivy[b]	Vine
Hydrilla verticillata	Hydrilla	Herb, aquatic
Lespedeza bicolor	Bicolor lespedeza	Shrub
Lespedeza cuneata	Sericea lespedeza[b]	Herb
Ligustrum sinense	Chinese privet[b]	Shrub
Lonicera fragrantissima	Fragrant honeysuckle[b]	Vine
Lonicera japonica	Japanese honeysuckle[b]	Vine
Microstegium vimineum	Japanese stilt grass[b]	Grass
Murdannia keisak	Asian spiderwort[b]	Herb
Myriophyllum aquaticum	Parrotfeather	Herb, aquatic
Paulownia tomentosa	Princess tree[b]	Tree
Persicaria perfoliata (Polygonum perfoliatum L.)	Mile-a-minute vine	Vine
Phragmites australis (Cav.) Trin. ssp. *australis*	Common reed	Grass, aquatic
Pyrus calleryana	Bradford pear[b]	Tree
Reynoutria japonica (Polygonum cuspidatum)	Japanese knotweed	Herb
Pueraria montana	Kudzu[b]	Vine
Rosa multiflora	Multiflora rose[b]	Vine/shrub
Wisteria sinensis	Chinese wisteria[b]	Vine

[a] In Virginia, Invasiveness ranks reflect the level of threat to forests and other natural communities and native species. Ranks used on the list are high, medium, and low. High Species pose a significant threat, Medium Species pose a moderate threat, Low Species pose a low threat. In North Carolina, Rank 1 – Severe Threat plants are exotic plant species that have invasive characteristics and spread readily into native plant communities, displacing native vegetation.

[b] Species observed during survey.

Sources: The Project used the Virginia Invasive Plant Species List and the North Carolina Invasive Plant Council List (Virginia Invasive Species Working Group, 2012; VDCR-DNH, 2018; and North Carolina Invasive Plant Council, 2016).

Crews recorded observations of exotic and invasive species concurrent with other field surveys. To ensure adequate survey coverage, the Project right-of-way was divided into 1,000-foot long blocks and where survey permission was granted, at least one observation of exotic and invasive species was made within each block and along each access road.

Limited weed-free areas were identified in the Project. Two or more adjacent blocks that lacked exotic and invasive species were considered weed-free; single isolated weed-free blocks surrounded by blocks with exotic and invasive species were not considered weed-free. Table 2 lists weed-free areas.

Exotic and invasive species were observed throughout the Project in both states. In Virginia, observations were completed in 133 blocks and partially completed in 27 blocks out of a total 193 blocks. At least one exotic or invasive species was present in 99% of surveyed and partially surveyed blocks (n=158). From blocks with exotic and invasive species, the most commonly observed species included: Japanese honeysuckle (*Lonicera japonica*) (87%); Chinese lespedeza (*Lespedeza cuneata*) (84%), Japanese stilt-grass (*Microstegium vimineum*) (67%); Chinese privet (*Ligustrum sinense*) (41%); tree of heaven (*Ailanthus altissima*) (35%); multiflora rose (*Rosa multiflora*) (30%); spotted knapweed (*Centaurea stoebe ssp. Micranthos*) (27%); and Johnson grass (*Sorghum halepense*) (25%).

In North Carolina, observations were completed in 214 blocks and partially completed in 52 blocks out of a total 338 blocks. At least one exotic or invasive species was present in 80% of surveyed and partially surveyed blocks (n=266). From blocks with exotic and invasive species, the most commonly observed species includes: Japanese honeysuckle (*Lonicera japonica*) (54%); Japanese stilt-grass (*Microstegium vimineum*) (54%); multiflora rose (34%); Chinese privet (*Ligustrum sinense*) (25%), and tree of heaven (*Ailanthus altissima*) (20%).

Table 1

Areas Lacking Invasive Species

County/State	Station Start	Station End
Rockingham, NC	31.2[a]	31.40 [a]
Rockingham, NC	37.30	37.48 [a]
Rockingham, NC	43.70[a]	43.90 [a]
Rockingham, NC	47.48 [a]	47.67
Alamance, NC	64.00 [a]	67.50[b]

[a] Weed-free block is adjacent to unsurveyed block; status as weed-free could be revised pending survey of adjacent blocks.

[b] Area associated with re-route, surveys pending

Prior to construction, unsurveyed and partially surveyed blocks will be assessed for presence of exotic and invasive species, and Table 2 will be updated to reflect applicable changes.

Potential Invasive Plant Species Introduction Associated with Pipeline Construction

Excavation for pipeline placement exposes the topsoil surface to potential entrance of exotic, noxious, and/or invasive plant species. This can occur either by physical transport onto the exposed soil site by way of equipment, machinery, or vehicles, through windborne dissemination of seeds of exotic or invasive species from the surrounding area, or by introduction of seeds or plant parts contained in mulch or straw bales.

To avoid and minimize potential for introduction of these seeds to the Project corridor, the Project will apply three management strategies to control exotic, noxious, and invasive plant species, including: avoidance of exotic and invasive species found in organic materials brought onsite; monitoring and selective treatment of exotic or invasive species encountered during or following construction; and using seed mixes that include native species whenever possible.

1. Introduction of invasive species from organic materials brought onsite will be avoided during construction, temporary stabilization, and final reclamation through use of certified weed-free mulch, including straw, hay, wood fiber hydromulch, erosion control fabric, or a functional equivalent.

2. The Project will monitor the ROW during construction and for two years post-construction to allow for early detection of all exotic or invasive species infestations or outbreaks, regardless of ranking. If species or colonies of exotic or invasive species are found in numbers substantially greater than those existing prior to construction, the Project will conduct selective spot eradications of those species. Eradication measures will include hand cutting and/or mechanical removal unless a state or federal management agency approves the use of herbicides to achieve effective removal of these species. Herbicide types will be determined based on the species requiring control using methods prescribed by the VDCR or the NCNHP, in each respective state. Actual treatment methods are not presented here as recent current events regarding herbicide use will likely lead to significant changes in treatment recommendations. The Project will use herbicide applications approved for aquatic use, as necessary. All herbicides will be applied by applicators appropriately licensed or certified by the state where the work is conducted.

3. Seed mixes used during restoration will include native species within the seed mix. The Project will implement the restoration measures contained in the FERC *Upland Erosion Control, Revegetation and Maintenance Plan* (“FERC Plan”) and *Wetland and Waterbody Construction and Mitigation Procedures* (“FERC Procedures”). In accordance with the FERC Plan, the Project will monitor all areas disturbed by Project construction to determine the post-construction revegetative success for a minimum of two growing seasons following construction, or until revegetation is successful.

In addition to the three strategies described above, the following control measures will be used to further minimize introduction and/or spread of these species:

- Adhere to erosion control measures in the FERC Plan and Procedures to ensure that sediment movement and associated movement of non-native seeds into newly disturbed soils is minimized.
- Prior to mobilization into the Project area, contractors thoroughly clean all construction equipment to limit potential for spread of noxious weeds, insects, or other soil-borne pests.
- During construction, the environmental inspector (EI) will ensure all contractors clean the tracks, tires, and blades of equipment by hand or compressed air or water to remove any excess soil prior to movement of equipment out of known weed or soil-borne pest infested areas.
- Use construction techniques along the pipeline route that minimize the duration of bare soil exposure thus, minimizing the opportunity for exotic species to become established.
- In areas along the pipeline identified as containing exotic and invasive species, the topsoil from the full width of the construction ROW is stripped and stored separately from other, less contaminated topsoil and subsoil. Where topsoil segregation is required, identify the topsoil layer as outlined in the FERC Plan. EIs will identify and mark these areas prior to grading activities.
- Reseed all disturbed areas promptly after final grading, weather and soil conditions permitting, and in consideration of written recommendations from the local soil conservation authorities. Prompt

reseeding ensures bare soil is not available for recruitment of exotic or invasive species. Seeding is not required in active agriculture lands unless requested by the landowner.

- As described in the FERC Plan, apply mulch (consisting of weed-free straw or hay or other erosion-control materials) if final grading and installation of permanent erosion control measures are not completed within 20 days after the trench is backfilled or seeding cannot be completed properly due to scheduling outside of recommended seeding dates.
- Do not move mowing and maintenance equipment from an area where invasive species have been encountered during operation of the Project unless the equipment is cleaned prior to moving.

At Project mobilization, contractors shall thoroughly clean all construction equipment prior to initial arrival at contractor yards and staging areas. This includes all equipment traveling along ROWs. Equipment includes all earth-moving vehicles, mechanized felling equipment, spreaders, track hoes, timber mats, straps, and any other heavy equipment capable of carrying mud and debris. Cleaning of tracks, heavy equipment tires, and blades is recommended. Cleaning shall remove excess soil and material. Upon arrival of equipment onsite, inspections are completed by the Contractor and an EI to verify equipment is free of soil and debris when it arrives onsite.

In addition to thorough cleaning prior to entering each spread, terrestrial equipment must be cleaned through the use of hand tools and/or pressurized air or water prior to entering areas lacking invasive species populations (Table 2). Information in Table 2 may be revised to include additional areas.

The EI will maintain a log documenting inspection of all equipment. Visual markers with date and time noted will be used to identify cleaned and inspected equipment. General requirements for equipment cleaning while on Project are summarized in Table 3.

Table 2

Requirements of Equipment Cleaning

Item	**Terrestrial Equipment Cleaning**
Approved Equipment	Hand tools, high pressure air or water.
Inspection	Completed by Contractor and EI
Frequency	Prior to entering a new Spread; and prior to entering areas lacking invasive species, identified in Table 2.

References

North Carolina Invasive Plant Council. 2016. Available online at: www.nc-ipc.weebly.com Accessed on July 16, 2018.

USDA (United States Department of Agriculture). 2015. Natural Resources Conservation Service. Invasive and Noxious Weeds. http://plants.usda.gov/java/noxiousDriver. Accessed October 6, 2015. VDCR-DNH (Virginia Department of Conservation and Recreation, Division of Natural Heritage). 2018.

Virginia Invasive Plant Species List. Available online at: http://www.dcr.virginia.gov/natural_heritage/invsppdflist.shtml. Accessed September 25, 2018.

Virginia Invasive Species Working Group. 2012. Natural Heritage Technical Document 12-13. Richmond, VA. 55 pages.

MVP Southgate Project

Docket No. CP19-14-000

Brush and Timber Management During Construction

October 2019

FERC Environmental Condition #17

Prior to construction, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, revised plans to dispose of brush and timber that are in accordance with the FERC Upland Erosion Control, Revegetation, and Maintenance Plan, section III.E (4.5.4.1).

MVP Southgate Project Response

The Project will determine methods and locations for the regular collection containment, and disposal of brush and timber throughout the construction process. Disposal of brush and timber for beneficial reuse will not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner approval, and permit requirements. Alternative methods may also be used for disposal, such as removal from the project site to an approved disposal location or chipping on the right-of-way. Landowner preferences or requests will be the primary consideration when determining the appropriate disposal method.

MVP Southgate Project

Docket No. CP19-14-000

Measures to Minimize Impacts on Migratory Birds

October 2019

FERC Environmental Condition #18

Prior to construction, Mountain Valley shall consult with the FWS and identify measures to minimize impacts on migratory birds if vegetation clearing for construction will occur during the migratory bird nesting season (March 15 - August 15 in Virginia and April 1 - August 31 in North Carolina). Mountain Valley shall file these measures with the Secretary, for review and written approval by the Director of OEP, along with records of its consultation with FWS (4.6.3.2).

MVP Southgate Project Response

The Project will consult with the FWS and identify measures to minimize impacts on migratory birds if vegetation clearing for construction occurs during the migratory bird nesting season (March 15 - August 15 in Virginia and April 1 - August 31 in North Carolina). Notes from the recent agency meeting is included as part of agency correspondence associated with this filing (see September 2019 Supplemental Correspondence from May 23, 2019 to October. 21, 2019).

MVP Southgate Project

Docket No. CP19-14-000

North Carolina Federal Plant Survey Report
CUI//PRIV - DO NOT RELEASE
(Provided Under Separate Cover)

October 2019

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 4 Table Updates

Tables considered sensitive in nature are labeled "*CUI//PRIV – DO NOT RELEASE*" in accordance with FERC procedures and 36 CFR Part 800.11(c)(1).
These tables are provided under separate cover.

October 2019

LIST OF TABLES

REVISED Table 4.3-1 Federally-Recognized Native American Groups Contacted for the MVP Southgate Project (current as of October 1, 2019)		
Tribe Name	**Date(s) Contacted (includes meetings)**	**Date(s) Response Received (includes meetings)**
Absentee Shawnee Tribe	11/2/2018	No response received to date
Catawba Indian Nation	5/31/2018, 6/1/2018, 6/28/2018, 7/11/2018, 8/31/2018/ 9/5/2018/, 9/28/2018, 11/2/2018, 2/6/2019, 2/27/2019, 2/28/2019, 8/07/2019	5/31/2018, 7/12/2018, 9/28/2018, 9/05/2019
Cherokee Nation of Oklahoma	8/31/2018, \11/2/2018, 12/05/2018	11/30/2018
Cheyenne River Sioux Tribe	6/6/2018, 7/11/2018, 8/31/2018	No response received to date
Chickahominy Tribe	5/31/2018, 6/1/2018, 6/12/2018, 6/14/2018, 6/25/2018, 6/29/2018, 7/11/2018, 8/31/2018, 9/6/2018, 11/2/2018, 2/6/2019, 2/10/2019, 2/27/2019, 2/28/2019, 04/16/2019, 05/01/2019, 08/07/2019	5/31/2018, 6/14/2018, 9/6/2018
Chickahominy Tribe Eastern Division	5/31/2018, 6/1/2018, 6/12/2018, 6/14/2018, 8/21/2018, 8/31/2018, 9/6/2018, 2/20/2019, 2/27/2019, 2/28/2019, 4/16/2019, 08/07/2019	5/31/2018, 6/14/2018, 9/6/2018
Choctaw Nation of Oklahoma	11/2/2018	No response received to date
Delaware Nation	6/6/2018, 7/11/2018, 8/31/2018, 11/2/2018	No response received to date
Delaware Tribe of Indians	6/6/2018, 7/11/2018, 11/2/2018	6/7/2018
Eastern Band of Cherokee Indians	5/31/2018, 6/1/2018, 6/11/2018, 6/29/2018, 7/11/2018, 8/31/2018, 11/2/2018, 2/6/2019, 2/27/2019, 2/28/2019	5/31/2018, 10/15/2018
Eastern Shawnee Tribe of Oklahoma	6/6/2018, 7/11/2018, 8/31/2018, 11/2/2018	No response received to date
Jena Band of Choctaw Indians	11/2/2018	No response received to date
Monacan Indian Nation*	5/31/2018, 6/1/2018, 6/12/2018, 6/27/2018, 7/11/2018, 8/9/2018, 8/15/2018, 8/31/2018, 10/9/2018, 11/2/2018, 2/6/2019, 2/21/2019, 2/26/2019, 2/28/2019, 04/16/2019, 08/07/2019	5/31/2018, 6/12/2018, 8/7/2018, 10/9/2018, 2/21/2019, 2/25/2019, 2/26/2019
Muscogee (Creek) Nation	6/6/2018, 7/11/2018, 8/31/2018, 11/2/2018	6/8/2018

REVISED Table 4.3-1 Federally-Recognized Native American Groups Contacted for the MVP Southgate Project (current as of October 1, 2019)		
Tribe Name	**Date(s) Contacted (includes meetings)**	**Date(s) Response Received (includes meetings)**
Nansemond Tribe	5/31/2018, 6/1/2018, 6/11/2018, 6/26/2018, 7/11/2018, 8/31/2018, 9/6/2018, 11/2/2018, 2/6/2019, 2/10/2019, 2/18/2019, 2/27/2019, 2/28/2019, 04/16/2019, 08/07/2019	5/31/2018, 6/11/2018, 9/6/2018, 04/29/2019, 05/01/2019
Oneida Tribe of Wisconsin	11/2/2018	No response received to date
Ottawa Tribe of Oklahoma	11/2/2018	No response received to date
Pamunkey Tribe	5/31/2018, 8/31/2018, 11/2/2018, 2/6/2019, 2/27/2019, 2/28/2019, 04/16/2019	No response received to date
Poarch Band of Creek Indians	11/2/2018	No response received to date
Rappahannock Tribe	5/31/2018, 6/5/2018, 7/11/2018, 8/31/2018, 9/6/2018, 11/2/2018, 2/6/2019, 2/10/2019, 2/27/2019, 2/28/2019, 04/16/2019	9/6/2018, 05/10/2019
Rosebud Sioux Tribe of Indians	6/6/2018, 6/7/2018, 7/11/2018, 8/31/2018	No response received to date
Saint Regis Mohawk Tribe	11/2/2018	No response received to date
Seneca Nation	11/2/2018	No response received to date
Seneca-Cayuga Nation	11/2/2018	No response received to date
Shawnee Tribe	11/2/2018	No response received to date
Stockbridge-Munsee Band of Mohicans	11/2/2018	No response received to date
Tonawanda Band of Seneca Indians	11/2/2018	No response received to date
Tuscarora Nation	6/6/2018, 7/11/2018, 8/31/2018, 11/2/2018, 2/10/2019	No response received to date
United Keetoowah Band of Cherokee Indians	11/2/2018	No response received to date
Upper Mattaponi Tribe	5/30/2018, 6/12/2018, 6/25/2018, 7/11/2018, 8/31/2018, 9/6/2018, 11/2/2018, 2/6/2019, 2/27/2019, 2/28/2019, 04/16/2019, 08/07/2019	9/6/2018, 05/01/2019

REVISED Table 4.3-2 Non-federally Recognized Native American Groups Contacted for the MVP Southgate Project (current as of October 1, 2019)		
Tribe Name	**Date(s) Contacted (includes meetings)**	**Date(s) Response Received (includes meetings)**
Cheroenhaka (Nottoway) Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
Mattaponi Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
Nottoway of Virginia	8/3/2018, 8/31/2018, 11/2/2018, 04/23/2019	04/23/2019, 05/07/2019, 05/10/2019,
Patawomeck Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
North Carolina Commission on Indian Affairs	7/12/2018, 7/25/2018, 7/31/2018, 8/22/2018, 8/31/2018, 9/7/2018, 11/2/2018, 2/28/2019, 4/15/2019, 04/26/2019, 08/07/2019	7/31/2018, 8/27/2018, 9/7/2018, 04/23/2019, 04/25/2019, 08/23/2019, 09/04/2019
Coharie Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
Haliwa-Saponi Indian Tribe	8/3/2018, 8/31/2018, 11/2/2019	No response received to date
Lumbee Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
Meherrin Indian Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date
Occaneechi Band of the Saponi Nation*	8/3/2018, 8/6/2018, 8/14/2018, 8/20/2018, 8/31/2018, 10/2/2018, 10/4/2018, 11/2/2018, 2/6/2019, 2/25/2019, 2/28/2019, 04/15/2019, 05/17/2019, 08/07/2019	8/17/2018, 8/24/2018, 10/5/2018, 04/15/2019, 05/15/2019
Sappony Tribe*	8/3/2018, 08/07/2019, , 8/9/2018, 8/15/2018, 8/31/2018, 10/9/2018, 11/2/2018, 2/6/2019, 2/21/2019, 2/26/2019, 2/28/2019	8/7/2018, 10/9/2018, 2/10/2019, 2/21/2019, 2/25/2019, 2/26/2019
Waccamaw Siouan Tribe	8/3/2018, 8/31/2018, 11/2/2018	No response received to date

REVISED Table 4.3-3 Other Virginia State and Local Agency Cultural Resources Coordination for the MVP Southgate Project (current as of October 1, 2019)		
Organization	**Date(s) Contacted**	**Date(s) Response Received**
City of Danville (CLG)	7/6/2018	No response received to date
Pittsylvania Historical Society	7/6/2018, 7/24/2018, 8/17/2018	7/21/2018

REVISED Table 4.3-4 **Other North Carolina State and Local Agency Cultural Resources Coordination for the MVP Southgate Project (current as of October 1, 2019)**		
Organization	**Date(s) Contacted**	**Date(s) Response Received**
Town of Eden (CLG)	7/6/2018	No response received to date
Alamance County Historical Properties Commission (CLG)	7/6/2018, 7/31/2018, 8/3/2018	7/30/2018, 7/31/2018, 8/3/2018
Rockingham County Historical Society	9/5/2018, 10/3/2018	10/2/2018, 10/4/2018
Alamance County Historical Museum	7/6/2018	No response received to date
Graham Historical Museum	7/6/2018, 7/23/2018	7/21/2018
Haw River Historical Society Museum	8/7/2018	No response received to date
Mebane Historical Society and Museum	7/6/2018	No response received to date
Textile Heritage Museum	7/6/2018	No response received to date
Virginia-North Carolina Piedmont Genealogical Society	8/19/2018	No response received to date
Afro-American Historical and Genealogical Society of North Carolina, Piedmont Triad Chapter	8/21/2018, 11/19/2018, 2/7/2019, 2/11/2019, 3/5/2019	3/4/2019

REVISED Table 4.3-5 Potential Cultural Resources Reported in Public Comments (updated October 1, 2019)				
Resource Number	**Resource Name**	**Distance from CL/Facility**	**Applicant's NRHP Recommendation**	**Applicant's Effects Recommendation**
071-0036	Little Cherrystone Manor	Property is crossed by CL	NRHP Listed	Assess effects and mitigate as necessary
071-0036	*Little Cherrystone Manor – mound adjacent to cemetery*	*~30 feet from workspace*	*Within NRHP Listed Property*	*Mound is outside direct effects APE*
071-0002	Bachelors Hall Plantation	8100 feet from TA-PI-052	VDHR determined eligible	No effect; resource is outside indirect effects APE
071-0020	Oak Ridge Plantation	8000 feet from TA-PI-054	NRHP listed	No effect; resource is outside indirect effects APE
071-0026; 44PY0040	Oak Hill Plantation	2780 feet from TA-PI-063	NRHP listed but demolished	No effect; resource is outside indirect effects APE
071-0035	Windsor Plantation	2000 feet from CL	NRHP listed	No effect; resource is outside indirect effects APE
071-0006	Berry Hill Plantation	1070 feet from workspace	NRHP listed	No effect; resource is outside indirect effects APE
AM0003	Glencoe Mill Village	1500 feet from CL	NRHP Listed Historic District	No effect; resource is outside indirect effects APE
AM2545	Arches Grove United Church of Christ	2340 feet from CL	Not Eligible	N/A
None	Moore property – 1810 farmhouse 613 Live Oak Road, Reidsville	~1400 feet from CL	Unassessed; property has not been accessed for above ground resources survey. Tax data suggest frame house on the property was built in 1973.	Unknown but likely no effect due to distance and vegetative screening
None	Moore property - family cemetery	Unknown	Unassessed/	No effect; property is not within direct effects APE
None	Moore property – Native American sites	Unknown	Unassessed/	No effect; property is not within direct effects APE
31AM431	Archaeological Site 31AM431	700 feet from PA-AL-174	Unassessed	No effect; property is not within direct effects APE
None	Burlington-Hillsborough Stage Coach Trail 2102 Roney Lineberry Road, Burlington	Unknown	Unassessed	No effect. The limited portion of the property within direct effects APE has been surveyed and no evidence of a roadbed or other cultural resources was identified.
AM2635	*William Fonville Family House 1648 S. Fonville Road, Burlington*	*750 feet from CL*	*Not Eligible*	*N/A*
AM0555	Aldridge building – Anderson House	11,500 feet from TAR-AL-79A	Unassessed (on NC HPO study list)	No effect; resource is outside indirect effects APE
AM0196	Aldridge building – Jacob Holt House	10,000 feet from TAR-AL-79A	Unassessed (on NC HPO study list)	No effect; resource is outside indirect effects APE
None known	Aldridge cemetery #1	Unknown; at least 9,000 feet from TAR-AL-79A	Unassessed	No effect; resource is outside direct effects APE
None known	Aldridge cemetery #2	Unknown; at least 9,000 feet from TAR-AL-79A	Unassessed	No effect; resource is outside direct effects APE

REVISED Table 4.3-5 Potential Cultural Resources Reported in Public Comments (updated October 1, 2019)				
Resource Number	**Resource Name**	**Distance from CL/Facility**	**Applicant's NRHP Recommendation**	**Applicant's Effects Recommendation**
AM0464	Kerr Scott Farm	1500 feet from CL	NRHP Listed	No effect; resource is outside indirect effects APE

NOTE:
Entries in italics have been added or updated

REVISED Table 4.5-5 Cultural Resources Survey Status of Pipeline Route (current as of October 15, 2019)*				
Facility	**County, State**	**Milepost**		**Survey Status/Scheduled Completion Date**
		Start	**End**	
H-605 Pipeline	Pittsylvania, VA	0	0.47	Surveyed
H-650 Pipeline	Pittsylvania, VA	0	4.40	Surveyed
H-650 Pipeline	Pittsylvania, VA	4.40	4.41	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	4.41	9.36	Surveyed
H-650 Pipeline	Pittsylvania, VA	9.36	9.37	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	9.37	9.60	Surveyed
H-650 Pipeline	Pittsylvania, VA	9.60	9.63	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	9.63	9.72	Surveyed
H-650 Pipeline	Pittsylvania, VA	9.72	9.85	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	9.85	13.53 RR	Surveyed
H-650 Pipeline	Pittsylvania, VA	13.53 RR	13.55 RR	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	13.55 RR	14.75 RR	Surveyed
H-650 Pipeline	Pittsylvania, VA	14.75 RR	14.70	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	14.70	14.73	Surveyed
H-650 Pipeline	Pittsylvania, VA	14.73	14.77	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	14.77	19.98	Surveyed
H-650 Pipeline	Pittsylvania, VA	19.98	19.99	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	19.99	22.43 RR	Surveyed
H-650 Pipeline	Pittsylvania, VA	22.43 RR	22.45 RR	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	22.45 RR	23.90 RR	Surveyed
H-650 Pipeline	Pittsylvania, VA	23.90 RR	23.90	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	23.90	24.76	Surveyed
H-650 Pipeline	Pittsylvania, VA	24.76	24.92	Pending survey completion
H-650 Pipeline	Pittsylvania, VA	24.92	26.74	Surveyed
H-650 Pipeline	Rockingham, NC	26.74	26.75	Pending survey completion
H-650 Pipeline	Rockingham, NC	26.75	26.91	Surveyed
H-650 Pipeline	Rockingham, NC	26.91	26.95	Pending survey completion
H-650 Pipeline	Rockingham, NC	26.95	26.98	Surveyed
H-650 Pipeline	Rockingham, NC	26.98	27.0 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	27.0 RR	27.06 RR	Surveyed
H-650 Pipeline	Rockingham, NC	27.06 RR	27.07 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	27.07 RR	27.65	Surveyed
H-650 Pipeline	Rockingham, NC	27.65	27.67 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	27.67 RR	33.60	Surveyed
H-650 Pipeline	Rockingham, NC	33.60	33.88	Pending survey completion
H-650 Pipeline	Rockingham, NC	33.88	37.71	Surveyed
H-650 Pipeline	Rockingham, NC	37.71	37.84	Pending survey completion
H-650 Pipeline	Rockingham, NC	37.84	42.16	Surveyed
H-650 Pipeline	Rockingham, NC	42.16	42.18	Pending survey completion
H-650 Pipeline	Rockingham, NC	42.18	46.01 RR	Surveyed
H-650 Pipeline	Rockingham, NC	46.01 RR	46.27 RR	Pending survey completion

REVISED Table 4.5-5 Cultural Resources Survey Status of Pipeline Route (current as of October 15, 2019)*				
Facility	**County, State**	**Milepost**		**Survey Status/Scheduled Completion Date**
		Start	**End**	
H-650 Pipeline	Rockingham, NC	46.27 RR	46.28 RR	Surveyed
H-650 Pipeline	Rockingham, NC	46.28 RR	46.29 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	46.29 RR	46.48	Surveyed
H-650 Pipeline	Rockingham, NC	46.48	46.50	Pending survey completion
H-650 Pipeline	Rockingham, NC	46.50	49.93	Surveyed
H-650 Pipeline	Rockingham, NC	49.93 RR	50.13 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	50.13 RR	50.34 RR	Surveyed
H-650 Pipeline	Rockingham, NC	50.34 RR	50.60 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	50.60 RR	51.58 RR	Surveyed
H-650 Pipeline	Rockingham, NC	51.58 RR	51.69 RR	Pending survey completion
H-650 Pipeline	Rockingham, NC	51.69	52.35	Surveyed
H-650 Pipeline	Rockingham, NC	52.35	52.37	Pending survey completion
H-650 Pipeline	Rockingham, NC	52.37	52.40 RR	Surveyed
H-650 Pipeline	Rockingham, NC	52.40 RR	52.48 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	52.48 RR	52.77	Surveyed
H-650 Pipeline	Alamance, NC	52.77	52.91	Pending survey completion
H-650 Pipeline	Alamance, NC	52.91	53.89	Surveyed
H-650 Pipeline	Alamance, NC	53.89	53.90	Pending survey completion
H-650 Pipeline	Alamance, NC	53.90	57.86	Surveyed
H-650 Pipeline	Alamance, NC	57.86	58.53	Pending survey completion
H-650 Pipeline	Alamance, NC	58.53	58.66 RR	Surveyed
H-650 Pipeline	Alamance, NC	58.66 RR	59.72	Pending survey completion
H-650 Pipeline	Alamance, NC	59.72	61.29	Surveyed
H-650 Pipeline	Alamance, NC	61.29	61.31	Pending survey completion
H-650 Pipeline	Alamance, NC	61.31	61.35	Surveyed
H-650 Pipeline	Alamance, NC	61.35	61.37	Pending survey completion
H-650 Pipeline	Alamance, NC	61.37	64.62	Surveyed
H-650 Pipeline	Alamance, NC	64.62	64.78	Pending survey completion
H-650 Pipeline	Alamance, NC	64.78	65.28 RR	Surveyed
H-650 Pipeline	Alamance, NC	65.28 RR	65.31 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	65.31 RR	65.36 RR	Surveyed
H-650 Pipeline	Alamance, NC	65.36 RR	65.37 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	65.37 RR	65.49 RR	Surveyed
H-650 Pipeline	Alamance, NC	65.49 RR	65.53 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	65.53 RR	65.99 RR	Surveyed
H-650 Pipeline	Alamance, NC	65.99 RR	66.11 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	66.11 RR	66.50 RR	Surveyed
H-650 Pipeline	Alamance, NC	66.50 RR	66.55 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	66.55 RR	66.65 RR	Surveyed
H-650 Pipeline	Alamance, NC	66.65 RR	66.82 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	66.82 RR	66.90 RR	Surveyed
H-650 Pipeline	Alamance, NC	66.90 RR	67.27 RR	Pending survey completion

REVISED Table 4.5-5 Cultural Resources Survey Status of Pipeline Route (current as of October 15, 2019)*				
Facility	**County, State**	**Milepost**		**Survey Status/Scheduled Completion Date**
		Start	**End**	
H-650 Pipeline	Alamance, NC	67.27 RR	67.60 RR	Surveyed
H-650 Pipeline	Alamance, NC	67.60 RR	67.63 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	67.63 RR	67.90	Surveyed
H-650 Pipeline	Alamance, NC	67.90	67.91	Pending survey completion
H-650 Pipeline	Alamance, NC	67.91	68.47	Surveyed
H-650 Pipeline	Alamance, NC	68.47	68.65	Pending survey completion
H-650 Pipeline	Alamance, NC	68.65	69.42	Surveyed
H-650 Pipeline	Alamance, NC	69.42	69.43	Pending survey completion
H-650 Pipeline	Alamance, NC	69.43	69.47	Surveyed
H-650 Pipeline	Alamance, NC	69.47	69.65	Pending survey completion
H-650 Pipeline	Alamance, NC	69.65	69.75 RR	Surveyed
H-650 Pipeline	Alamance, NC	69.75 RR	69.85 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	69.85	69.97 RR	Surveyed
H-650 Pipeline	Alamance, NC	69.97 RR	69.98 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	69.98 RR	70.23 RR	Surveyed
H-650 Pipeline	Alamance, NC	70.23 RR	70.26 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	70.26 RR	71.88	Surveyed
H-650 Pipeline	Alamance, NC	71.88	71.94 RR	Pending survey completion
H-650 Pipeline	Alamance, NC	71.94 RR	72.01 RR	Surveyed
H-650 Pipeline	Alamance, NC	72.01 RR	72.20	Pending survey completion
H-650 Pipeline	Alamance, NC	72.20	72.84	Surveyed
H-650 Pipeline	Alamance, NC	72.84	72.86	Pending survey completion
H-650 Pipeline	Alamance, NC	72.86	73.17RR	Surveyed
*Note: Mainline valves, Groundbeds, ATWSs, and pig launcher/receiver locations are included within the survey corridor for the H-650 pipeline.				

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
Compressor Station Lambert Compressor Station / Interconnect / MLV 1	0.0	Pittsylvania, VA	3.29	Pending survey completion
Interconnects				
LN 3600 Interconnect	28.2	Rockingham, NC	0.28	Surveyed
T-15 Dan River Interconnect / MLV 4	30.4	Rockingham, NC	0.68	Surveyed
T-21 Haw River Interconnect / MLV 8	73.17RR	Alamance, NC	0.48	Surveyed
Contractor Yards				
CY-01	N/A	Pittsylvania, VA	22.03	Surveyed
CY-03	N/A	Pittsylvania, VA	16.82	Surveyed
CY-05	N/A	Rockingham, NC	18.30	Surveyed
CY-08	N/A	Rockingham, NC	11.47	Surveyed
CY-19	N/A	Pittsylvania, VA	36.19	Pending survey completion
CY-22	N/A	Pittsylvania, VA	23.05	Pending survey completion
CY-25	N/A	Caswell, NC	24.85	Pending survey completion
CY-26A	N/A	Alamance, NC	11.76	Surveyed
CY-26B	N/A	Alamance, NC	10.32	Surveyed
Access Roads				
TA-PI-000A	CY-01	Pittsylvania, VA	0.01	Surveyed
TA-PI-000B	CY-03	Pittsylvania, VA	0.10	Surveyed
TA-PI-065	CY-19	Pittsylvania, VA	0.04	Pending survey completion
TA-PI-065A	CY-19	Pittsylvania, VA	1.29	Pending survey completion
TA-PI-040	CY-22	Pittsylvania, VA	0.04	Pending survey completion
TA-PI-040A	CY-22	Pittsylvania, VA	0.03	Pending survey completion
TA-PI-000	0	Pittsylvania, VA	0.19	Surveyed
PA-PI-001A	0.47	Pittsylvania, VA	1.46	Surveyed
PA-PI-001B	0.47	Pittsylvania, VA	0.49	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
PA-PI-001C	0.47	Pittsylvania, VA	0.34	Surveyed
TA-PI-004	1.6	Pittsylvania, VA	1.82	Surveyed
TA-PI-005	2.3	Pittsylvania, VA	2.20	Pending survey completion
TA-PI-006	3.4	Pittsylvania, VA	0.75	Pending survey completion*
TA-PI-008	4.5	Pittsylvania, VA	0.17	Surveyed
TA-PI-007	4.6	Pittsylvania, VA	0.53	Surveyed
TA-PI-011	5.1	Pittsylvania, VA	3.08	Pending survey completion
TA-PI-015	5.6	Pittsylvania, VA	0.62	Surveyed
TA-PI-016	5.9	Pittsylvania, VA	1.99	Surveyed
TA-PI-017	6.2	Pittsylvania, VA	0.51	Surveyed
TA-PI-018	6.8	Pittsylvania, VA	0.89	Pending survey completion
PA-PI-018B	7.4	Pittsylvania, VA	0.02	Surveyed
TA-PI-022	8.5	Pittsylvania, VA	1.66	Pending survey completion
TA-PI-023	9.0	Pittsylvania, VA	1.23	Surveyed
PA-PI-024	9.3	Pittsylvania, VA	0.01	Surveyed
TA-PI-025	9.6	Pittsylvania, VA	1.37	Pending survey completion
TA-PI-026B	10.4	Pittsylvania, VA	0.03	Surveyed
TA-PI-027	11.1	Pittsylvania, VA	0.92	Pending survey completion
TA-PI-032	13.2	Pittsylvania, VA	0.60	Surveyed
TA-PI-033	13.2	Pittsylvania, VA	0.43	Surveyed
TA-PI-035	14.2 RR	Pittsylvania, VA	2.52	Pending survey completion
TA-PI-037	15.2	Pittsylvania, VA	0.98	Pending survey completion
TA-PI-037A	15.9	Pittsylvania, VA	0.01	Surveyed
TA-PI-037B	15.9	Pittsylvania, VA	0.02	Surveyed
TA-PI-041	16.7	Pittsylvania, VA	0.38	Surveyed
TA-PI-043	17.2	Pittsylvania, VA	1.23	Surveyed
TA-PI-046	18.0	Pittsylvania, VA	0.89	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
PA-PI-046A	18.3	Pittsylvania, VA	0.01	Surveyed
TA-PI-049	19.5	Pittsylvania, VA	0.17	Surveyed
TA-PI-050	20.0	Pittsylvania, VA	0.19	Surveyed
PA-PI-050	20.0	Pittsylvania, VA	0.01	Surveyed
TA-PI-051A	20.2	Pittsylvania, VA	0.06	Pending survey completion
TA-PI-052	20.4	Pittsylvania, VA	1.66	Surveyed
TA-PI-053	21.1	Pittsylvania, VA	0.53	Pending survey completion
TA-PI-061	23.0 RR	Pittsylvania, VA	2.02	Surveyed
TA-PI-063	24.0	Pittsylvania, VA	1.59	Surveyed
TA-PI-066	24.8	Pittsylvania, VA	1.45	Pending survey completion
TA-PI-067	25.1	Pittsylvania, VA	1.19	Pending survey completion
TA-RO-082C	CY-05	Rockingham, NC	0.02	Surveyed
TA-RO-082D	CY-05	Rockingham, NC	0.01	Surveyed
TA-RO-082E	CY-05	Rockingham, NC	0.01	Surveyed
TA-RO-000A	CY-08	Rockingham, NC	0.21	Surveyed
TA-CA-105	CY-25	Caswell, NC	1.29	Pending survey completion
TA-AL-195	CY-26A	Alamance, NC	0.07	Surveyed
TA-AL-196	CY-26B	Alamance, NC	0.04	Pending survey completion
TA-AL-197	CY-26B	Alamance, NC	0.06	Pending survey completion
TA-RO-072	26.9	Rockingham, NC	0.61	Surveyed
TA-RO-072A	26.9	Rockingham, NC	0.14	Pending survey completion
TA-RO-072B	27.0 RR	Rockingham, NC	0.25	Pending survey completion
TA-RO-075	28.1 RR	Rockingham, NC	1.28	Pending survey completion
PA-RO-000	28.2 RR	Rockingham, NC	2.86	Surveyed
TA-RO-076	28.6 RR	Rockingham, NC	1.45	Pending survey completion
TA-RO-078	29.2	Rockingham, NC	1.29	Surveyed
TA-RO-079	29.6	Rockingham, NC	0.17	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
TA-RO-079A	29.6	Rockingham, NC	1.06	Surveyed
TA-RO-080	29.9	Rockingham, NC	2.15	Surveyed
TA-RO-081	30.4	Rockingham, NC	0.02	Surveyed
TA-RO-083	30.4	Rockingham, NC	0.12	Surveyed
PA-RO-082	30.4	Rockingham, NC	0.12	Surveyed
PA-RO-082A	30.4	Rockingham, NC	0.06	Surveyed
TA-RO-085	32.4	Rockingham, NC	2.05	Surveyed
TA-RO-087	32.8	Rockingham, NC	1.54	Surveyed
TA-RO-088	33.6	Rockingham, NC	1.05	Pending survey completion
TA-RO-091	34.7	Rockingham, NC	0.58	Surveyed
TA-RO-092	35.4	Rockingham, NC	0.51	Surveyed
TA-RO-094	35.9	Rockingham, NC	0.46	Surveyed
TA-RO-100	37.0	Rockingham, NC	1.00	Surveyed
TA-RO-102	37.6	Rockingham, NC	0.89	Surveyed
TA-RO-103	38.1	Rockingham, NC	0.87	Surveyed
TA-RO-106	38.9	Rockingham, NC	0.16	Surveyed
TA-RO-106A	38.8	Rockingham, NC	0.02	Surveyed
TA-RO-107	39.6	Rockingham, NC	0.40	Surveyed
TA-RO-108	39.6	Rockingham, NC	0.12	Surveyed
TA-RO-109	39.7	Rockingham, NC	0.67	Surveyed
TA-RO-110	40.4 RR	Rockingham, NC	0.02	Surveyed
TA-RO-111	40.9	Rockingham, NC	1.90	Surveyed
TA-RO-112	41.4	Rockingham, NC	1.97	Surveyed
TA-RO-113	41.8	Rockingham, NC	0.11	Surveyed
PA-RO-113A	41.8	Rockingham, NC	1.03	Surveyed
PA-RO-114A	42.2	Rockingham, NC	0.03	Surveyed
TA-RO-115	42.4	Rockingham, NC	0.34	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
TA-RO-115B	43.2	Rockingham, NC	0.02	Surveyed
TA-RO-115C	43.2	Rockingham, NC	0.01	Surveyed
TA-RO-118A	43.4	Rockingham, NC	0.03	Surveyed
TA-RO-118B	43.4	Rockingham, NC	0.01	Surveyed
TA-RO-119	43.9	Rockingham, NC	1.11	Surveyed
TA-RO-122	44.1	Rockingham, NC	1.09	Surveyed
PA-RO-124A	44.9	Rockingham, NC	0.01	Surveyed
TA-RO-125	45.0	Rockingham, NC	0.14	Surveyed
TA-RO-126	45.3	Rockingham, NC	1.31	Pending survey completion*
TA-RO-127	46.1 RR	Rockingham, NC	1.59	Pending survey completion
TA-RO-129	46.7	Rockingham, NC	0.91	Surveyed
TA-RO-130	47.3	Rockingham, NC	1.27	Surveyed
TA-RO-131A	48.4	Rockingham, NC	0.03	Surveyed
TA-RO-131B	48.4	Rockingham, NC	0.02	Surveyed
TA-RO-134	48.9	Rockingham, NC	0.03	Surveyed
TA-RO-135	49.2	Rockingham, NC	0.27	Pending survey completion
TA-RO-136A	49.5	Rockingham, NC	0.02	Surveyed
TA-RO-136B	49.5	Rockingham, NC	0.02	Surveyed
TA-RO-138	49.8 RR	Rockingham, NC	0.46	Surveyed
TA-RO-139	50.3 RR	Rockingham, NC	1.60	Pending survey completion
TA-RO-140	51.4 RR	Rockingham, NC	0.51	Pending survey completion
TA-RO-141	51.6	Rockingham, NC	0.26	Surveyed
TA-RO-142	51.8	Rockingham, NC	0.39	Pending survey completion
TA-RO-144	52.1 RR	Rockingham, NC	0.31	Surveyed
TA-RO-144A	52.2 RR	Rockingham, NC	0.28	Surveyed
TA-RO-145	52.3	Rockingham, NC	0.32	Surveyed
TA-AL-147	53.0	Alamance, NC	0.08	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
TA-AL-149A	53.3	Alamance, NC	0.01	Surveyed
TA-AL-149B	53.3	Alamance, NC	0.02	Surveyed
TA-AL-153	53.8	Alamance, NC	0.82	Surveyed
TA-AL-154	54.2	Alamance, NC	0.72	Surveyed
TA-AL-155	54.7	Alamance, NC	2.02	Surveyed
PA-AL-155A	55.1	Alamance, NC	0.02	Surveyed
PA-AL-155B	55.1	Alamance, NC	0.01	Surveyed
TA-AL-156	55.5	Alamance, NC	0.34	Surveyed
TA-AL-157	55.6	Alamance, NC	0.28	Surveyed
TA-AL-159B	56.8	Alamance, NC	0.13	Surveyed
TA-AL-159A	56.9	Alamance, NC	1.07	Surveyed
TA-AL-161	57.7	Alamance, NC	0.38	Surveyed
TA-AL-162	58.1	Alamance, NC	0.58	Pending survey completion
TA-AL-163	58.4	Alamance, NC	0.60	Pending survey completion
TA-AL-165A	60.0	Alamance, NC	0.02	Surveyed
TA-AL-165B	60.0	Alamance, NC	0.02	Surveyed
TA-AL-166A	60.2	Alamance, NC	0.01	Surveyed
TA-AL-166B	60.2	Alamance, NC	0.01	Surveyed
PA-AL-166	60.3	Alamance, NC	0.09	Surveyed
TA-AL-167	61.2	Alamance, NC	0.44	Surveyed
TA-AL-168	61.6	Alamance, NC	0.36	Surveyed
TA-AL-169	62.5	Alamance, NC	0.83	Surveyed
TA-AL-171A	63.3 RR	Alamance, NC	0.16	Surveyed
TA-AL-172	63.7	Alamance, NC	1.38	Surveyed
TA-AL-175A	64.8	Alamance, NC	0.02	Surveyed
TA-AL-172A	64.8	Alamance, NC	0.01	Surveyed
TA-AL-172B	64.8	Alamance, NC	0.02	Surveyed

REVISED Table 4.5-6 Cultural Resources Survey Status of Aboveground Facilities (current as of October 15, 2019)				
Facility	**Approximate Milepost**	**County, State**	**Area (acres) Required for Construction**	**Survey Status/Scheduled Completion Date**
TA-AL-179B	67.2 RR	Alamance, NC	1.09	Pending survey completion
TA-AL-180	67.4 RR	Alamance, NC	1.12	Surveyed
TA-AL-181	68.0	Alamance, NC	0.88	Surveyed
TA-AL-181A	68.2	Alamance, NC	1.16	Surveyed
PA-AL-182	68.7	Alamance, NC	0.07	Surveyed
TA-AL-185	68.9	Alamance, NC	0.92	Surveyed
TA-AL-186	69.2	Alamance, NC	0.02	Surveyed
TA-AL-187B	69.8 RR	Alamance, NC	0.18	Pending survey completion
TA-AL-187A	69.9 RR	Alamance, NC	0.65	Pending survey completion
TA-AL-188	70.9	Alamance, NC	0.45	Surveyed
TA-AL-189	71.2	Alamance, NC	1.32	Surveyed
TA-AL-190	71.5	Alamance, NC	0.89	Pending survey completion
TA-AL-192	72.2	Alamance, NC	0.74	Pending survey completion
TA-AL-193	72.4	Alamance, NC	0.73	Surveyed
TA-AL-193A	72.9 RR	Alamance, NC	0.05	Surveyed
PA-AL-194	73.17 RR	Alamance, NC	0.12	Surveyed
* Note: Survey complete except for turning apron.				

MVP Southgate Project

Docket No. CP19-14-000

Cultural Resources Addendum Reports

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(Provided Under Separate Cover)

October 2019

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 5 Table Updates

October 2019

LIST OF TABLES

REVISED [Oct 2019] - Table 5.2-1 Construction Schedule for the MVP Southgate Project				
Facility	**County/State**	**Milepost**		**Miles**
		From	**To**	
H-605 Pipeline				
Spread 1	Pittsylvania, Virginia	0.0	0.5	0.5
H-650 Pipeline				
Spread 1	Pittsylvania, Virginia	0.0RR	26.1	26.4
	Rockingham, North Carolina	26.1	30.4	4.4
Spread 2	Rockingham, North Carolina	30.4	52.6	22.4
	Alamance, North Carolina	52.6	73.2RR	21.5
			Total	**75.1**
Facility				
Lambert Compressor Station /Lambert Interconnect Delivery / MLV 1	Pittsylvania, Virginia	0.0RR	N/A	N/A
LN 3600 Interconnect Delivery	Rockingham, North Carolina	28.2	N/A	N/A
T-15 Dan River Interconnect Delivery / MLV 4	Rockingham, North Carolina	30.4	N/A	N/A
T-21 Haw River Interconnect Delivery / MLV 8	Alamance, North Carolina	73.2RR	N/A	N/A
N/A = Not Applicable				

REVISED [Oct 2019] - Table 5.3-9

EJ Block Group and Census Tracts for Counties Crossed by the MVP Southgate Project Facilities

State/County Block Group/Census Tract	Total Population	Median Household Income (U.S. Dollars)	Percent												
			White	African American	Native American & Alaskan Native	Asian	Native Hawaiian & Pacific Islander	Other Race	Hispanic or Latino Origin	Children (5 and under)	Elderly (over 65)	Non- English at Home a/	Less Than High School Education	Minority Population b/, c/	Household Poverty b/
Virginia	**8,365,952**	**$66,149**	**68.4**	**19.2**	**0.3**	**6.2**	**0.1**	**2.4**	**9.0**	**6.1**	**13.8**	**15.5**	NA	37.4	26.0
PIPELINE															
Pittsylvania County	***61,970***	***$43,087***	***74.9***	***21.2***	***0.1***	***0.4***	***0.2***	***1.6***	***2.5***	***4.5***	***19.8***	***3.7***	***14.8***	***25.8***	***40.0***
Block Group 1, Census Tract 105[1]	1,176	NA	77.8	18.1	0.0	0.9	0.0	3.1	3.1	5	19	5	2	22.2	**33.2**
Block Group 3, Census Tract 105	2,246	NA	49.8	45.2	0.0	1.3	0.0	0.7	1.2	2	13	5	4	**50.2**	46.7
Block Group 2, Census Tract 109	1,461	NA	86.8	9.0	0.0	0.0	0.0	2.4	2.8	3	20	3	5	13.6	32.0
Block Group 1, Census Tract 110.02	3,303	NA	83.4	15.4	0.1	0.3	0.0	0.0	0.3	4	17	4	4	16.6	21.6
Block Group 2, Census Tract 110.02	1,330	NA	82.3	11.8	0.0	0.0	0.8	0.0	0.0	6	16	4	7	17.7	**41.6**
Block Group 3, Census Tract 110.01	1,016	NA	86.2	13.4	0.0	0.0	0.0	0.0	0.0	6	17	2	2	13.8	28.7
Block Group 2, Census Tract 110.01	854	NA	92.7	5.8	0.0	0.0	0.0	0.0	0.0	1	24	2	8	7.3	37.6
Block Group 1, Census Tract 111	1,460	NA	88.1	11.9	0.0	0.0	0.0	0.0	7.7	2	20	6	3	19.6	45.9
Block Group 2, Census Tract 111	1,496	NA	46.4	41.5	0.0	0.0	0.0	12.1	12.1	7	13	6	6	**53.6**	26.5
CONTRACTOR YARDS															
CY-03 Block Group 3, Census Tract 114	508	NA	79.7	20.3	0.0	0.0	0.0	0.0	0.0	13	29	5	11	20.3	31.0
CY-19 Block Group 2, Census Tract 111	1,496	NA	46.4	41.5	0.0	0.0	.0.	12.1	12.1	--	--	--	--	**53.6**	26.5
CY-22 Block Group 1, Census Tract 110.01	2,516	NA	79.8	18.9	0.0	0.0	0.0	0.9	3.8	--	--	--	--	22.5	45.5
North Carolina	**10,052,564**	**$48,256**	**69.0**	**21.5**	**1.2**	**2.7**	**0.1**	**3.1**	**9.1**	**6.1**	**14.7**	**11.3**	NA	36.4	36.5
PIPELINE															
Rockingham County	***91,566***	***$40,003***	***75.9***	***18.6***	***0.5***	***0.6***	***0.1***	***2.4***	***5.5***	***5.2***	***18.3***	***5.6***	***14.1***	***27.4***	***41.5***
Block Group 1, Census Tract 402[2]	984	NA	90.7	7.2	0.0	0.7	0.0	0.0	2.0	2	23	16	7	11.4	47.8
Block Group 1, Census Tract 401.01	919	NA	70.2	29.8	0.0	0.0	0.0	0.0	0.3	0	15	5	5	30.1	**44.6**
Block Group 1, Census Tract 411	627	NA	77.2	22.8	0.0	0.0	0.0	0.0	0.0	0	21	1	2	22.8	48.2
Block Group 3, Census Tract 401.01	1,401	NA	63.2	21.8	0.0	0.0	0.0	12.3	15.8	9	22	9	7	38.7	34.8
Block Group 2, Census Tract 401.01	1,742	NA	72.6	24.5	2.3	0.0	0.0	0.0	0.0	2	20	4	6	27.4	37.3
Block Group 2, Census Tract 401.02	1,236	NA	56.8	43.2	0.0	0.0	0.0	0.0	4.4	13	10	2	2	**47.6**	**58.0**
Block Group 3, Census Tract 401.02	844	NA	80.8	8.6	0.0	0.0	0.0	0.0	0.0	6	22	0	4	27.0	50.1
Block Group 1, Census Tract 413	1,810	NA	85.4	9.9	0.0	0.8	0.0	0.0	2.6	7	18	2	10	17.2	48.3
Block Group 4, Census Tract 413	1,032	NA	67.2	27.9	0.0	0.0	0.0	0.9	11.1	7	21	17	4	**43.0**	**52.0**
Block Group 2, Census Tract 413	1,088	NA	68.0	27.8	4.2	0.0	0.0	0.0	0.6	1	25	0	3	32.6	39.1
CONTRACTOR YARDS															
CY-08 Block Group 2, Census Tract 414	901	NA	57.4	42.6	0.0	0.0	0.0	0.0	24.4	9	19	8	15	***64.5***	***78.3***
Caswell County															

REVISED [Oct 2019] - Table 5.3-9

EJ Block Group and Census Tracts for Counties Crossed by the MVP Southgate Project Facilities

State/County Block Group/Census Tract	Total Population	Median Household Income (U.S. Dollars)	Percent												
			White	African American	Native American & Alaskan Native	Asian	Native Hawaiian & Pacific Islander	Other Race	Hispanic or Latino Origin	Children (5 and under)	Elderly (over 65)	Non- English at Home a/	Less Than High School Education	Minority Population b/, c/	Household Poverty b/
CY-25 Block Group 3, Census Tract 9302	1,804	NA	46.5	51.6	0.0	1.2	00	0.0	0.0	--	--	--	--	***54.0***	***60***
PIPELINE															
Alamance County	***157,844***	***$43,209***	***70.5***	***19.0***	***0.3***	***1.5***	***0.0***	***6.1***	***12.3***	***5.9***	***16.0***	***12.6***	***17.3***	***35.0***	***40.3***
Block Group 2, Census Tract 215	1,477	NA	82.3	11.0	0.0	0.0	0.0	6.6	6.6	6	13	6	3	17.7	19.0
Block Group 1, Census Tract 215	1,243	NA	82.0	10.9	0.0	0.0	0.0	7.1	7.1	9	17	8	2	18.0	34.8
Block Group 4, Census Tract 215	1,407	NA	88.3	7.0	0.0	0.0	0.0	3.6	3.6	5	18	2	0	11.7	**36.2**
Block Group 3, Census Tract 215	863	NA	79.7	2.0	0.0	0.0	0.0	2.8	19.6	10	12	2	3	21.6	38.4
Block Group 1, Census Tract 214	1,753	NA	94.8	1.1	0.0	0.5	0.0	0.0	4.5	5	22	5	3	9.7	35.8
Block Group 5, Census Tract 213	874	NA	64.1	30.2	0.1	0.0	0.0	2.6	4.8	5	22	5	6	36.8	46.3
Block Group 2, Census Tract 212.01	1,763	NA	66.3	20.2	0.0	0.0	0.2	10.2	13.9	6	14	10	10	37.4	**44.1**
Block Group 3, Census Tract 212.01	1,314	NA	84.1	8.2	0.0	0.0	0.0	7.2	7.2	1	10	9	7	15.9	**55.3**
Block Group 1, Census Tract 220.01	1,571	NA	79.1	18.3	0.0	2.0	0.0	0.0	3.9	5.0	19	5	6	24.7	21.3
CONTRACTOR YARDS															
CY-26A Block Group 3, Census Tract 212.04[3]	4,691	NA	76.1	20.9	0.0	0.0	0.0	2.6	21.1	--	--	--	--	42.0	33.5

Sources: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimate and Table C17002 – Ratio of Income to Poverty Level in the Past 12 Months – Population Less than 2 Times the Poverty Level

Notes:
[1] CY-01 included in Block Group 1, Census Tract 105
[2] CY-05 included in Block Group 1, Census Tract 402
[3] CY-26B included in Block Group 3, Census Tract 212.04
a/ Percent is only for non-English population age 5 years and over.
b/ Data fields are shaded in green for those census block groups with more than 50 percent of minority population and/or households below the poverty level.
c/ Minority population includes total population other than non-Hispanic whites.
N/A = Not applicable.

REVISED [Oct 2019] - Table 5.3-10

EJ Block Group and Census Tracts for Counties Crossed by the MVP Southgate Project by Milepost

State/*County* Block Group/Census Tract	**Milepost Enter**	**Milepost Exit**	**Total Distance (Miles) b/**	**Collocation Distance (Miles)**
Virginia/*Pittsylvania County*				
Block Group 1, Census Tract 105 a/	0.0	0.47	0.47	0.05
Block Group 1, Census Tract 105 c/	0.00RR	4.33	**4.36***	**3.29***
Block Group 3, Census Tract 105	4.33	4.94	0.62	.054
Block Group 2, Census Tract 109	4.94	10.74	5.80	4.99
Block Group 1, Census Tract 110.02	10.74	13.38	2.63	1.67
Block Group 2, Census Tract 110.02	13.38	15.93	2.55	0.90
Block Group 3, Census Tract 110.01	15.93	18.26	2.33	1.31
Block Group 2, Census Tract 110.01	18.26	19.96	1.71	1.71
Block Group 1, Census Tract 111	19.96	23.70	3.73	3.73
Block Group 2, Census Tract 111	23.70	26.09	**2.39***	**2.39***
North Carolina/*Rockingham County*				
Block Group 1, Census Tract 402 c/	26.09	30.08	4.02	3.29
Block Group 1, Census Tract 401.01	30.08	30.48	0.40	0.40
Block Group 1, Census Tract 411 c/	30.48	36.28	5.81	3.36
Block Group 3, Census Tract 401.01	36.28	38.82	2.54	0.42
Block Group 2, Census Tract 401.01	38.82	39.68	0.86	.017
Block Group 2, Census Tract 401.02	39.68	40.34	**0.66***	**0.00***
Block Group 3, Census Tract 401.02	40.34	42.19	**1.84***	**1.00***
Block Group 1, Census Tract 413	42.19	43.16	0.97	0.40
Block Group 4, Census Tract 413	43.16	44.90	**1.74***	**0.70***
Block Group 1, Census Tract 413	44.90	48.41	3.51	0.19
Block Group 2, Census Tract 413	48.41	52.63	4.22	3.24
North Carolina/*Alamance County*				
Block Group 2, Census Tract 215	52.63	55.07	2.43	1.92
Block Group 1, Census Tract 215	55.07	57.86	2.79	1.89
Block Group 4, Census Tract 215	57.86	60.26	2.40	0.63
Block Group 3, Census Tract 215	60.26	61.37	1.11	0.00
Block Group 1, Census Tract 214 c/	61.37	66.08	4.77	0.00
Block Group 5, Census Tract 213	66.08	66.39	0.30	0.00
Block Group 2, Census Tract 212.01	66.39	69.65	**3.26***	**0.00***
Block Group 3, Census Tract 212.01	69.65	72.92	3.27	0.00
Block Group 1, Census Tract 220.01 c/	72.92	73.17RR	0.15	0.00
		TOTALS	**73.67 (14.3*)**	**37.55 (7.4*)**

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates.

a/ Southgate Lateral (H605 Pipeline).

b/ Totals may be off slightly due to rounding of numbers. Total distance crossed incorporates the station equations for the incorporated reroutes.

* /Bold, Green highlight, Potential EJ Community.

MVP Southgate Project

Docket No. CP19-14-000

Resource Report 6 Table Updates

October 2019

LIST OF TABLES

REVISED [Oct 2019] - Table 6.2-1 Elevations at the MVP Southgate Project Aboveground Facilities				
Facility	**Milepost a/**	**State / County**	**Approximate Minimum Elevation (feet above mean sea level)**	**Approximate Maximum Elevation (feet above mean sea level)**
Lambert Compressor Station / Interconnect / MLV 1	0.0RR	Virginia / Pittsylvania	647	665
LN 3600 Interconnect	28.2	North Carolina / Rockingham	508	514
T-15 Dan River Interconnect / MLV 4	30.4	North Carolina / Rockingham	504	508
T-21 Haw River Interconnect / MLV 8	73.2RR	North Carolina / Alamance	510	514
MLV 2	7.4	Virginia / Pittsylvania	726	728
MLV 3	18.3	Virginia / Pittsylvania	660	662
MLV 5	42.2	North Carolina / Rockingham	732	732
MLV 6	55.1	North Carolina / Alamance	716	718
MLV 7	68.7	North Carolina / Alamance	556	558
a/ Mileposts with an “RR” indicate locations where a re-route was incorporated into the pipeline alignment.				

REVISED [Oct 2019] - Table 6.5-1

Locations where the Project alignment intersects conglomerate that may represent karst terrain

County, State	From Milepost	To Milepost	Crossing Length (feet)	Rock Type	Construction Method
Karst features are not present along the Project alignment – See Karst Hazards Assessment, Version 3.0 Revised April 2019 (FERC Accession No. 20190522-5174).					

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Lateral (H-605 Pipeline)	30 to 50	0.12 RR	0.13 RR	25
Southgate Mainline (H-650 Pipeline)	30 to 50	3.94 RR	3.94 RR	26
Southgate Mainline (H-650 Pipeline)	30 to 50	4.12	4.12	27
Southgate Mainline (H-650 Pipeline)	30 to 50	4.84	4.85	25
Southgate Mainline (H-650 Pipeline)	50 to 66	5.11	5.12	21
Southgate Mainline (H-650 Pipeline)	50 to 66	5.24	5.25	28
Southgate Mainline (H-650 Pipeline)	30 to 50	5.25	5.25	28
Southgate Mainline (H-650 Pipeline)	30 to 50	5.65	5.66	24
Southgate Mainline (H-650 Pipeline)	50 to 66	6.99	6.99	29
Southgate Mainline (H-650 Pipeline)	30 to 50	7.60	7.61	25
Southgate Mainline (H-650 Pipeline)	30 to 50	7.98	7.99	75
Southgate Mainline (H-650 Pipeline)	30 to 50	8.58	8.58	29
Southgate Mainline (H-650 Pipeline)	50 to 66	8.58	8.59	29
Southgate Mainline (H-650 Pipeline)	30 to 50	8.59	8.59	34
Southgate Mainline (H-650 Pipeline)	66 to 80	9.95	9.95	30
Southgate Mainline (H-650 Pipeline)	50 to 66	9.95	9.96	24
Southgate Mainline (H-650 Pipeline)	30 to 50	9.96	9.96	18
Southgate Mainline (H-650 Pipeline)	30 to 50	10.08	10.09	44
Southgate Mainline (H-650 Pipeline)	30 to 50	10.29	10.30	25
Southgate Mainline (H-650 Pipeline)	30 to 50	11.04	11.06	76
Southgate Mainline (H-650 Pipeline)	50 to 66	11.83	11.84	24
Southgate Mainline (H-650 Pipeline)	30 to 50	12.78	12.79	52
Southgate Mainline (H-650 Pipeline)	66 to 80	13.47 RR	13.47 RR	35
Southgate Mainline (H-650 Pipeline)	30 to 50	13.47 RR	13.48 RR	33
Southgate Mainline (H-650 Pipeline)	30 to 50	17.27	17.28	51
Southgate Mainline (H-650 Pipeline)	50 to 66	17.29	17.30	31
Southgate Mainline (H-650 Pipeline)	30 to 50	17.30	17.31	49
Southgate Mainline (H-650 Pipeline)	30 to 50	17.63 RR	17.63 RR	21
Southgate Mainline (H-650 Pipeline)	50 to 66	17.70 RR	17.71 RR	53
Southgate Mainline (H-650 Pipeline)	30 to 50	17.71 RR	17.72 RR	45
Southgate Mainline (H-650 Pipeline)	30 to 50	17.81 RR	17.72 RR	36
Southgate Mainline (H-650 Pipeline)	30 to 50	17.92	17.93	50
Southgate Mainline (H-650 Pipeline)	30 to 50	18.01	18.02	94
Southgate Mainline (H-650 Pipeline)	30 to 50	20.39	20.41	118
Southgate Mainline (H-650 Pipeline)	30 to 50	20.63	20.64	72
Southgate Mainline (H-650 Pipeline)	30 to 50	21.52	21.54	73
Southgate Mainline (H-650 Pipeline)	30 to 50	21.54	21.55	42
Southgate Mainline (H-650 Pipeline)	30 to 50	22.00	22.01	27
Southgate Mainline (H-650 Pipeline)	30 to 50	22.35	22.36	32
Southgate Mainline (H-650 Pipeline)	30 to 50	22.50 RR	22.51 RR	32
Southgate Mainline (H-650 Pipeline)	30 to 50	22.71 RR	22.74 RR	120
Southgate Mainline (H-650 Pipeline)	30 to 50	22.83 RR	22.87 RR	193
Southgate Mainline (H-650 Pipeline)	30 to 50	22.90 RR	22.91 RR	26

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	30 to 50	22.95 RR	22.95 RR	32
Southgate Mainline (H-650 Pipeline)	30 to 50	23.20 RR	23.21 RR	22
Southgate Mainline (H-650 Pipeline)	50 to 66	23.21 RR	23.21 RR	20
Southgate Mainline (H-650 Pipeline)	30 to 50	23.21 RR	23.21 RR	20
Southgate Mainline (H-650 Pipeline)	30 to 50	23.24 RR	23.25 RR	90
Southgate Mainline (H-650 Pipeline)	30 to 50	24.37	24.37	31
Southgate Mainline (H-650 Pipeline)	30 to 50	24.78	24.79	77
Southgate Mainline (H-650 Pipeline)	30 to 50	24.99	25.00	56
Southgate Mainline (H-650 Pipeline)	30 to 50	25.16	25.17	45
Southgate Mainline (H-650 Pipeline)	30 to 50	26.19	26.20	21
Southgate Mainline (H-650 Pipeline)	30 to 50	27.49	27.50	22
Southgate Mainline (H-650 Pipeline)	66 to 80	27.52	27.52	16
Southgate Mainline (H-650 Pipeline)	30 to 50	27.52	27.52	10
Southgate Mainline (H-650 Pipeline)	30 to 50	28.82	28.85	142
Southgate Mainline (H-650 Pipeline)	30 to 50	28.95	28.96	63
Southgate Mainline (H-650 Pipeline)	30 to 50	29.28 RR	29.28 RR	39
Southgate Mainline (H-650 Pipeline)	30 to 50	29.34 RR	29.36 RR	124
Southgate Mainline (H-650 Pipeline)	30 to 50	29.41 RR	29.43 RR	133
Southgate Mainline (H-650 Pipeline)	30 to 50	29.52 RR	29.53 RR	23
Southgate Mainline (H-650 Pipeline)	50 to 66	29.53 RR	29.53 RR	9
Southgate Mainline (H-650 Pipeline)	50 to 66	30.05	30.06	31
Southgate Mainline (H-650 Pipeline)	30 to 50	31.06	31.06	22
Southgate Mainline (H-650 Pipeline)	30 to 50	31.06	31.07	36
Southgate Mainline (H-650 Pipeline)	30 to 50	31.09	31.12	139
Southgate Mainline (H-650 Pipeline)	30 to 50	31.28	31.29	68
Southgate Mainline (H-650 Pipeline)	30 to 50	31.30	31.31	57
Southgate Mainline (H-650 Pipeline)	30 to 50	31.31	31.32	31
Southgate Mainline (H-650 Pipeline)	30 to 50	31.67	31.68	97
Southgate Mainline (H-650 Pipeline)	30 to 50	31.70	31.70	34
Southgate Mainline (H-650 Pipeline)	30 to 50	31.72	31.73	66
Southgate Mainline (H-650 Pipeline)	30 to 50	31.86	31.87	51
Southgate Mainline (H-650 Pipeline)	30 to 50	31.87	31.88	40
Southgate Mainline (H-650 Pipeline)	66 to 80	31.88	31.89	54
Southgate Mainline (H-650 Pipeline)	30 to 50	31.89	31.89	10
Southgate Mainline (H-650 Pipeline)	66 to 80	31.93	31.93	29
Southgate Mainline (H-650 Pipeline)	50 to 66	31.93	31.94	32
Southgate Mainline (H-650 Pipeline)	50 to 66	32.02	32.03	28
Southgate Mainline (H-650 Pipeline)	30 to 50	32.04	32.04	40
Southgate Mainline (H-650 Pipeline)	30 to 50	32.27	32.27	31
Southgate Mainline (H-650 Pipeline)	30 to 50	32.46	32.47	60
Southgate Mainline (H-650 Pipeline)	30 to 50	32.47	32.48	26
Southgate Mainline (H-650 Pipeline)	30 to 50	32.50	32.52	80
Southgate Mainline (H-650 Pipeline)	30 to 50	32.55	32.56	40

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	50 to 66	32.56	32.57	20
Southgate Mainline (H-650 Pipeline)	30 to 50	32.57	32.57	36
Southgate Mainline (H-650 Pipeline)	30 to 50	32.59	32.60	92
Southgate Mainline (H-650 Pipeline)	30 to 50	32.66	32.67	26
Southgate Mainline (H-650 Pipeline)	30 to 50	32.75	32.76	25
Southgate Mainline (H-650 Pipeline)	30 to 50	33.12	33.13	40
Southgate Mainline (H-650 Pipeline)	66 to 80	33.13	33.14	75
Southgate Mainline (H-650 Pipeline)	30 to 50	33.14	33.15	21
Southgate Mainline (H-650 Pipeline)	30 to 50	33.16	33.17	34
Southgate Mainline (H-650 Pipeline)	30 to 50	33.25	33.26	23
Southgate Mainline (H-650 Pipeline)	30 to 50	33.27	33.28	30
Southgate Mainline (H-650 Pipeline)	30 to 50	33.30	33.32	64
Southgate Mainline (H-650 Pipeline)	30 to 50	33.33	33.34	89
Southgate Mainline (H-650 Pipeline)	30 to 50	33.38	33.39	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.68	33.69	56
Southgate Mainline (H-650 Pipeline)	30 to 50	33.70	33.70	41
Southgate Mainline (H-650 Pipeline)	50 to 66	33.73	33.73	23
Southgate Mainline (H-650 Pipeline)	50 to 66	33.74	33.75	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.75	33.77	103
Southgate Mainline (H-650 Pipeline)	30 to 50	33.79	33.80	28
Southgate Mainline (H-650 Pipeline)	30 to 50	33.81	33.82	42
Southgate Mainline (H-650 Pipeline)	30 to 50	33.82	33.83	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.88	33.89	52
Southgate Mainline (H-650 Pipeline)	30 to 50	33.92	33.94	94
Southgate Mainline (H-650 Pipeline)	30 to 50	33.99	34.00	23
Southgate Mainline (H-650 Pipeline)	30 to 50	34.15	34.16	23
Southgate Mainline (H-650 Pipeline)	50 to 66	34.21 RR	34.21 RR	4
Southgate Mainline (H-650 Pipeline)	> 80+	34.21 RR	34.22 RR	8
Southgate Mainline (H-650 Pipeline)	50 to 66	34.22 RR	34.22 RR	4
Southgate Mainline (H-650 Pipeline)	30 to 50	34.22 RR	34.23 RR	60
Southgate Mainline (H-650 Pipeline)	30 to 50	34.29	34.30	42
Southgate Mainline (H-650 Pipeline)	50 to 66	34.30	34.31	42
Southgate Mainline (H-650 Pipeline)	30 to 50	34.51	34.52	21
Southgate Mainline (H-650 Pipeline)	30 to 50	34.52	34.53	50
Southgate Mainline (H-650 Pipeline)	30 to 50	34.55	34.56	20
Southgate Mainline (H-650 Pipeline)	30 to 50	34.59	34.60	27
Southgate Mainline (H-650 Pipeline)	30 to 50	34.85	34.86	52
Southgate Mainline (H-650 Pipeline)	30 to 50	35.07	35.08	21
Southgate Mainline (H-650 Pipeline)	30 to 50	35.14	35.14	31
Southgate Mainline (H-650 Pipeline)	30 to 50	35.36	35.36	24
Southgate Mainline (H-650 Pipeline)	30 to 50	35.57	35.57	20
Southgate Mainline (H-650 Pipeline)	30 to 50	35.92	35.93	25
Southgate Mainline (H-650 Pipeline)	66 to 80	35.98	35.99	54

REVISED [Oct 2019] - Table 6-G-1

Potential Areas of Steep Slopes Crossed by the MVP Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of slope crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	37.01	37.02	21
Southgate Mainline (H-650 Pipeline)	30 to 50	37.03	37.05	94
Southgate Mainline (H-650 Pipeline)	30 to 50	37.16	37.16	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.18	37.19	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.27	37.28	43
Southgate Mainline (H-650 Pipeline)	30 to 50	37.29	37.29	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.30	37.30	29
Southgate Mainline (H-650 Pipeline)	30 to 50	37.35	37.36	38
Southgate Mainline (H-650 Pipeline)	30 to 50	37.58	37.59	24
Southgate Mainline (H-650 Pipeline)	30 to 50	37.72	37.72	31
Southgate Mainline (H-650 Pipeline)	30 to 50	38.24	38.25	23
Southgate Mainline (H-650 Pipeline)	66 to 80	38.54	38.55	76
Southgate Mainline (H-650 Pipeline)	30 to 50	38.60	38.61	28
Southgate Mainline (H-650 Pipeline)	30 to 50	38.76	38.76	35
Southgate Mainline (H-650 Pipeline)	30 to 50	38.78	38.80	93
Southgate Mainline (H-650 Pipeline)	30 to 50	39.03	39.04	39
Southgate Mainline (H-650 Pipeline)	30 to 50	39.05	39.06	45
Southgate Mainline (H-650 Pipeline)	30 to 50	39.06	39.07	24
Southgate Mainline (H-650 Pipeline)	30 to 50	39.10	39.10	28
Southgate Mainline (H-650 Pipeline)	50 to 66	39.67	39.68	26
Southgate Mainline (H-650 Pipeline)	50 to 66	39.69	39.70	27
Southgate Mainline (H-650 Pipeline)	30 to 50	40.54	40.55	44
Southgate Mainline (H-650 Pipeline)	30 to 50	40.56	40.56	36
Southgate Mainline (H-650 Pipeline)	66 to 80	40.57	40.57	24
Southgate Mainline (H-650 Pipeline)	30 to 50	40.64	40.64	25
Southgate Mainline (H-650 Pipeline)	30 to 50	40.74	40.74	23
Southgate Mainline (H-650 Pipeline)	30 to 50	40.75	40.75	41
Southgate Mainline (H-650 Pipeline)	30 to 50	40.88	40.89	40
Southgate Mainline (H-650 Pipeline)	30 to 50	41.11	41.11	39
Southgate Mainline (H-650 Pipeline)	30 to 50	41.56	41.57	23
Southgate Mainline (H-650 Pipeline)	30 to 50	41.57	41.58	25
Southgate Mainline (H-650 Pipeline)	50 to 66	41.67	41.67	20
Southgate Mainline (H-650 Pipeline)	30 to 50	41.67	41.68	32
Southgate Mainline (H-650 Pipeline)	30 to 50	42.25	42.26	44
Southgate Mainline (H-650 Pipeline)	30 to 50	43.69	43.69	28
Southgate Mainline (H-650 Pipeline)	30 to 50	43.70	43.71	31
Southgate Mainline (H-650 Pipeline)	30 to 50	43.81	43.82	23
Southgate Mainline (H-650 Pipeline)	30 to 50	43.93	43.93	36
Southgate Mainline (H-650 Pipeline)	50 to 66	43.98	43.99	53
Southgate Mainline (H-650 Pipeline)	30 to 50	44.02	44.03	32
Southgate Mainline (H-650 Pipeline)	50 to 66	44.03	44.03	24
Southgate Mainline (H-650 Pipeline)	30 to 50	44.03	44.03	9
Southgate Mainline (H-650 Pipeline)	50 to 66	44.06	44.06	20

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	30 to 50	44.14	44.14	26
Southgate Mainline (H-650 Pipeline)	30 to 50	44.15	44.19	169
Southgate Mainline (H-650 Pipeline)	30 to 50	44.56	44.57	22
Southgate Mainline (H-650 Pipeline)	30 to 50	45.72	45.73	45
Southgate Mainline (H-650 Pipeline)	30 to 50	45.83	45.85	134
Southgate Mainline (H-650 Pipeline)	30 to 50	46.01 RR	46.01 RR	22
Southgate Mainline (H-650 Pipeline)	30 to 50	46.02 RR	46.03 RR	56
Southgate Mainline (H-650 Pipeline)	30 to 50	46.03 RR	46.04 RR	47
Southgate Mainline (H-650 Pipeline)	30 to 50	46.08 RR	46.11 RR	131
Southgate Mainline (H-650 Pipeline)	30 to 50	46.20 RR	46.21 RR	24
Southgate Mainline (H-650 Pipeline)	30 to 50	46.22 RR	46.23 RR	33
Southgate Mainline (H-650 Pipeline)	30 to 50	46.48	46.49	37
Southgate Mainline (H-650 Pipeline)	50 to 66	46.50	46.50	39
Southgate Mainline (H-650 Pipeline)	30 to 50	46.53	46.54	29
Southgate Mainline (H-650 Pipeline)	30 to 50	46.89	46.91	78
Southgate Mainline (H-650 Pipeline)	50 to 66	47.01	47.02	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.35	47.36	27
Southgate Mainline (H-650 Pipeline)	30 to 50	47.37	47.39	142
Southgate Mainline (H-650 Pipeline)	30 to 50	47.42	47.44	125
Southgate Mainline (H-650 Pipeline)	50 to 66	47.44	47.45	39
Southgate Mainline (H-650 Pipeline)	30 to 50	47.45	47.46	36
Southgate Mainline (H-650 Pipeline)	30 to 50	47.46	47.47	50
Southgate Mainline (H-650 Pipeline)	30 to 50	47.54	47.56	107
Southgate Mainline (H-650 Pipeline)	30 to 50	47.57	47.57	31
Southgate Mainline (H-650 Pipeline)	30 to 50	47.58	47.59	83
Southgate Mainline (H-650 Pipeline)	30 to 50	47.60	47.61	55
Southgate Mainline (H-650 Pipeline)	30 to 50	47.61	47.62	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.65	47.66	33
Southgate Mainline (H-650 Pipeline)	30 to 50	47.66	47.66	23
Southgate Mainline (H-650 Pipeline)	30 to 50	47.67	47.67	23
Southgate Mainline (H-650 Pipeline)	30 to 50	47.67	47.68	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.76	47.77	58
Southgate Mainline (H-650 Pipeline)	30 to 50	47.78	47.79	55
Southgate Mainline (H-650 Pipeline)	30 to 50	50.80 RR	50.81 RR	52
Southgate Mainline (H-650 Pipeline)	30 to 50	50.82 RR	50.83 RR	47
Southgate Mainline (H-650 Pipeline)	30 to 50	51.35 RR	51.36 RR	28
Southgate Mainline (H-650 Pipeline)	30 to 50	58.91	58.91	31
Southgate Mainline (H-650 Pipeline)	30 to 50	63.21 RR	63.21 RR	40
Southgate Mainline (H-650 Pipeline)	30 to 50	63.58	63.58	40
Southgate Mainline (H-650 Pipeline)	30 to 50	63.65	63.65	24
Southgate Mainline (H-650 Pipeline)	30 to 50	64.47	64.48	20
Southgate Mainline (H-650 Pipeline)	30 to 50	64.07 RR	64.08 RR	27
Southgate Mainline (H-650 Pipeline)	30 to 50	64.08 RR	64.08 RR	30

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	30 to 50	68.74	68.74	20
Southgate Mainline (H-650 Pipeline)	30 to 50	68.79	68.80	20
Southgate Mainline (H-650 Pipeline)	30 to 50	69.10	69.11	60
Southgate Mainline (H-650 Pipeline)	30 to 50	69.37	69.38	23
Southgate Mainline (H-650 Pipeline)	30 to 50	69.39	69.40	30
Southgate Mainline (H-650 Pipeline)	30 to 50	69.65 RR	69.65 RR	20
Southgate Mainline (H-650 Pipeline)	66 to 80	69.70 RR	69.71 RR	36
Southgate Mainline (H-650 Pipeline)	50 to 66	69.71 RR	69.72 RR	40
Southgate Mainline (H-650 Pipeline)	50 to 66	69.72 RR	69.72 RR	36
Southgate Mainline (H-650 Pipeline)	30 to 50	69.80 RR	69.81 RR	70
Southgate Mainline (H-650 Pipeline)	30 to 50	69.93 RR	69.94 RR	68
Southgate Mainline (H-650 Pipeline)	30 to 50	69.96 RR	69.97 RR	20
Southgate Mainline (H-650 Pipeline)	30 to 50	70.02	70.03	21
Southgate Mainline (H-650 Pipeline)	30 to 50	70.50	70.51	23
Southgate Mainline (H-650 Pipeline)	30 to 50	70.61	70.62	33
Southgate Mainline (H-650 Pipeline)	50 to 66	70.75	70.76	47
Southgate Mainline (H-650 Pipeline)	30 to 50	70.76	70.77	21
Southgate Mainline (H-650 Pipeline)	30 to 50	71.13	71.13	20
Southgate Mainline (H-650 Pipeline)	30 to 50	71.19	71.20	28
Southgate Mainline (H-650 Pipeline)	30 to 50	71.21	71.22	78
Southgate Mainline (H-650 Pipeline)	30 to 50	71.25	71.26	54
Southgate Mainline (H-650 Pipeline)	30 to 50	71.31	71.32	28
Southgate Mainline (H-650 Pipeline)	30 to 50	71.49	71.49	33
Southgate Mainline (H-650 Pipeline)	30 to 50	71.62	71.63	37
Southgate Mainline (H-650 Pipeline)	30 to 50	71.82	71.83	70
Southgate Mainline (H-650 Pipeline)	30 to 50	71.90	71.92	103
Southgate Mainline (H-650 Pipeline)	30 to 50	72.19	72.20	24
Southgate Mainline (H-650 Pipeline)	30 to 50	72.71	72.72	30
Southgate Mainline (H-650 Pipeline)	50 to 66	72.72	72.72	40
Southgate Mainline (H-650 Pipeline)	30 to 50	72.72	72.73	25
Southgate Mainline (H-650 Pipeline)	30 to 50	72.79 RR	72.79 RR	29
Southgate Mainline (H-650 Pipeline)	30 to 50	72.80 RR	72.80 RR	21
Southgate Mainline (H-650 Pipeline)	50 to 66	72.91 RR	72.92 RR	25

Methodology:

1. Steep Slope percentages are grouped as follows:
   30-50%
   50-66%
   66-80%
   80%+
2. Only crossings that are longer than 20 feet are considered. Some locations may seem smaller but they are still considered if they are a continuation of another slope group.
3. For crossings that have multiple variations of slope group within small lengths, an average slope group is assigned.
4. The length of slope crossed might be slightly shorter than actual mile post lengths because of small stretches of data that are not in slope groups.

Notes: Results based on desktop analysis. Data to be verified in field.

REVISED [Oct 2019] - Table 6-G-1 Potential Areas of Steep Slopes Crossed by the MVP Southgate Project				
Route	**Steep Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
This table is consistent with the table included in Resource Report 6 of the November 2018 filing to include a 30% slope minimum.				

REVISED [Oct 2019] - Table 6-G-2 Potential Areas of Side Slopes Crossed by the MVP Southgate Project H-650				
Route	**Side Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	18 to 25	3.82 RR	3.83 RR	56
Southgate Mainline (H-650 Pipeline)	14 to 18	3.90 RR	3.91 RR	27
Southgate Mainline (H-650 Pipeline)	18 to 25	3.91 RR	3.92 RR	86
Southgate Mainline (H-650 Pipeline)	25+	3.92 RR	3.94 RR	111
Southgate Mainline (H-650 Pipeline)	18 to 25	3.94 RR	3.96 RR	59
Southgate Mainline (H-650 Pipeline)	14 to 18	8.63	8.71	298
Southgate Mainline (H-650 Pipeline)	14 to 18	9.00	9.02	70
Southgate Mainline (H-650 Pipeline)	14 to 18	9.97	10.03	283
Southgate Mainline (H-650 Pipeline)	14 to 18	13.68 RR	13.69 RR	86
Southgate Mainline (H-650 Pipeline)	18 to 25	13.78 RR	13.80 RR	60
Southgate Mainline (H-650 Pipeline)	25+	13.80 RR	13.81 RR	66
Southgate Mainline (H-650 Pipeline)	14 to 18	15.51	15.58	244
Southgate Mainline (H-650 Pipeline)	18 to 25	16.01	16.02	40
Southgate Mainline (H-650 Pipeline)	14 to 18	16.55	16.58	98
Southgate Mainline (H-650 Pipeline)	14 to 18	16.59	16.60	43
Southgate Mainline (H-650 Pipeline)	18 to 25	17.49 RR	17.49 RR	37
Southgate Mainline (H-650 Pipeline)	14 to 18	17.49 RR	17.53 RR	178
Southgate Mainline (H-650 Pipeline)	18 to 25	17.53 RR	17.54 RR	46
Southgate Mainline (H-650 Pipeline)	14 to 18	17.54 RR	17.55 RR	46
Southgate Mainline (H-650 Pipeline)	18 to 25	17.98	18.01	157
Southgate Mainline (H-650 Pipeline)	18 to 25	18.04	18.05	52
Southgate Mainline (H-650 Pipeline)	14 to 18	19.49	19.50	62
Southgate Mainline (H-650 Pipeline)	18 to 25	19.54	19.60	233
Southgate Mainline (H-650 Pipeline)	14 to 18	19.63	19.64	40
Southgate Mainline (H-650 Pipeline)	18 to 25	21.58	21.60	87
Southgate Mainline (H-650 Pipeline)	18 to 25	21.74	21.78	155
Southgate Mainline (H-650 Pipeline)	14 to 18	22.00	22.04	134
Southgate Mainline (H-650 Pipeline)	14 to 18	22.36	22.38	87
Southgate Mainline (H-650 Pipeline)	25+	22.72 RR	22.76 RR	186
Southgate Mainline (H-650 Pipeline)	18 to 25	22.76 RR	22.78 RR	97
Southgate Mainline (H-650 Pipeline)	14 to 18	22.78 RR	22.79 RR	53
Southgate Mainline (H-650 Pipeline)	18 to 25	22.98 RR	22.99 RR	63
Southgate Mainline (H-650 Pipeline)	18 to 25	25.15	25.22	216
Southgate Mainline (H-650 Pipeline)	14 to 18	28.71	28.74	70
Southgate Mainline (H-650 Pipeline)	14 to 18	29.01	29.06	177
Southgate Mainline (H-650 Pipeline)	25+	29.10	29.14	100
Southgate Mainline (H-650 Pipeline)	14 to 18	29.29 RR	29.30 RR	60
Southgate Mainline (H-650 Pipeline)	18 to 25	31.34	31.37	86
Southgate Mainline (H-650 Pipeline)	18 to 25	31.67	31.69	56
Southgate Mainline (H-650 Pipeline)	18 to 25	31.88	31.95	236
Southgate Mainline (H-650 Pipeline)	25+	32.18	32.20	46
Southgate Mainline (H-650 Pipeline)	18 to 25	32.55	32.59	75
Southgate Mainline (H-650 Pipeline)	14 to 18	32.78	32.89	355

REVISED [Oct 2019] - Table 6-G-2 Potential Areas of Side Slopes Crossed by the MVP Southgate Project H-650				
Route	**Side Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	18 to 25	33.28	33.30	89
Southgate Mainline (H-650 Pipeline)	18 to 25	33.35	33.41	217
Southgate Mainline (H-650 Pipeline)	14 to 18	33.45	33.47	47
Southgate Mainline (H-650 Pipeline)	18 to 25	33.64	33.67	146
Southgate Mainline (H-650 Pipeline)	18 to 25	33.70	33.73	104
Southgate Mainline (H-650 Pipeline)	18 to 25	33.88	33.92	110
Southgate Mainline (H-650 Pipeline)	18 to 25	33.95	34.01	280
Southgate Mainline (H-650 Pipeline)	18 to 25	34.33	34.35	93
Southgate Mainline (H-650 Pipeline)	18 to 25	34.56	34.60	171
Southgate Mainline (H-650 Pipeline)	18 to 25	35.03	35.11	283
Southgate Mainline (H-650 Pipeline)	14 to 18	35.21	35.26	160
Southgate Mainline (H-650 Pipeline)	18 to 25	35.30	35.34	190
Southgate Mainline (H-650 Pipeline)	14 to 18	35.52	35.53	48
Southgate Mainline (H-650 Pipeline)	18 to 25	35.55	35.56	56
Southgate Mainline (H-650 Pipeline)	18 to 25	35.93	35.95	57
Southgate Mainline (H-650 Pipeline)	14 to 18	36.18	36.22	85
Southgate Mainline (H-650 Pipeline)	18 to 25	36.67	36.74	252
Southgate Mainline (H-650 Pipeline)	18 to 25	36.90	36.93	135
Southgate Mainline (H-650 Pipeline)	14 to 18	36.96	36.98	93
Southgate Mainline (H-650 Pipeline)	14 to 18	37.05	37.09	158
Southgate Mainline (H-650 Pipeline)	14 to 18	37.21	37.22	40
Southgate Mainline (H-650 Pipeline)	18 to 25	37.53	37.55	74
Southgate Mainline (H-650 Pipeline)	14 to 18	37.63	37.66	122
Southgate Mainline (H-650 Pipeline)	14 to 18	37.78	37.81	122
Southgate Mainline (H-650 Pipeline)	14 to 18	37.84	37.86	74
Southgate Mainline (H-650 Pipeline)	14 to 18	37.90	37.92	77
Southgate Mainline (H-650 Pipeline)	14 to 18	38.02	38.05	117
Southgate Mainline (H-650 Pipeline)	18 to 25	39.05	39.09	136
Southgate Mainline (H-650 Pipeline)	14 to 18	39.37	39.45	291
Southgate Mainline (H-650 Pipeline)	14 to 18	39.48	39.49	71
Southgate Mainline (H-650 Pipeline)	14 to 18	40.40 RR	40.41 RR	51
Southgate Mainline (H-650 Pipeline)	18 to 25	40.41 RR	40.43 RR	65
Southgate Mainline (H-650 Pipeline)	18 to 25	40.49 RR	40.50 RR	61
Southgate Mainline (H-650 Pipeline)	14 to 18	40.64	40.66	63
Southgate Mainline (H-650 Pipeline)	18 to 25	41.42	41.50	423
Southgate Mainline (H-650 Pipeline)	18 to 25	41.58	41.59	78
Southgate Mainline (H-650 Pipeline)	18 to 25	41.69	41.77	384
Southgate Mainline (H-650 Pipeline)	18 to 25	41.97	41.99	85
Southgate Mainline (H-650 Pipeline)	18 to 25	42.13	42.16	99
Southgate Mainline (H-650 Pipeline)	18 to 25	42.35	42.42	309
Southgate Mainline (H-650 Pipeline)	14 to 18	42.46	42.48	113
Southgate Mainline (H-650 Pipeline)	18 to 25	42.84	42.85	41
Southgate Mainline (H-650 Pipeline)	18 to 25	43.80	43.82	48

REVISED [Oct 2019] - Table 6-G-2 Potential Areas of Side Slopes Crossed by the MVP Southgate Project H-650				
Route	**Side Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	25+	43.86	43.88	78
Southgate Mainline (H-650 Pipeline)	18 to 25	43.99	44.02	102
Southgate Mainline (H-650 Pipeline)	18 to 25	44.07	44.10	132
Southgate Mainline (H-650 Pipeline)	14 to 18	45.06	45.09	108
Southgate Mainline (H-650 Pipeline)	14 to 18	45.86	45.91	221
Southgate Mainline (H-650 Pipeline)	14 to 18	45.95	45.98	85
Southgate Mainline (H-650 Pipeline)	18 to 25	46.12 RR	46.13 RR	61
Southgate Mainline (H-650 Pipeline)	14 to 18	46.16 RR	46.17 RR	67
Southgate Mainline (H-650 Pipeline)	25+	47.47	47.50	131
Southgate Mainline (H-650 Pipeline)	14 to 18	47.99	48.02	97
Southgate Mainline (H-650 Pipeline)	18 to 25	49.64	49.68	173
Southgate Mainline (H-650 Pipeline)	18 to 25	49.75 RR	49.76 RR	42
Southgate Mainline (H-650 Pipeline)	14 to 18	50.12 RR	50.13 RR	42
Southgate Mainline (H-650 Pipeline)	18 to 25	50.74 RR	50.76 RR	90
Southgate Mainline (H-650 Pipeline)	14 to 18	50.78 RR	50.80 RR	56
Southgate Mainline (H-650 Pipeline)	25+	50.80 RR	50.81 RR	61
Southgate Mainline (H-650 Pipeline)	18 to 25	50.81 RR	50.83 RR	99
Southgate Mainline (H-650 Pipeline)	18 to 25	52.04 RR	52.08 RR	224
Southgate Mainline (H-650 Pipeline)	18 to 25	52.19	52.24	213
Southgate Mainline (H-650 Pipeline)	14 to 18	54.36	54.38	64
Southgate Mainline (H-650 Pipeline)	18 to 25	54.47	54.49	75
Southgate Mainline (H-650 Pipeline)	25+	54.51	54.54	131
Southgate Mainline (H-650 Pipeline)	18 to 25	63.50	63.52	130
Southgate Mainline (H-650 Pipeline)	14 to 18	65.10 RR	65.12 RR	93
Southgate Mainline (H-650 Pipeline)	18 to 25	65.12 RR	65.12 RR	31
Southgate Mainline (H-650 Pipeline)	14 to 18	65.12 RR	65.13 RR	41
Southgate Mainline (H-650 Pipeline)	14 to 18	65.18 RR	65.19 RR	58
Southgate Mainline (H-650 Pipeline)	14 to 18	66.97 RR	66.98 RR	69
Southgate Mainline (H-650 Pipeline)	18 to 25	68.28	68.31	149
Southgate Mainline (H-650 Pipeline)	14 to 18	68.47	68.48	41
Southgate Mainline (H-650 Pipeline)	14 to 18	68.48	68.49	48
Southgate Mainline (H-650 Pipeline)	14 to 18	68.55	68.56	51
Southgate Mainline (H-650 Pipeline)	14 to 18	68.67	68.68	44
Southgate Mainline (H-650 Pipeline)	18 to 25	69.08	69.11	124
Southgate Mainline (H-650 Pipeline)	18 to 25	69.24	69.25	48
Southgate Mainline (H-650 Pipeline)	18 to 25	69.33	69.45	445
Southgate Mainline (H-650 Pipeline)	14 to 18	69.56 RR	69.58 RR	65
Southgate Mainline (H-650 Pipeline)	18 to 25	69.58 RR	69.58 RR	40
Southgate Mainline (H-650 Pipeline)	25+	69.70 RR	69.72 RR	112
Southgate Mainline (H-650 Pipeline)	25+	69.80 RR	69.82 RR	109
Southgate Mainline (H-650 Pipeline)	18 to 25	69.83 RR	69.84 RR	40
Southgate Mainline (H-650 Pipeline)	14 to 18	69.84 RR	69.85 RR	48
Southgate Mainline (H-650 Pipeline)	14 to 18	69.85 RR	69.86 RR	36

REVISED [Oct 2019] - Table 6-G-2 Potential Areas of Side Slopes Crossed by the MVP Southgate Project H-650				
Route	**Side Slope Group**	**Milepost Begin**	**Milepost End**	**Length of slope crossed (feet)**
Southgate Mainline (H-650 Pipeline)	14 to 18	70.58	70.59	47
Southgate Mainline (H-650 Pipeline)	18 to 25	70.60	70.63	96
Southgate Mainline (H-650 Pipeline)	18 to 25	71.09	71.27	616
Southgate Mainline (H-650 Pipeline)	14 to 18	71.78	71.80	78
Southgate Mainline (H-650 Pipeline)	18 to 25	71.85	71.88	144
Southgate Mainline (H-650 Pipeline)	18 to 25	71.98 RR	71.99 RR	72
Southgate Mainline (H-650 Pipeline)	14 to 18	71.99 RR	72.00 RR	50
Southgate Mainline (H-650 Pipeline)	18 to 25	72.01 RR	72.03 RR	138
Southgate Mainline (H-650 Pipeline)	18 to 25	72.16	72.21	180
Southgate Mainline (H-650 Pipeline)	18 to 25	72.73 RR	72.74 RR	50
Southgate Mainline (H-650 Pipeline)	14 to 18	72.74 RR	72.75 RR	69
Southgate Mainline (H-650 Pipeline)	18 to 25	72.81 RR	72.82 RR	65
Southgate Mainline (H-650 Pipeline)	18 to 25	72.84 RR	72.86 RR	116
Southgate Mainline (H-650 Pipeline)	25+	72.86 RR	72.87 RR	54

Methodology
1. Side Slope percentages are grouped as follows:
   - 14-18%
   - 18-25%
   - 25%+
2. Only crossings that are longer than 40 feet are considered. Some locations may seem smaller but they are still considered if they are a continuation of another slope group.
3. For crossings that have multiple variations of slope group within small lengths, an average slope group is assigned.
4. The length of slope crossed might be slightly shorter than actual mile post lengths because of small stretches of data that are not in slope groups.

Notes: Results based on desktop analysis. Data to be verified in field.

This table is consistent with the table included in Resource Report 6 of the November 2018 filing to include a 30% slope minimum.

REVISED [Oct 2019] -Table 27-1 Areas of Potential FAE for Right-of-Way grade and Pipeline Trench Excavation					
From Milepost	**To Milepost**	**Need for FAE**			**FAE Potential**
		Slope	**Depth to Bedrock**	**Rock Type**	
0.00	0.95	X			Low
1.20	1.85			X	Low
17.28	33.89	X	X	X	High
34.50	48.23	X	X	X	High
49.29	68.05	X	X	X	High
70.94	72.81RR	X			Low
Lambert Interconnect and Main Valve		X	X		Low
LN 3600 Interconnect		X	X		Low
T-15 Dan River Interconnect					None
T-21 Haw River Interconnect					None
Mainline Valves		Included within Mainline FAE Potential			

REVISED [Oct 2019] - Table 27-2 Areas of Potential FAE for Waterbody Crossings							
State/County	**Milepost**	**Waterbody Name**	**Need for FAE**			**FAE Potential**	**Projected Depth to Bedrock (Inches)**
			Slope	**Depth to Bedrock**	**Rock Type**		
VIRGINIA							
	23.0RR	Tributary to Trotters Creek		X	X	High	24 to 31
	23.2RR	Trotters Creek	X	X	X	High	16 to 20
Pittsylvania	24.4	Tributary to Dan River	X	X	X	High	16 to 20
	24.8	Tributary to Dan River	X	X	X	High	24 to 31
				X			
NORTH CAROLINA							
	32.5	Tributary to Town Creek	X	X	X	High	10 to 20
	33.7	Tributary to Town Creek		X	X	High	20 to 40
	34.7	Tributary to Town Creek	X	X	X	High	10 to 20
	39.0	Tributary to Wolf Island Creek		X	X	High	10 to 20
	40.5RR	Tributary to Lick Fork	X	X	X	High	10 to 20
	40.4	Tributary to Lick Fork	X	X	X	High	10 to 20
	40.6	Tributary to Lick Fork	X	X	X	High	10 to 20
Rockingham	40.7	Tributary to Jones Creek	X	X	X	High	10 to 20
	42.9	Tributary to Jones Creek		X	X	High	10 to 20
	44.1	Tributary to Jones Creek		X	X	High	10 to 20
	44.1	Tributary to Hogans Creek		X	X	High	10 to 20
	45.8	Tributary to Hogans Creek	X	X	X	High	10 to 20
	45.9	Tributary to Hogans Creek	X	X	X	High	10 to 20
	46.5	Tributary to Hogans Creek	X	X	X	High	10 to 20
	46.5	Tributary to Hogans Creek		X	X	High	10 to 20
	47.4	Tributary to Hogans Creek		X	X	High	10 to 20
	47.6						
	68.1	Tributary to Boyds Creek	X	X	X	Low	>80
Alamance	68.9	Tributary to Haw River	X	X	X	Low	>80
	71.0	Tributary to Haw River	X	X	X	Low	>80
	72.6	Tributary to Haw River	X	X	X	Low	>80

MVP Southgate Project

Docket No. CP19-14-000

Updated Landslide Mitigation Report

October 2019

LANDSLIDE MITIGATION REPORT

Mountain Valley Pipeline, LLC

MVP Southgate - H-605 and H-650 Pipelines

Revision: 2 10/17/2019

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This report addresses potential post-construction landslide hazards for the pipeline listed below. The pipeline route was analyzed to determine if mitigation controls installed during construction are necessary to avoid potential landslide issues following construction. Potential landslide sites were identified by a desktop analysis that considered previous landslide activity, slope steepness, and sidehill construction. MVP Design Engineering has determined that the areas that are listed in Appendix A require additional controls to maintain slope stability. A summary of the required mitigation controls can be found in ***Section 4.0*** . These controls may be added, edited, or removed based on changing construction practices through the design of the pipeline and/or field conditions at the time of construction. A plan depicting the extents of the controls for each site can be found in ***Appendix A*** , and details for the controls are provided in ***Appendix B*** .

Name of system: Mountain Valley Pipeline, LLC
Name of pipeline: MVP Southgate - H-605 and H-650 Pipelines
Length of pipeline: 75.1 miles

2.0 DESKTOP ANALYSIS

A desktop analysis was performed for the entire length of the pipeline route to identify areas most susceptible to landslide issues. The analysis considered three critical factors:

- Previous landslide activity: LIDAR and field verification were used to determine if there is evidence of movement on slopes crossed by the project.
- Steepness of slope: Portions of the pipeline which traverse slopes with an angle of inclination of 18 degrees or greater are considered to be in a steep slope area. A slope of 18 degrees is marginally stable with a typical low strength in-situ soil and is therefore used as the threshold for this analysis. Slopes were measured using LIDAR flown for the project. The steepness of the slope is measured without regard for the orientation of the pipeline (i.e., perpendicular to the contour lines even if the pipeline is sidehill).
- Sidehill construction: If the orientation of a segment of the pipeline is parallel or near parallel to the contour lines of a slope, then the segment is considered an area of sidehill construction.

3.0 PROPOSED MITIGATION CONTROLS

The following section provides a description of proposed mitigation controls. One or a combination of controls may be utilized and shall be based on the actual field conditions encountered. The comments column in Appendix A provides suggested controls based on the desktop analysis.

3.1 Surface and Subsurface Drainage Controls

• **Trench Breaker Daylight Drain (MVP-SG-35):** The trench breaker daylight drains will prevent saturation of the trench backfill by pulling groundwater moving along the trench to the surface. A 4" perforated pipe bedded in free-draining AASHTO #57 stone and wrapped in permeable geotextile filter fabric will be placed against the upslope face of a trench breaker (perpendicular to the pipeline) at the bottom of the trench underneath the pipeline. The perforated pipe will turn 90 degrees at the low point of the trench and daylight into a riprap apron to dissipate the flow of water.

• **Cutoff Drain (MVP-SG-36A/B and MVP-SG-37):** For sidehill construction, the cutoff drain works by catching or "cutting off" groundwater as it enters the ROW. The sidehill cutoff drains is a subsurface drain constructed of a 6" perforated pipe bedded in AASHTO #57 stone and wrapped in geotextile filter fabric. The drain is placed upslope of and parallel to the pipe for the specified length before turning downslope and daylighting near the edge of the ROW into riprap to dissipate the flow of water. For downhill construction, the cutoff drain is intended to cut off groundwater flowing along the ROW at specified location. The downhill cutoff drain will be identical to the sidehill cutoff drain, except that it will be oriented perpendicular to the pipelines. In both cases, the drain pipe will be solid and surrounded by typical trench backfill for the portion crossing the pipeline trench in order to prevent the migration of water from the drain pipe into the trench.

• **Transverse Trench Drain (MVP-SG-38A/B):** These drains are to be installed within the trench at specified intervals and/or at low points of sidehill construction. They are constructed by digging a small ditch extending from the pipeline trench to the edge of the ROW. The ditch will be lined with geotextile filter fabric and a 4" perforated pipe will be laid in the ditch and surrounded with AASHTO #57 stone. The remainder of the ditch will be filled with the same type of stone, to the top of the ditch, and then covered with backfill as required for grading purposes. The drain should form a 10 ft tee within the trench against the back (uphill side) of the trench. Where this drain crosses the pipeline trench, stone backfill in the drain will only extend to just below the bottom of the pipe, after which typical trench backfill will be used.

• **Rock Lined Swale (MVP-SG-39):** A small surface drainage ditch will be constructed to efficiently convey water across the pipeline ROW and into a wooded area off the ROW and prevent surface water from seeping into the ground and causing saturation of the ROW. The drainage ditch will be lined with geotextile filter fabric overlain by 6" to 12" rock (which can be sourced from excavated spoils).

• **Riprap Natural Drains (MVP-SG-40):** Where natural drains intersect the pipeline ROW, the drain shall be restored to its original dimensions and drainage path. The drain shall be lined with geotextile filter fabric overlain by 6" to 12" rock (which can be sourced from excavated spoils).

• **Riprap Slope Breakers (MVP-SG-41)**: Slope breakers (water bars) that may experience more constant or higher peak flows may be lined with riprap to ensure their long term integrity. Slope breakers receiving riprap treatment will be lined with 3" to 6" rock (which can be sourced from excavated spoils).

• **Trench Breaker Pass-through Drain (MVP-SG-43A/B):** The pass-through trench breaker drain is intended to prevent the buildup of water behind trench breakers which could saturate the slope and cause a slide. These pass-through drains will be installed on the same slopes as the trench breaker daylight drains and will provide a way for groundwater to reach the daylight drains and ultimately be pulled to the surface. The trench breaker pass-through drains will allow water to pass through the trench breaker using two 2" PVC pipes which will be placed near the bottom of the trench breaker.

• **Brow Ditch (MVP-SG-46):** The brow ditch is a rock lined ditch intended to catch surface water runoff and divert it around a protected area of the ROW. These are typically installed in sidehill sections oriented parallel to the pipeline at the uphill edge of the ROW to catch the water flowing from upslope of the ROW. The brow ditch will eventually turn and cross the ROW to safely carry the water to an exit point at the downhill edge of the ROW.

• **Other (Site-Specific) Drainage Controls:** Depending on the site, this may consist of either grading the area to drain surface water runoff a certain direction or relocation of existing drainage controls (e.g., culverts). Design Engineering will come up with site-specific details for these items if required.

3.2 Stabilization Controls

• **Geogrid Reinforcement (MVP-SG-42A/B/C):** In areas where the existing grade of the slope is too steep to maintain long-term stability, layers of geogrid reinforcement may be placed during backfill operations to provide additional strength to the slope.

• **Highwall Revetment (MVP-SG-44A/B):** For near vertical slopes requiring additional trench stabilization measures sakrete highwall revetment may be used. The revetment is essentially acting as a concrete retaining wall, and therefore a footing in the form of a toe key and rebar will be utilized to help stabilize the wall. The trench may be filled with sandbags or crushed rock. Design Engineering shall determine or approve all materials used. Weephole drains should be installed at specified intervals to relieve water pressure from behind the revetment.

• **Steep Slope Revetment (MVP-SG-45):** For steep slopes requiring additional trench stabilization measures, sakrete trench breakers with a sakrete or riprap revetment may be used. The trench may be filled with sandbags or crushed rock, or in some cases native material. Design Engineering shall determine or approve all materials used and the spacing of the sakrete trench breakers. All sakrete breakers shall have drains installed.

• **Other (Site-Specific) Stabilization:** Depending on the site, this may involve regrading the slope to a more stable angle or installing some sort of engineered retaining structure (soil nails, soldier pile wall, gabions, etc.). Design Engineering will come up with site-specific details for these items if required.

3.3 Additional Measures

In addition to these site-specific controls, the following practices should be applied to the entire length of the pipeline:

• **Compact Slope Breakers:** All slope breakers (water bars) shall be compacted as specified in the ESCP drawings. Compaction can be achieved via bucket tamping with a hoe. This will help ensure that water bars maintain their intended drainage and are not deformed by freeze-thaw cycles.

• **Track-In Workspaces:** All workspaces on a hillside that have had fill temporarily placed during construction and then removed for backfill operations shall be tracked in. For sidehill construction areas, special attention shall be paid to the area where the cut and fill portions of the slope meet, as this is the most likely area for cracks to form. If this area is not tracked in, water can seep into the crack and may eventually destabilize the hillside.

Note that the information contained in this report is based upon the results of the desktop analysis and field-reported areas of concern received to date. **If additional areas of concern are encountered during construction, the author of this report should be contacted for guidance.**

3.4 Construction Considerations

Design Engineering recommends that the contractor submit to MVP a description of the construction means and methods for the areas identified in this report. The purpose of this is to allow MVP to determine if temporary construction conditions could lead to a slide.

APPENDIX A: SITE SPECIFIC MITIGATION CONTROLS

Yellow highlight denotes additions to the report due to reroute

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SS-01		X		Wetland	0.00	5.11	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H650	SS-02		X		Stream	9.00	7.99	MVP-SG-35	This pipeline segment is a steep planar segment with an average slope of 26 degrees (49%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil.
H-650	SS-03		X		Wetland	0.00	8.59	MVP-SG-35	This segement is a steep planar segment with an average slope of 25 degrees (47%) with localized segments of 28 degrees (53%). Daylight drains will be used behind sakrete trench breakers to provide additional stability to the slope. The drains will prevent accumulation of water behind the breakers. In the event that the trench breakers are within the stream buffer, sakrete will not be used.
H-650	SS-04		X	X	Wetland	10.00	9.97	MVP-SG-35	This segment is located on a steep area with an average slope of 30 degrees (58%) and previous landslide activity. Sakrete trench breakers with daylight drains will be utilized to stabilize the trench and previous landslide activity. In the event that the trench breakers are within the stream buffer, sakrete will not be used.
H-650	SH-05				Weland	94.70	9.99	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 10 degree (17.6%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-06		X		Wetland	10.00	10.09	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (34%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-07		X		Stream	57.00	12.79	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-08		X		Wetland	0.00	13.48	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep planar segment with an average slope of 26 degrees (49%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil.
H-650	SS-09		X		Stream	0.00	17.30	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a steep area of 25 degrees (47%) with a stream at the very base of the hill. The hill has no evidence of movement. Trench breaker pass through and daylight drains will be used to keep the trench stable
H-650	SS-01RR		X		Wetland	12.00	17.7RR	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep planar segment with an average slope of 26 degrees (49%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SH-02RR	X			Stream	78.00	17.75RR	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 11 degree (19.4%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-03RR		X		Stream	5.00	17.81 RR	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-10		X		Wetland	27.00	18.03	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a 20 degree (36%) slope with well established vegetation and no evidence of movement. Where trench breakers are specified, trench breaker pass through drains and daylight drains will be utilized.
H-650	SS-11		X		Stream	96.00	20.61	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-12				Wetland	1100.00	21.55	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SH-05RR	X			Stream	1500.00	22.70	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 10 degree (17.6%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-06RR		X		Stream	792.00	22.85	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-07RR		X		Stream	160.00	23.21	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (34%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-08RR		X		Stream	160.00	23.21	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (34%). Trench breaker pass through and daylight drains will be utilized in this location.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SS-13		X		Stream	675.00	25.00	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-14		X		Stream	29.00	28.81	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a planar segment of 21 degrees (38%) with no evidence of slope movement. Trench breaker daylight and pass through drains will be utilized in this area.
H-650	SS-15		X		Stream	400.00	29.37RR	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-16		X		Stream	334.00	29.4RR	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-17		X		Stream	0.00	31.08	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	Planar segment of 20 degrees (36%) that is steep going down into a creek. No evidence of movement. Alternating trench breaker pass through and daylight drains will be utilized in this area
H-650	SS-18		X		Stream	5.00	31.10	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 21 degrees (38%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-19		X		Stream	14.50	31.10	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 21 degrees (38%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-20		X		Stream	5.00	31.30	MVP-SG-35	This segment is planar and has no evidence of movement. Trench breaker daylight drains will be used at every breaker to keep the trench dry and stable.Sakrete may be used if shallow bedrock is encountered, but will not be used within the stream buffer.
H-650	SS-21		X		Stream	20.00	31.30	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is planar and extends from SS-18 on the other side of the stream bank. The area is well vegetated and there is no evidence of movement. This 23 degree (42%) slope will utilize alternating trench breaker daylight drains and pass through drains.
H-650	SH-22	X			Stream	175.00	31.70	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (17.6%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-23		X		Stream	68.20	32.50	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is planar with an average slope of 19 degrees (34%). The area is well vegetated and has no evidence of movement. Daylight and pass through drains will be utilized on this segment.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SS-24		X		Wetland	39.00	32.60	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is planar with an average slope of 20 degrees (36%). There is no evidence of movement and the area is well vegetated. Pass through and daylight drains will be utilized in this segment.
H-650	SS-25	X			Stream	290.60	32.80	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 11 degree (19.4%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur. In addition to the steep slope, there is a sidehill section immediately after. This will be addressed with transverse trench drains and cutoff drains as necessary
H-650	SS-26		X		Wetland	18.50	33.15	MVP-SG-45, MVP-SG-35	This segment is on a a very steep slope, with an average measurement of 31 degrees (61%). While there is no evidence of movement currently, a riprap revetment will be utilized in this section with sakrete trench breakers to provide stability.
H-650	SS-27		X		Stream	36.50	33.30	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-28		X		Stream	50.00	33.35	MVP-SG-45, MVP-SG-35	This segment is on a very steep slope, with an average measurement of 31 degrees (60%), with localized segments on as much as 37 degrees slope. This segment is near a stream and to preserve future slope stability, a riprap revetment with sakrete breakers should be used with daylight drains behind each trench breaker.
H-650	SH-29	X			Wetland	234.00	33.35	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 12 degree (21%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SH-30	X			Wetland	212.00	33.68	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 11 degree (19.4%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-31		X		Wetland	0.00	33.69	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 18 degrees (32%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-32		X		Wetland	5.00	33.70	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 23 degrees (42%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-33		X		Stream	16.70	33.75	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep planar segment with an average slope of 25 degrees (47%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SS-34		X		Stream	600.00	33.82	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SH-35	X			Stream	291.00	33.90	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 12 degree (21%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SH-36				Stream	336	34.05	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 13 degree (23%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-37		X		Stream	16.00	34.20	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-38		X		Stream	83.00	34.50	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-39		X		Stream	45.00	34.50	MVP-SG-35, MVP-SG-43A, MVP-SG-43B , MVP-SG-38A, MVP-SG-38B, MVP-SG-36A	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location. This section is also located next to a side slope area. Transverse trench drains and cutoff drains will be utilitzed as necessary in the sidehill
H-650	SH-40	X			Stream	122.00	35.05	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (17.6%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SH-41				Stream	149.00	35.30	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (17.6%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-42		X		Stream	0.00	36.00	MVP-SG-35	This segment has an average slope of 27 degrees (51%) and doesn't have any evidence of movement. Trench breaker daylight drains will be used behind every breaker. If bedrock is encountered at shallow depths, sakrete may be used in lieu of sandbag breakers, however it will not be used within the stream buffer.
H-650	SH-43				Stream	88.00	36.70	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 13 degree (23%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-651	SS-44		X		Wetland	10.00	38.55	MVP-SG-45, MVP-SG-35	This planar segment has an average slope of 37 (76%) degrees. While the area is well vegetated, there is evidence of landslide activity. To stabilize the area, a riprap revetment using R4 riprap should be used in conjunction with sakrete trenchbreakers.
H-650	SS-45		X		Wetland	16.00	38.80	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 23 degrees (42%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized

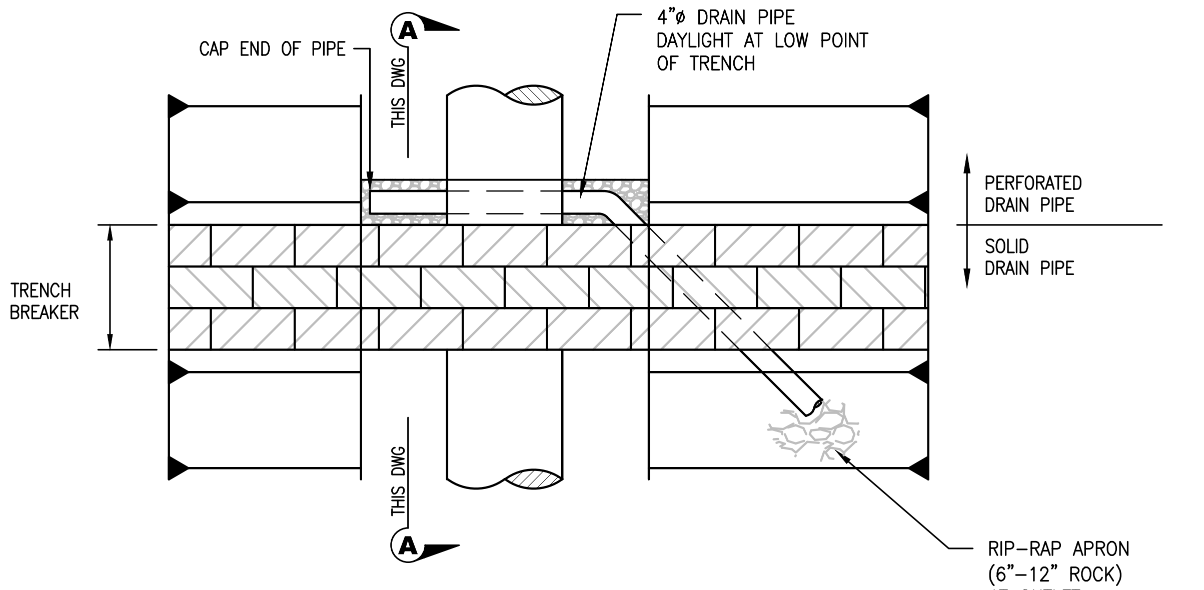
Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SH-46	X			Stream	56.00	39.08	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 13 degree (23%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-47		X		Stream	0.00	40.58	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-48		X		Stream	0.00	40.58	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (34%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-49		X		Stream	34.00	40.75	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 22 degrees (40%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SS-50		X		Wetland	0.00	41.10	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 21 degrees (38%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SH-51				Stream	375.00	41.54	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 11 degree (19.4%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-52		X		Stream	45.00	41.69	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-53		X		Stream	16.00	42.25	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 19 degrees (34%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SH-54	X			Home	150.00	42.37	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (17.6%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SH-55	X			Stream	148.00	44.10	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 12 degree (21%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-56		X		Stream	81.00	44.15	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SS-57		X		Stream	72.80	45.70	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-651	SS-58		X		Stream	89.00	45.88	MVP-SG-35	This pipeline segment is a steep planar segment with an average slope of 28 degrees (51%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil. If bedrock is shallow, sakrete breakers may be used.
H-650	SH-59				Stream	201.00	46.1RR	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (21%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-60		X		Wetland	0.00	47.03	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This is a planar segment of 20 degrees (36%) with no evidence of movement. Alternating trench breaker pass-through drains and daylight drains will be utlized to keep the trench dry
H-650	SS-61		X		Stream	45.00	47.40	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is located on a slope with an average inclination of 18 degrees (32%). Trench breaker pass through and daylight drains will be utilized in this location.
H-650	SH-62	X			Stream	183.00	47.45	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (21%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-63		X		Stream	10.00	47.60	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep segment with an average slope of 21 degrees (38%). A trench breaker daylight drain will be utilized to prevent an accumulation of water behind the trench breaker. If more than one trench breaker is to be installed along this segment, alternating pass through drains and daylight drains will be utilized
H-650	SH-64	X			Home	411.00	49.75	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (21%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SH-65	X			Stream	87.90	69.40	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 13 degree (23%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.
H-650	SS-08RR		X		Stream	61.00	69.7RR	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This pipeline segment is a steep planar segment with an average slope of 26 degrees (49%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil.
H-650	SH-09RR				Stream	260.00	69.85RR	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 10 degree (21%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SH-66	X			Stream	360.00	70.60	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 11 degree (19.4%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-67		X		Stream	122.00	70.75	MVP-SG-35	This pipeline segment is a steep planar segment with an average slope of 29 degrees (49%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil. If bedrock is shallow, sakrete breakers may be used.

Line Name	Site ID	Sidehill	Steep Slope	Previous Landslide	Downslope Resource	Distance From Downslope Resource (ft.)	Approx. Milepost	Mitigation Controls (Appendix B)	Comments
H-650	SH-68	X			River	186.00	71.20	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on a 15 degree (27%) slope with no movement present. Transverse trench drains should be utilized in the low portions of this sidehill segment to convey any accumulated water out of the trench.
H-650	SS-69		X		Stream	20.00	71.80	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is planar with an average slope of 20 degrees (36%). The area is well vegetated and has no evidence of movement. Daylight and pass through drains will be utilized on this segment.
H-650	SS-70		X		River	326.00	71.90	MVP-SG-35, MVP-SG-43A, MVP-SG-43B	This segment is planar with an average slope of 21 degrees (38%). The area is well vegetated and has no evidence of movement. Daylight and pass through drains will be utilized on this segment.
H-650	SS-71		X		River	52.40	72.72	MVP-SG-35	This pipeline segment is a steep planar segment with an average slope of 30 degrees (47%). Trees are well establised, with no visible signs of slope movement. Trench breaker daylight drains will be installed in the pipeline trench to prevent an accumulation of water behind the trench breakers which could saturate the local soil. If bedrock is shallow, sakrete breakers may be used.
H-650	SH-04RR	X			Stream	50.00	72.85RR	MVP-SG-38A, MVP-38B, MVP-SG-36A	This segment is sidehill on an 11 degree (19.4%) slope. A transverse trench drain will extend through the trench and sidehill cutoff drains will be utilized where seeps occur.

APPENDIX B

SLIDE MITIGATION DETAILS



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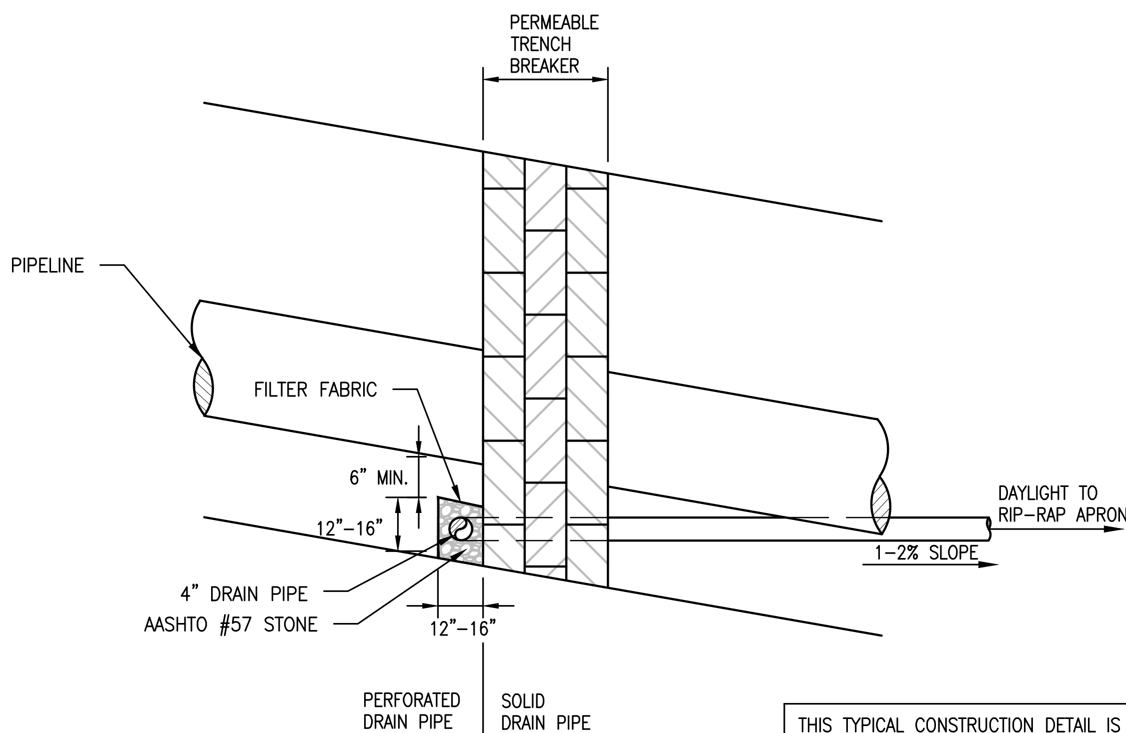

SECTION A-A

SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN TRC	DATE 8/7/2018	Mountain Valley PIPELINE LLC	TYPICAL CONSTRUCTION DETAIL
CHECKED XXX	DATE X/X/2018		TRENCH BREAKER DAYLIGHT DRAIN
APP'D XXX	DATE X/X/2018		
SCALE N.T.S.	SHEET 1 OF 1		
JOB NO.			DRAWING NO. MVP–SG–35
PROJECT ID: H–650–TYP			REV. P1

Plotted by: Sample, Stanley on August 14, 2018 – 12:39 PM

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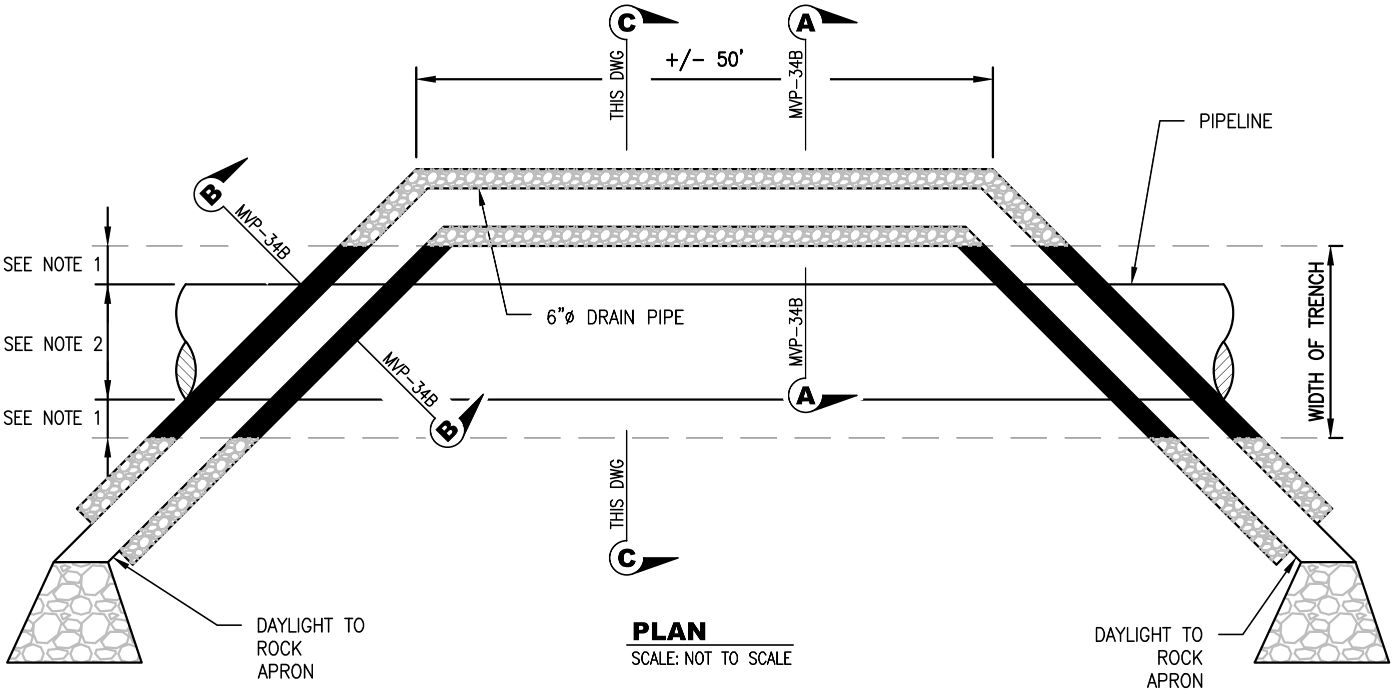

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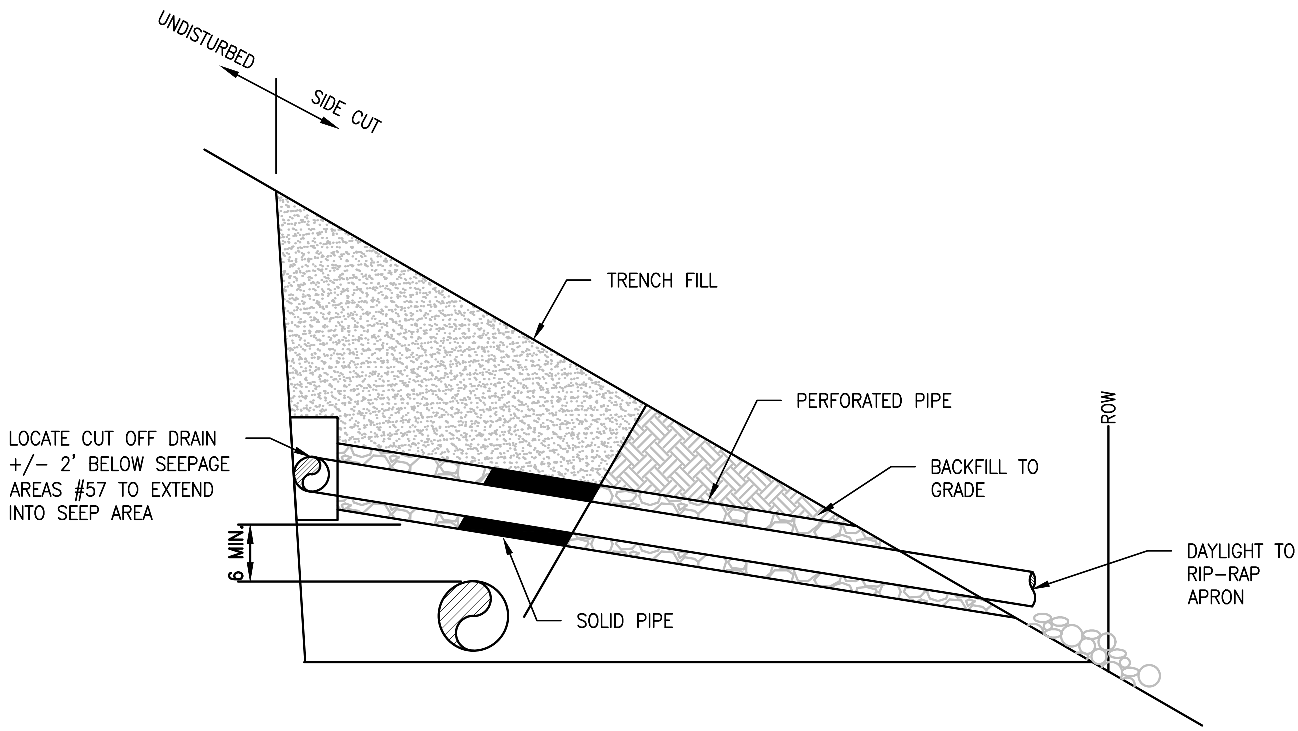

SECTION C-C
SCALE: NOT TO SCALE

NOTES:
1. PERFORATED PIPE SURROUNDED BY #57 STONE.
2. SOLID PIPE (IN TRENCH) SURROUNDED BY TRENCH BACKFILL.

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DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

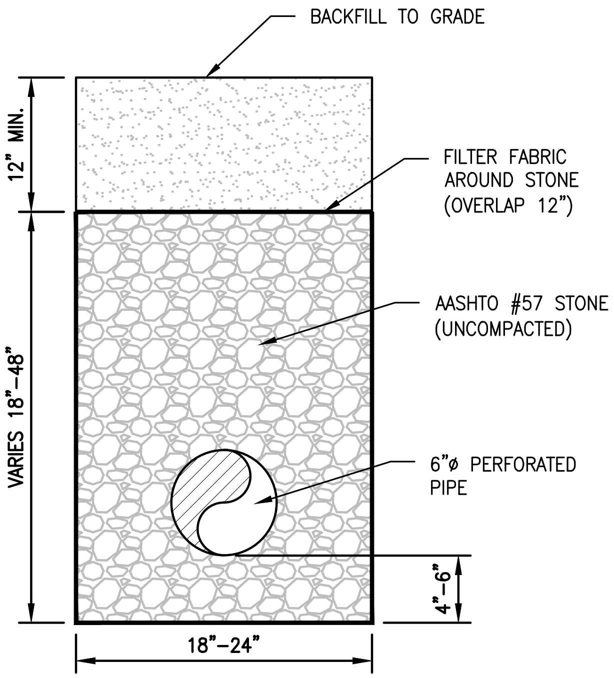
TYPICAL CONSTRUCTION DETAIL

CUTOFF DRAIN-SIDEHILL

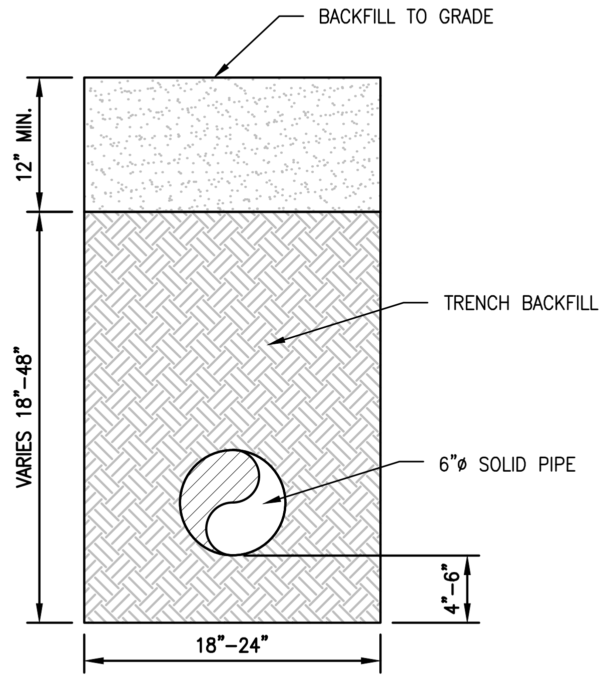
DRAWING NO.	REV.
MVP-SG-36A	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:39 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-36A.dwg



SECTION A-A
SCALE: NOT TO SCALE
FROM MVP-34A



SECTION B-B
SCALE: NOT TO SCALE
FROM MVP-34A

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

CUTOFF DRAIN-SIDEHILL

DRAWING NO.	REV.
MVP-SG-36B	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:39 PM

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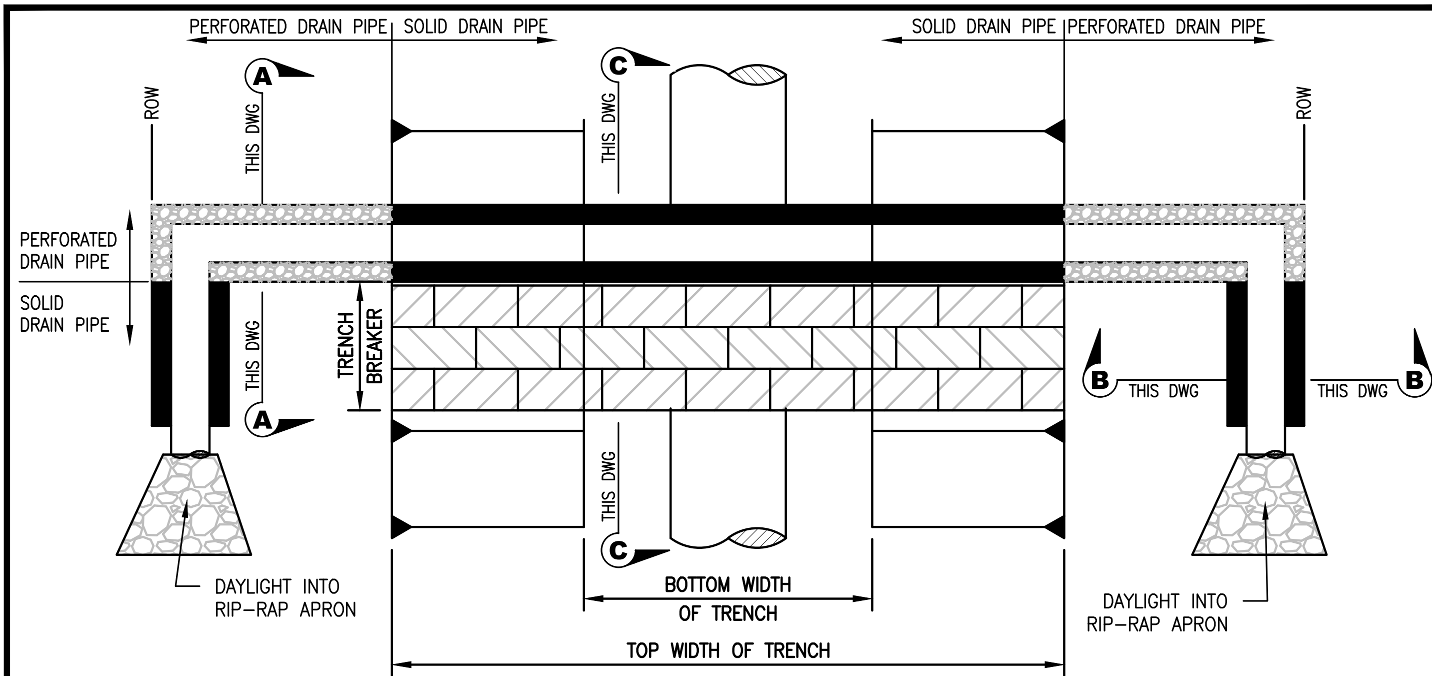
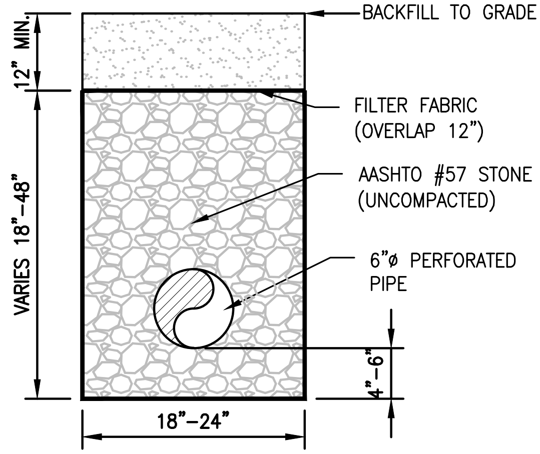


PLAN

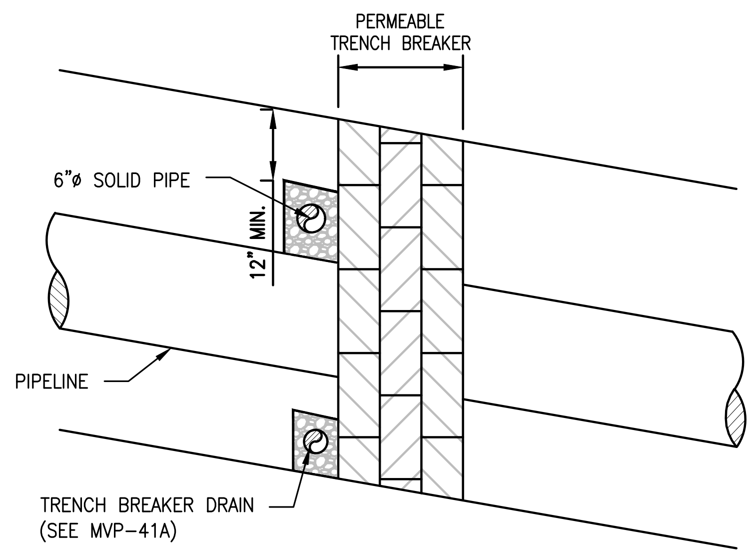
SCALE: NOT TO SCALE

NOTES:
1. EACH CUTOFF DRAIN SHALL UTILIZE A TRENCH BREAKER DRAIN (SEE DETAIL 1) TO DRAIN THE TRENCH.



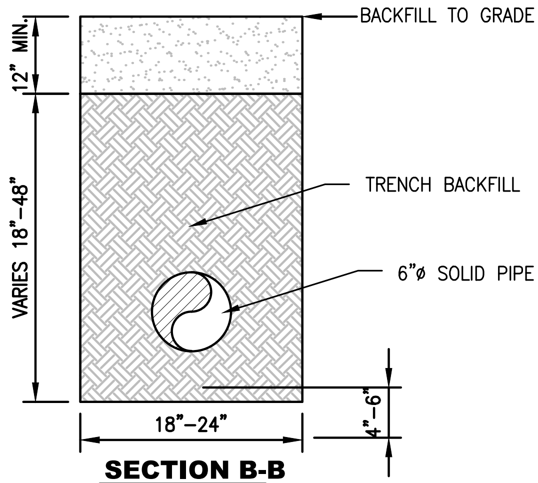
SECTION A-A

SCALE: NOT TO SCALE



SECTION C-C

SCALE: NOT TO SCALE



SECTION B-B

SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: H-650-TYP			

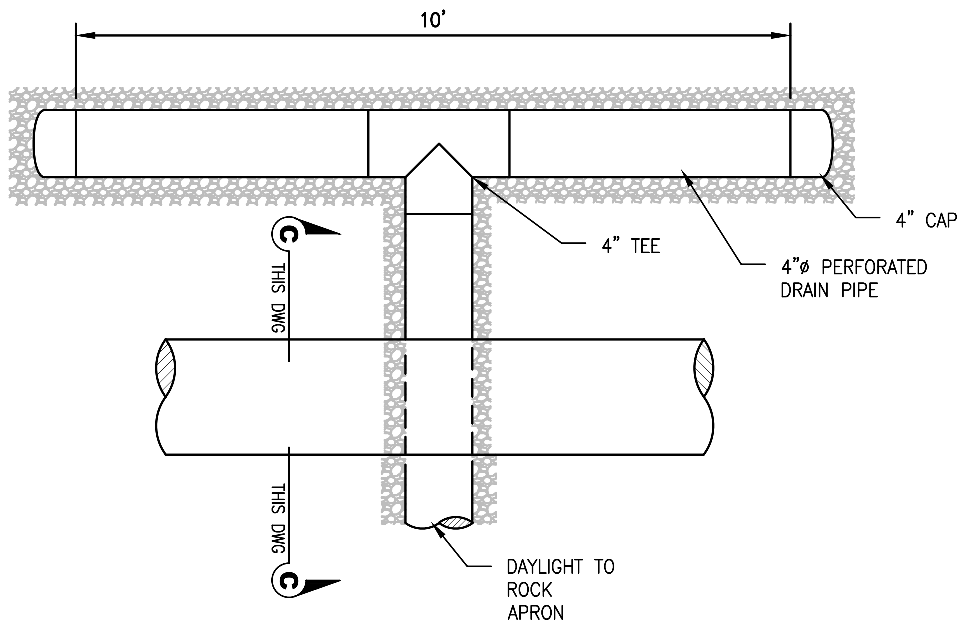
Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

CUTOFF DRAIN-PLANAR

DRAWING NO. MVP-SG-37

REV. P1



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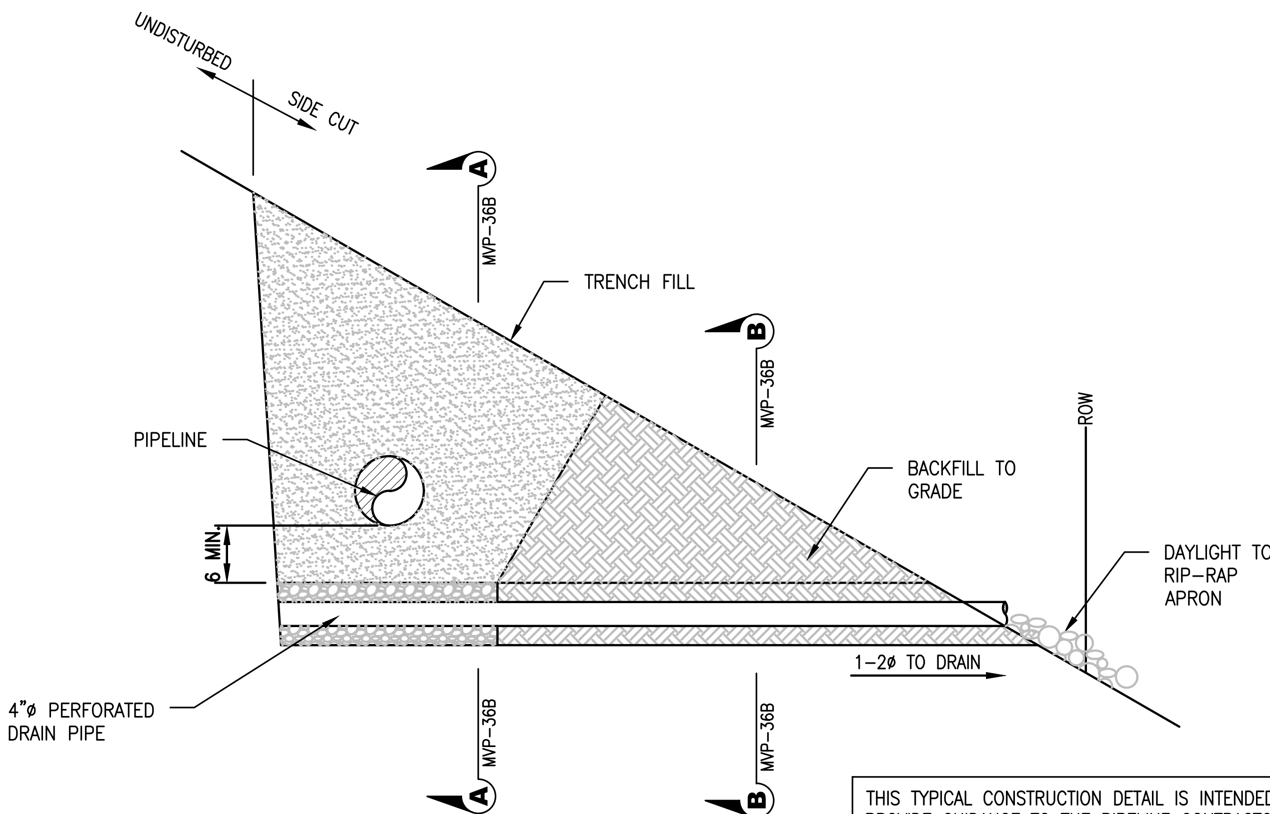


C-C
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID: H-650-TYP			

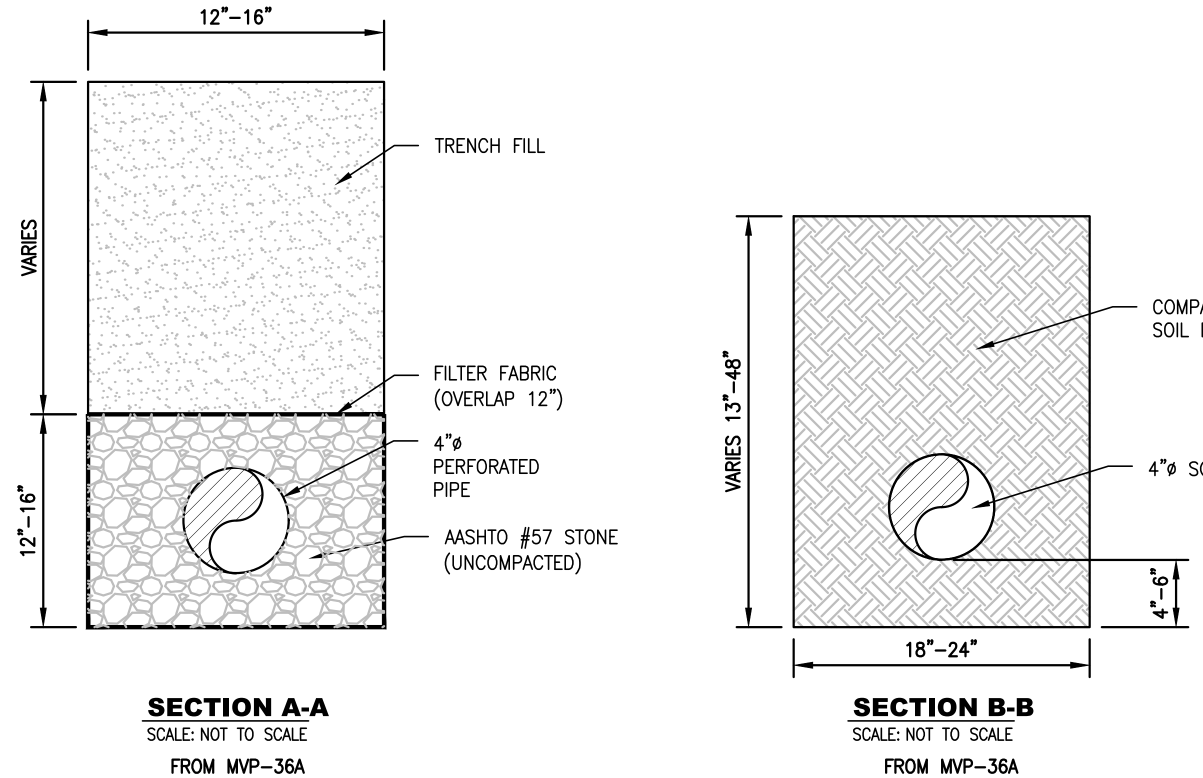
Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

TRANSVERSE TRENCH DRAIN

DRAWING NO. MVP-SG-38A

REV. P1



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID: H–650–TYP			

Mountain Valley PIPELINE LLC

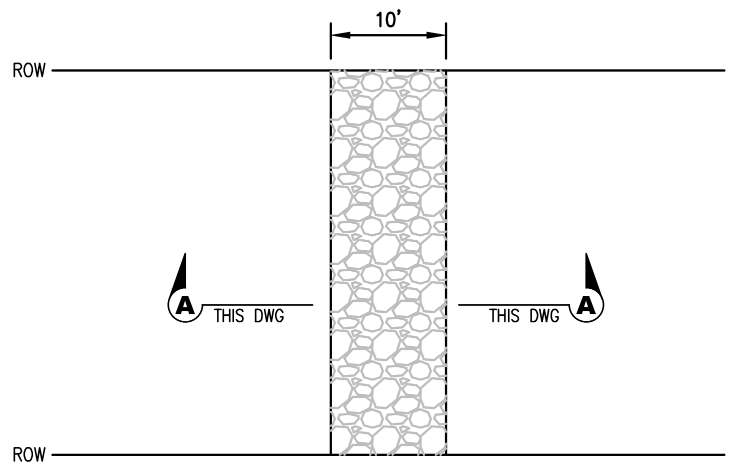
TYPICAL CONSTRUCTION DETAIL

TRANSVERSE TRENCH DRAIN

DRAWING NO.	REV.
MVP–38B	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:39 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-38B.dwg



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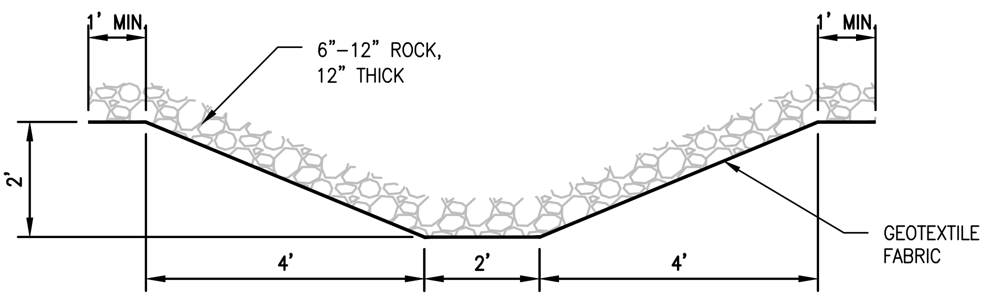


SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: H–650–TYP			

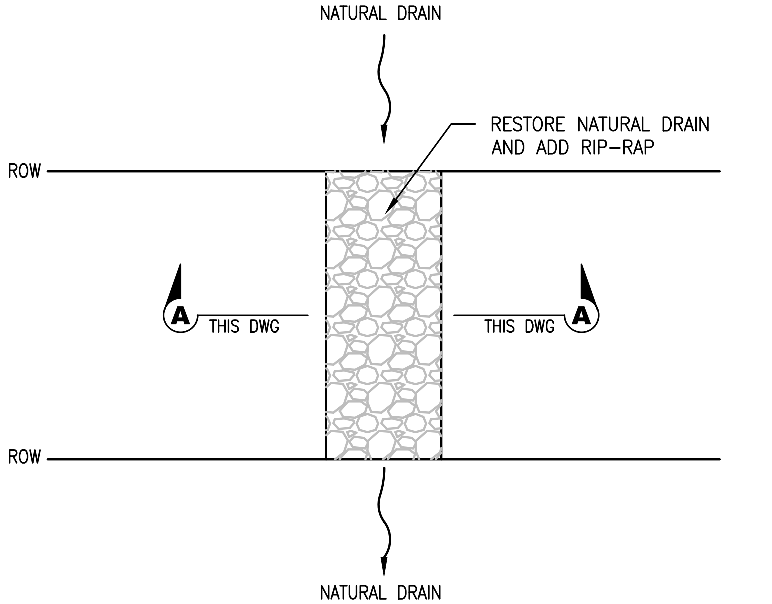
Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

ROCK LINED SWALE

DRAWING NO. MVP–SG–39

REV. P1



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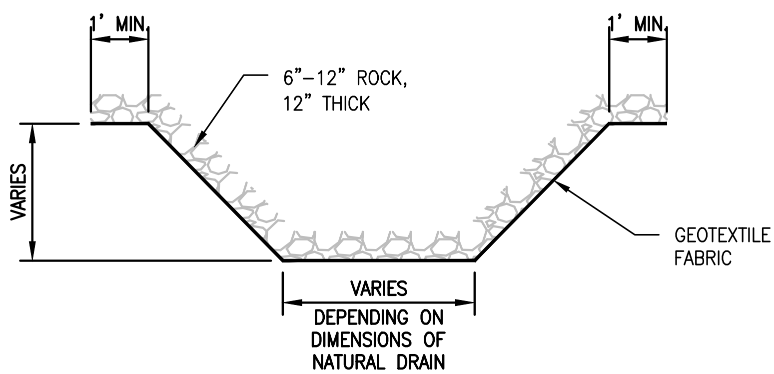


SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: H–650–TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

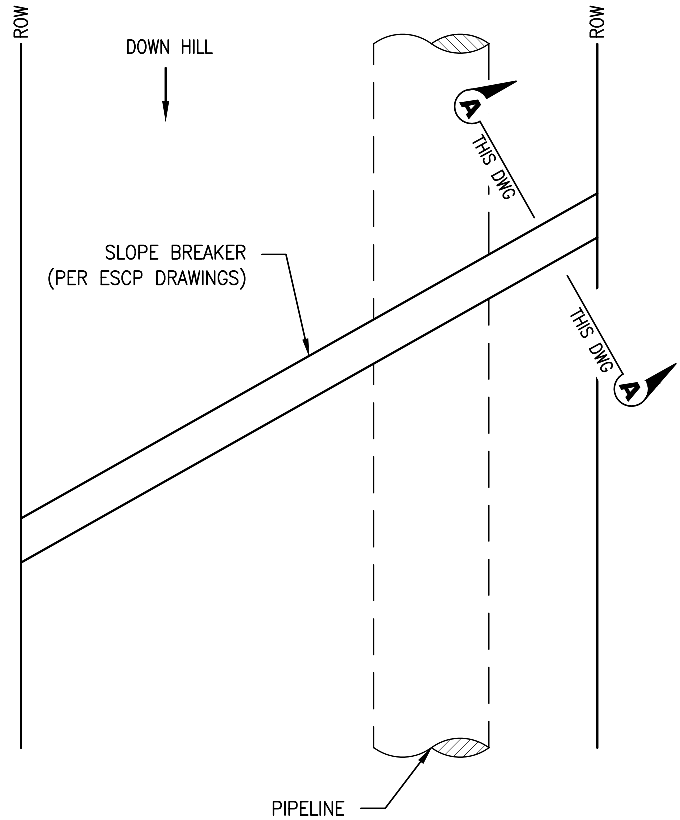
RIP–RAP NATURAL DRAIN

DRAWING NO. MVP–SG–40

REV. P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:39 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-40.dwg



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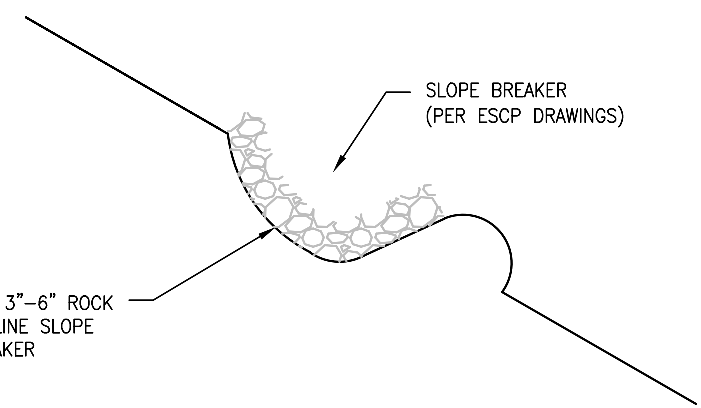


SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: H–650–TYP			

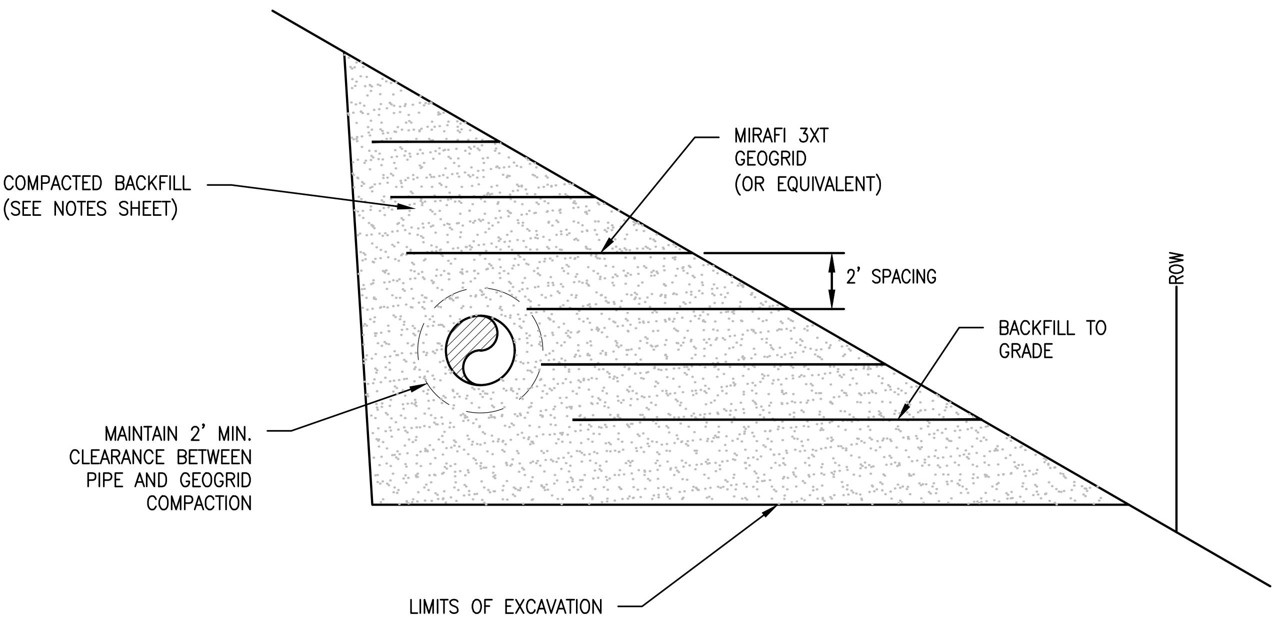
Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

RIP–RAP SLOPE BREAKERS

DRAWING NO. MVP–SG–41

REV. P1



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

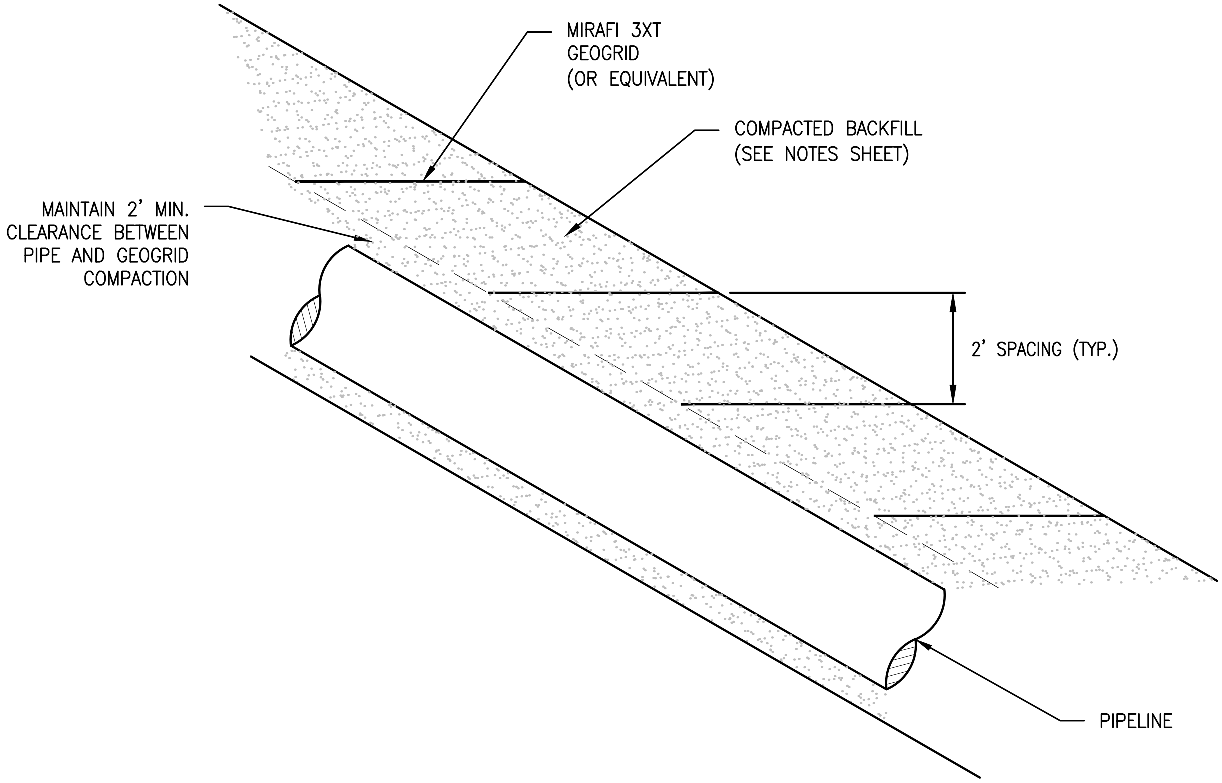
DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 3
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

GEOGRID–SIDEHILL

DRAWING NO.	REV.
MVP–SG–42A	P1



SECTION VIEW

SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	2 OF 3
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

SLIDE MITIGATION DETAIL

GEOGRID-PLANAR

DRAWING NO.	REV.
MVP-SG-42B	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:58 PM

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COMPACTION NOTES

1) ALL ROCKS LARGER THAN 6 INCHES IN SIZE, AND MORE THAN 10 PERCENT BY VOLUME SHOULD BE REMOVED AND PROPERLY DISPOSED FROM THE BACKFILL MATERIAL.
2) THE SUBGRADE AT THE BASE OF THE EXCAVATION SHOULD BE PROOFROLLED WITH A PNEUMATIC TIRED ROLLER OR VEHICLE.
3) THE EXCAVATED AREA SHALL BE BACKFILLED WITH THE CLEANED EXCAVATED SOIL MATERIAL AND COMPACTED IN PLACE.
4) BACKFILL OPERATIONS SHALL BE PERFORMED WHEN SOIL IS SUITABLE FOR COMPACTION (I.E., NOT IMMEDIATELY FOLLOWING A LARGE RAIN, SNOW, OR ICE EVENT). FROZEN FILL SHALL NOT BE USED.
5) THE BACKFILL SHALL BE PLACED IN COMPACTED LIFTS NO GREATER THAN 12 INCHES.
6) MAINTAIN A MINIMUM 2FT CLEARANCE BETWEEN COMPACTION ACTIVITY AND THE GAS PIPELINE.

GRAVEL DRAIN NOTES

1) GEOTEXTILE FABRIC SHALL BE TENCATE MIRAFI 140N OR APPROVED EQUIVALENT.
2) THE GEOTEXTILE FABRIC SHALL BE STORED UNDAMAGED PURSUANT TO MANUFACTURERS RECOMMENDATIONS.
3) DO NOT OPERATE CONSTRUCTION EQUIPMENT DIRECTLY ON THE GEOTEXTILE FABRIC.
4) DRAINAGE AGGREGATE SHALL MEET THE REQUIREMENTS OF AASHTO NO. 57 STONE.
5) DRAINAGE AGGREGATE SHALL NOT BE COMPACTED.

GEOGRID NOTES

1) GEOGRID REINFORCEMENT SHALL BE TENCATE MIRAFI 3XT OR APPROVED EQUIVALENT.
2) THE GEOGRID MATERIAL SHALL BE STORED UNDAMAGED PURSUANT TO MANUFACTURERS RECOMMENDATIONS.
3) GEOGRID SHALL BE PLACED HORIZONTALLY ON THE BACKFILL WITH THE PRINCIPAL STRENGTH DIRECTION PERPENDICULAR TO THE FACE OF THE SLOPE. ADJACENT PIECES OF PRIMARY GEOGRID SHALL NOT OVERLAP BUT ARE TO BE BUTTED SIDE TO SIDE.
4) REMOVE ALL SLACK IN THE GEOGRID MATERIAL AND ANCHOR AS NECESSARY WITH PINS, OR BAGS TO PREVENT SLACK FROM DEVELOPMENT DURING FILL PLACEMENT AND COMPACTION.
5) FILL IS TO BE PLACED AND SPREAD DIRECTLY ON THE GEOGRID MATERIAL WITH RUBBER TIRED EQUIPMENT ONLY. SPEEDS ARE TO BE KEPT SLOW WITH AS FEW STOPS AND TURNS AS PRACTICAL.
6) DO NOT OPERATE TRACKED EQUIPMENT DIRECTLY ON THE GEOGRID MATERIAL.
7) MAINTAIN A MINIMUM 2FT CLEARANCE BETWEEN GEOGRID MATERIAL AND THE GAS PIPELINE.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	3 OF 3
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

GEOGRID NOTES

DRAWING NO. MVP-SG-42C

REV. P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

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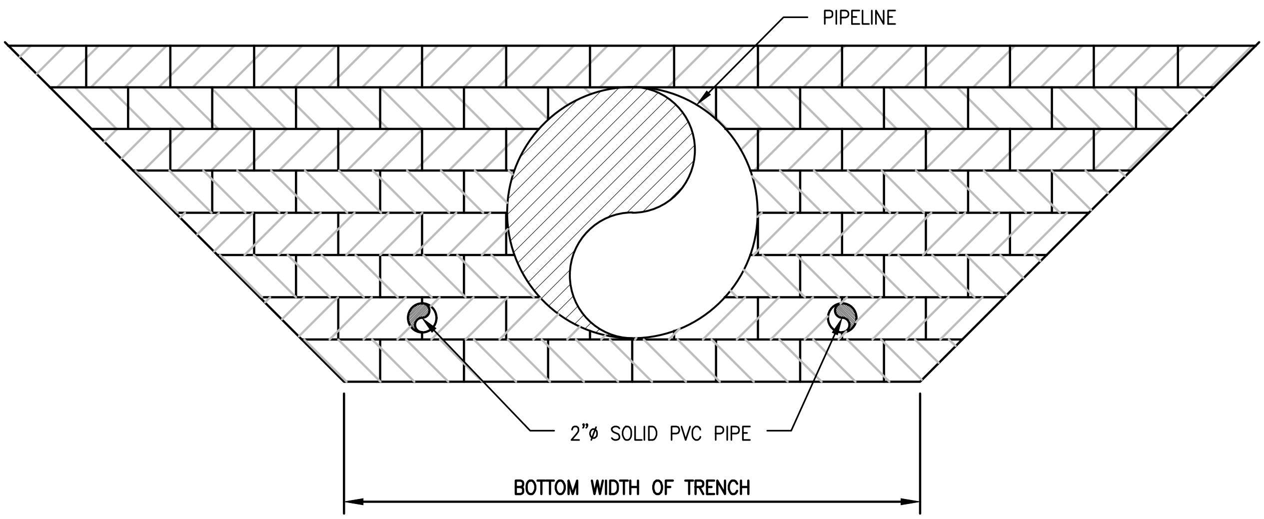
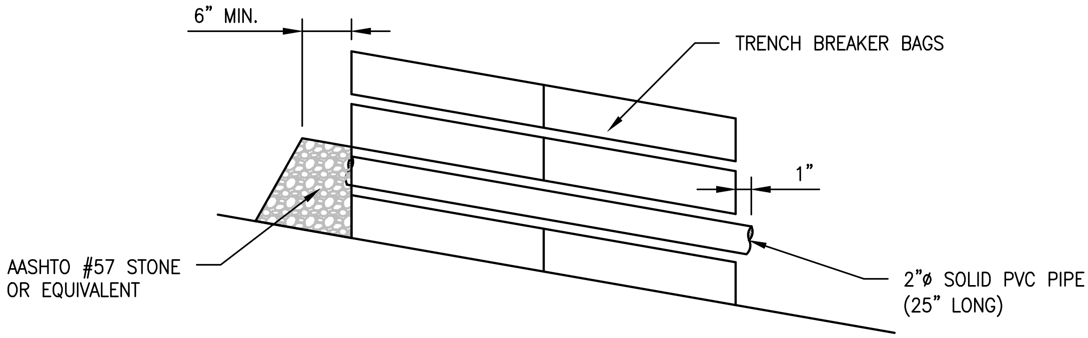


FRONT VIEW
SCALE: NOT TO SCALE



SECTION VIEW
SCALE: NOT TO SCALE

NOTES:
1. PLACE PVC DRAIN PIPE ON FIRST LAYER OF TRENCH BREAKER BAGS.
2. PLACE PVC DRAIN PIPE EQUADISTANT FROM THE OUTSIDE EDGE OF THE 30" GAS PIPE AND THE BOTTOM LIMITS OF THE TRENCH.
3. EXTEND PVC PIPE THROUGH ENTIRE TRENCH BREAKER AND EXTEND APPROX. 1" PAST END OF BREAKER.
4. AASHTO#57 STONE SHALL BE PLACED TO A MINIMUM 6" THICKNESS UPSLOPE OF THE DRAIN PIPE.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

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SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

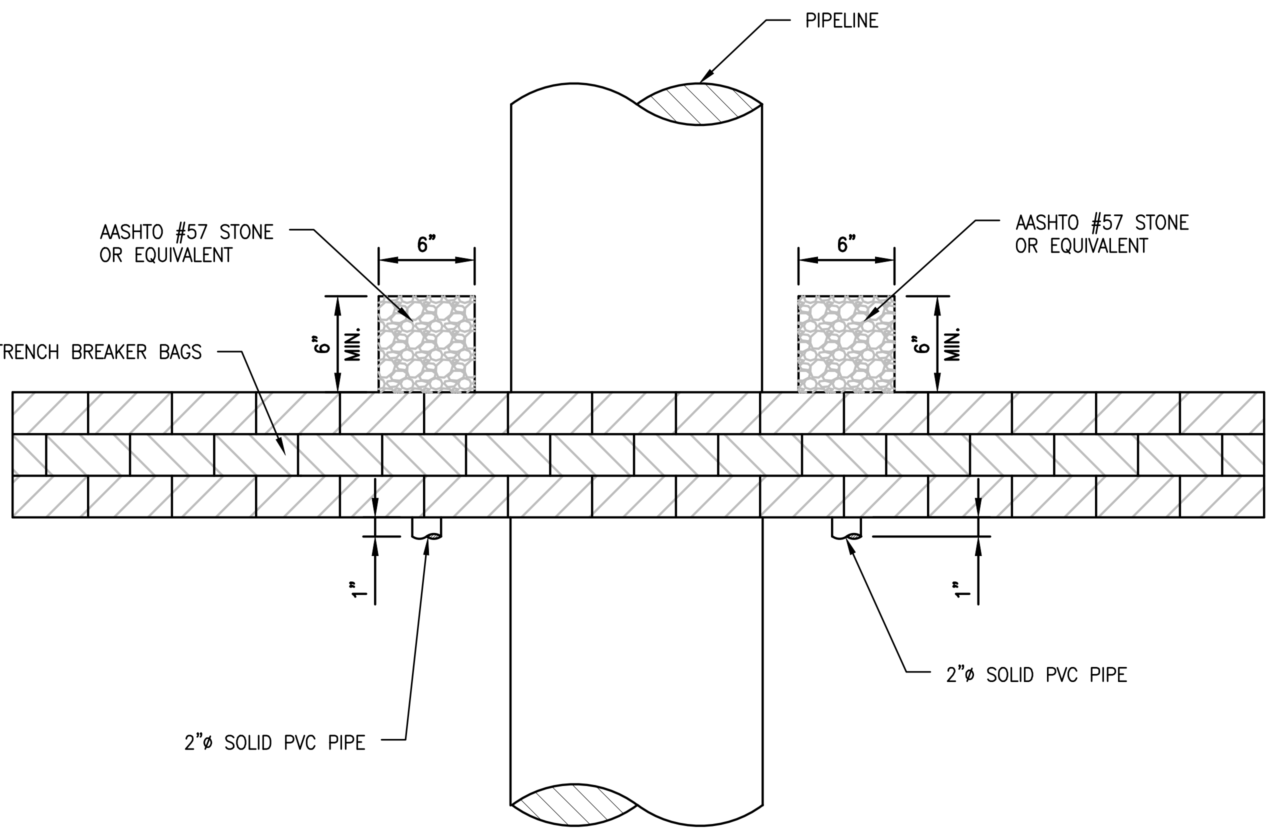
TYPICAL CONSTRUCTION DETAIL

TRENCH BREAKER
PASS-THROUGH DRAIN

DRAWING NO. MVP-SG-43A

REV. P1

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-43A.dwg



PLAN VIEW
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
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JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

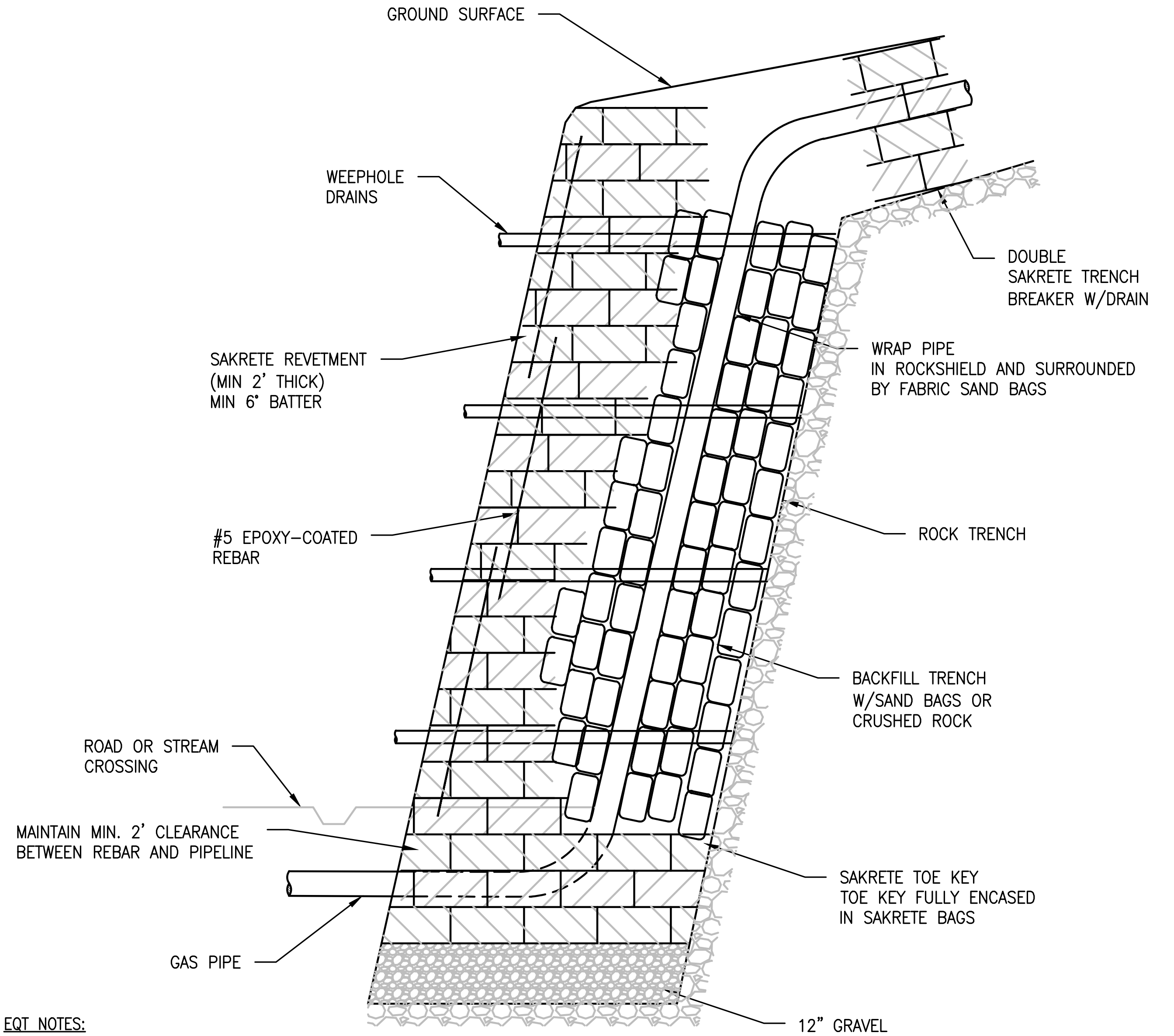
TRENCH BREAKER PASS-THROUGH DRAIN

DRAWING NO. MVP-SG-43B

REV. P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-43B.dwg



SIDE VIEW
SCALE: NOT TO SCALE

EQT NOTES:

1. SAKRETE BAGS SHOULD EXTEND 4 BAGS DEEP PIPE SHOULD BE COMPLETELY SURROUNDED BY SAND BAGS, OR CRUSHED ROCK (MAX 6").
2. SAKRETE BAGS SHOULD BE STAGGERED IN A MASONRY FASHION. THE FACE OF THE WELL SHALL BE INCLINED 6"–10" FROM VERTICAL.
3. #5 REBAR SHOULD BE DRIVEN THROUGH THE SAKRETE BAGS (SEE DETAIL 1).
4. 2"ø PVC WEEPHOLE DRAINS SHALL BE INSTALLED EVERY 15 FT.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
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JOB NO.			
PROJECT ID: H–650–TYP			

Mountain Valley PIPELINE LLC

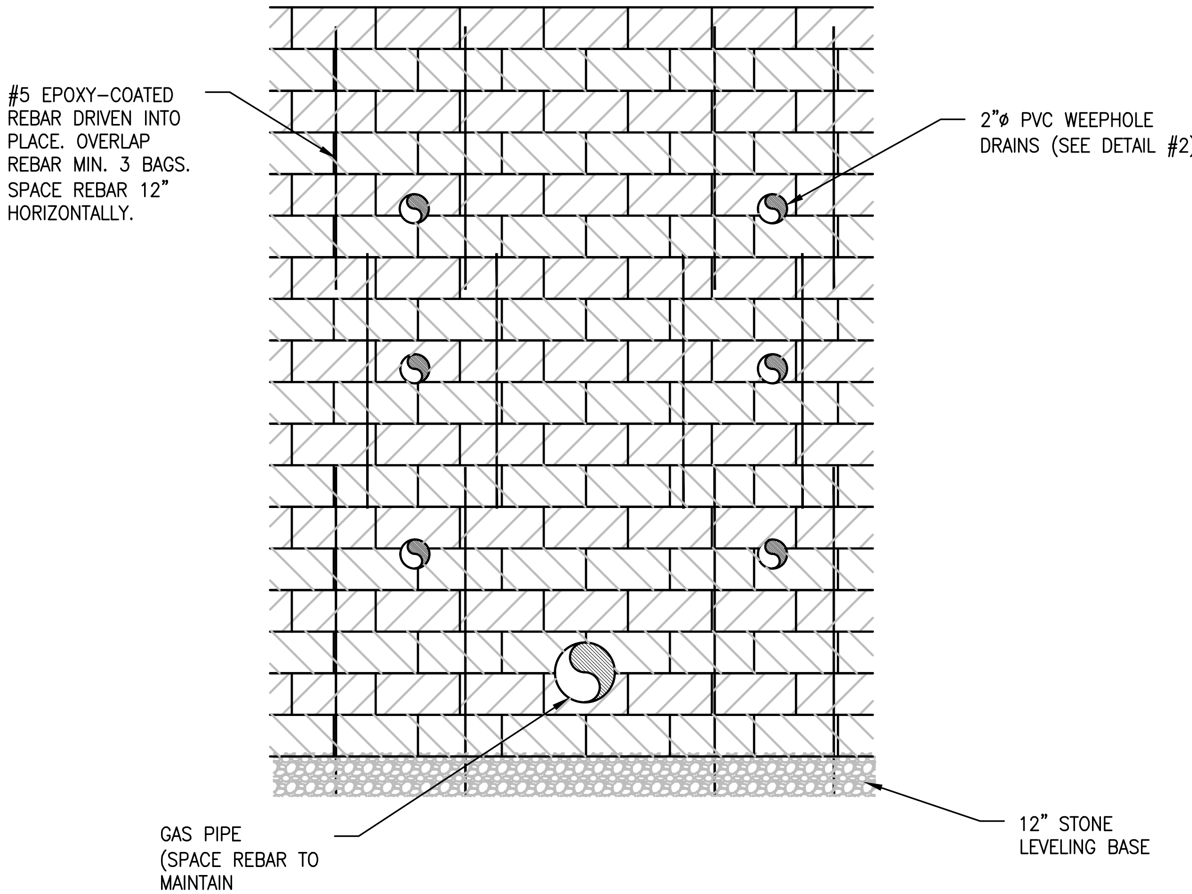
TYPICAL CONSTRUCTION DETAIL

SLIDE MITIGATION
HIGHWALL REVETMENT
SIDE VIEW

DRAWING NO.	REV.
MVP–SG–44A	P1

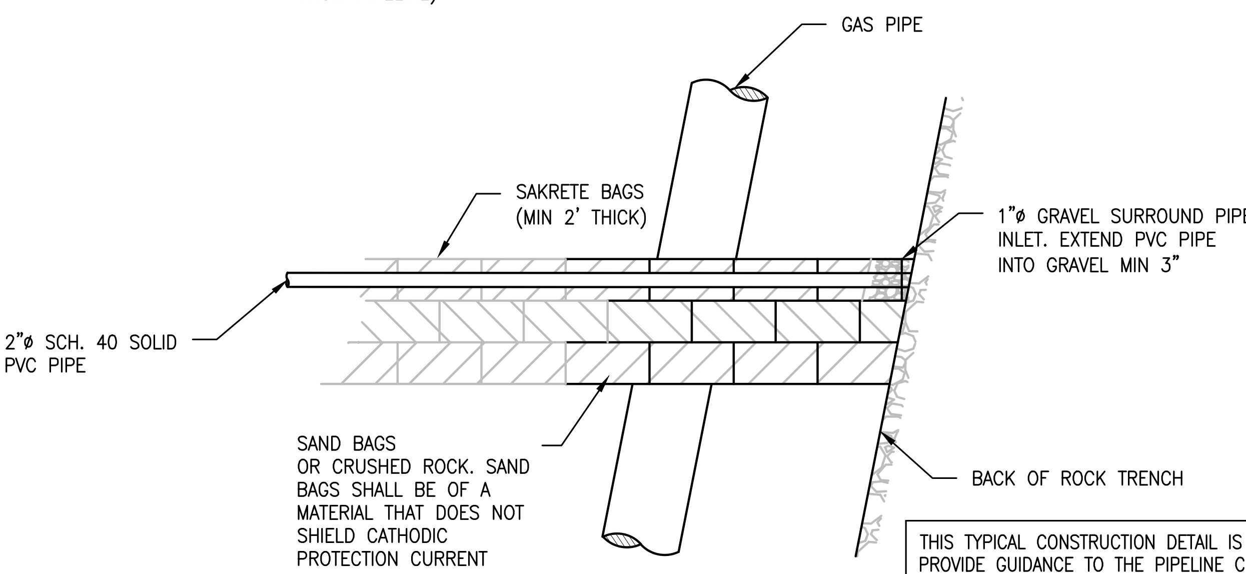
Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-44A.dwg



FRONT VIEW

SCALE: NOT TO SCALE



DRAIN DETAIL

SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

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APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

SLIDE MITIGATION
HIGHWALL REVETMENT
FRONT VIEW AND DRAIN DETAIL

DRAWING NO.	REV.
MVP-SG-44B	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

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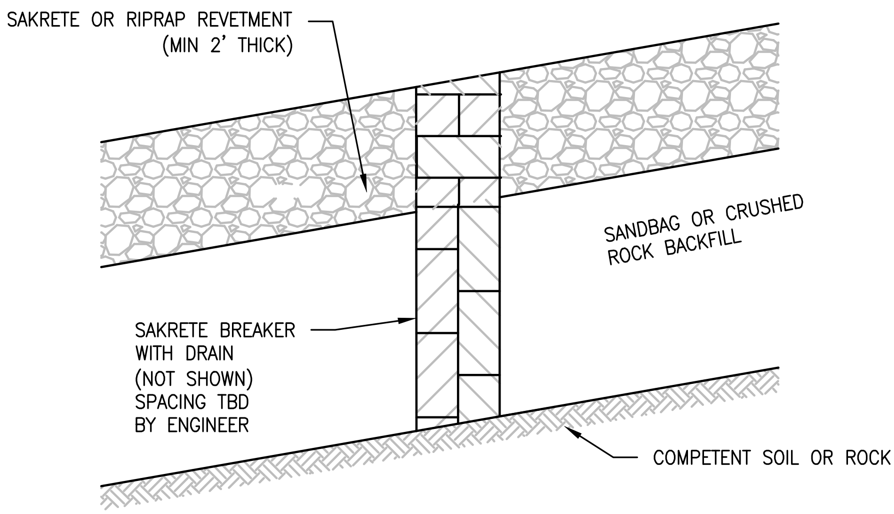

SIDE VIEW
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

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JOB NO.			
PROJECT ID: H-650-TYP			

Mountain Valley PIPELINE LLC

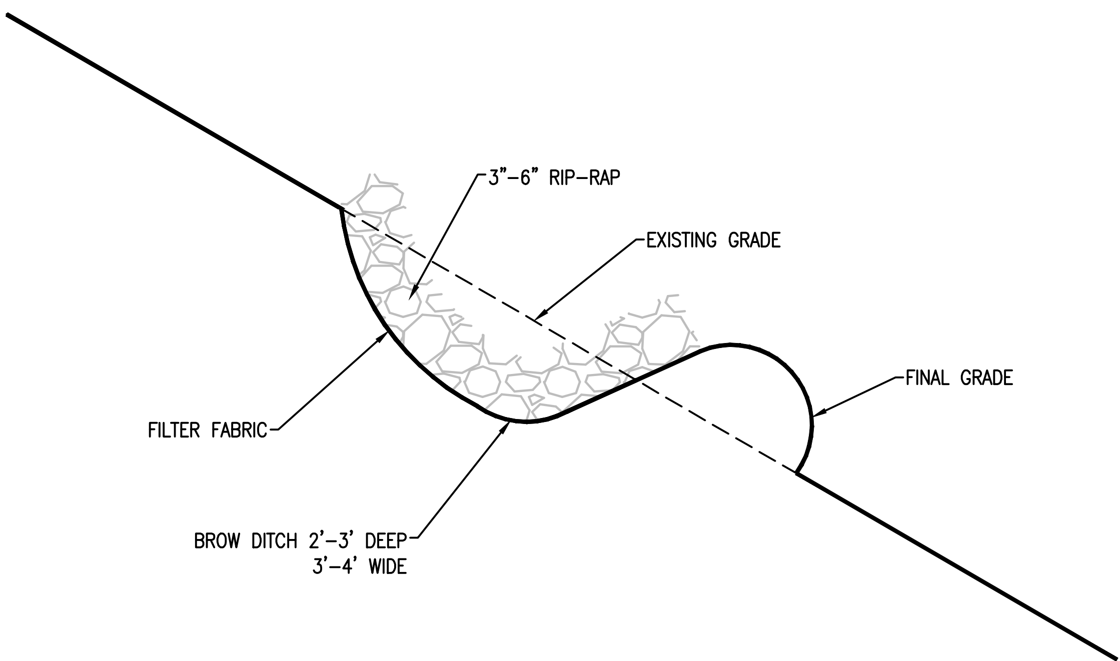
TYPICAL CONSTRUCTION DETAIL

STEEP SLOPE REVETMENT

DRAWING NO.	REV.
MVP-SG-45	P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-45.dwg



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	TRC	DATE	8/7/2018
CHECKED	XXX	DATE	X/X/2018
APP'D	XXX	DATE	X/X/2018
SCALE	N.T.S.	SHEET	1 OF 1

JOB NO.

PROJECT ID:

H-650-TYP

Mountain Valley PIPELINE LLC

TYPICAL CONSTRUCTION DETAIL

BROW DITCH DETAIL

DRAWING NO. MVP-SG-46

REV. P1

Plotted by: Sample, Stanley on: August 14, 2018 - 12:40 PM

File Path: O:\Projects\300423 - NextEra MVP Southgate\CA - CADD\Pipeline\Drawings\Typicals\MVP-SG-46.dwg

MVP Southgate Project

Docket No. CP19-14-000

Final Geotechnical Investigation Reports
Dan River / Stony Creek

October 2019

FERC Environmental Condition #13

Prior to the end of the draft EIS comment period, Mountain Valley shall file with the Secretary all outstanding geotechnical studies for the proposed Dan River and Stony Creek Reservoir HDD crossings, revised feasibility and hydrofracture analyses, and any proposed mitigation following completion of these studies (4.1.4.9).

MVP Southgate Project Response

The Project is providing its Final Geotechnical Investigation Reports for the proposed Dan River and Stony Creek Reservoir HDD crossings with this filing (see Final Geotechnical Investigation Reports Dan River/Stony Creek). The Project will adjust the HDD profile (if necessary) to route through areas with low potential of rock fracture. In addition, the Project has included its final geotechnical information for the highway crossings in Virginia and North Carolina which will be crossed via HDD. The Project will implement its HDD Contingency Plan when conducting HDDs in these locations.

The Project performed Delft equation analysis on the geotechnical core samples that were completed for both Dan River and Stoney Creek. The Delft equation analyses are updated below.

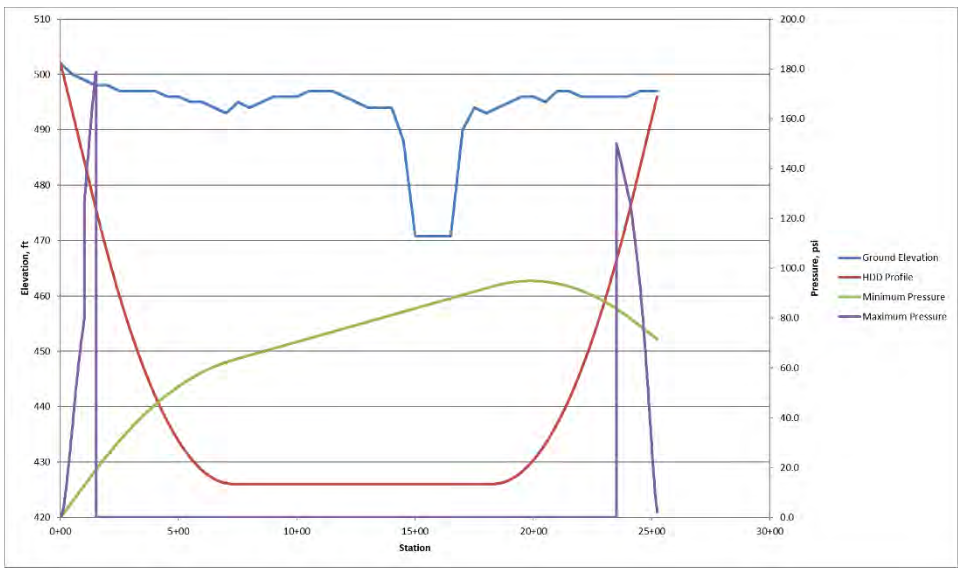
The Delft equation determines the maximum mud pressure to avoid inadvertent returns in soils. The inputs used to determine the Delft Equation values are located in the Geotechnical Investigations Report. This analysis has been updated with the completion of the remaining bore locations. To best describe the maximum mud pressure and its impact on each of the horizontal directional drills (HDD) the figures below depict the ground elevation (blue), preliminary HDD profile (red), minimum mud pressure (green), and the maximum mud pressure (purple). These curves are a function of drill bit and rod size, mud specifications, pump flow rates, and other variables determined by contractor's preference. The Project will work with the drilling contractor, once awarded, to update the curve accordingly.

Dan River Delft Equation

The Dan River Delft Equation was performed based on the results of Core Sample No. 1 and 4 taken on the northern side of the Dan River. The Delft Equation analysis was updated based on the results of the sample taken on the southern side of the river, Core Sample 2. The minimum mud pressure line (green) is much lower than the maximum mud pressure line (purple), therefore the risk of inadvertent return is low for the entry side of the drill. This has not changed from the initial Delft equations that were previously filed due to the similar nature of the geology on either side of the river. For much of the exit side, the maximum mud pressure line is well above the minimum mud pressure line. The lines do cross very near the proposed exit which creates an area of known risk, but will be included in the mud return pit on the exit side of the drill and is mitigated. The exit side of the drill has not changed, as the samples had been previously completed..

The Delft Equation is used to calculate the approximate required pressure for soils to fracture creating paths for inadvertent return. This does not apply to rock of any kind, regardless how weathered or fractured, because fractured rock does not provide any cohesion and competent rock has too much strength for a typical HDD rig to fracture. This is shown graphically with the maximum mud pressure dropping to zero once the drill enters rock. RQD values and recovery percentages can provide insight into the drill's success. At the Dan River, the HDD will be designed such that the majority of the drill path will be located in a competent rock layer with high RQD values directly beneath the river. Chance encounters with unpredictable single fractures are the only concern at this point and they present a minimal risk.

The largest concern for inadvertent returns (IR) occurs at the highly weathered and fractured rock layer between the soil and the competent bedrock. The concern is a radial and horizontal translation of drilling fluid from the drill path toward the river. To mitigate this concern, the drill path is designed to maximize the distance between the drill path when it crosses this layer and the river bank. Standard drilling fluid characteristics may be enough to prevent a loss to formation via the “filter cake” that gets applied to the bore hole walls. If not, additives maybe added to the drilling fluid to better fill the cracks and fractures until the loss stops. It is required in MVP Construction Specifications and the HDD Contingency Plan that the contractor monitor downhole pressure at all times during the pilot. The increased distance between drill path and river bank and constant monitoring will allow the contractor to identify fluid loss and remedy the situation before an IR reaches the river.

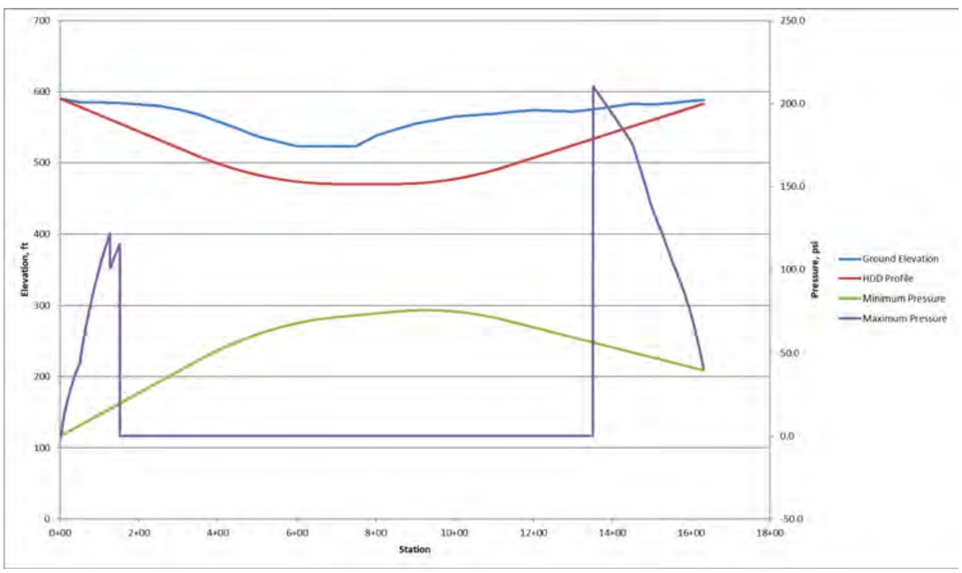


Stony Creek Delft Equation

The Stony Creek Delft Equation was performed based on the results of Core Sample No. 1, taken on the east side of Stony Creek. This Delft equation was updated to include Core Sample No. 2, which was completed and submitted with Supplemental #5 information. The minimum mud pressure line (green) is much lower than the maximum mud pressure line (purple), therefore the risk of inadvertent return is low for the entry side of the drill. The maximum mud pressure drops to zero once the drill enters rock, but RQD values can provide insight into the drill’s success. At Stony Creek, the HDD will be tailored to meet a high RQD value, especially in areas under the river. At the exit side, the minimum pressure crosses the maximum pressure line, meaning there is still low probability of an IR at this location, but this is included in the mud return pit and is therefore mitigated.

The Delft Equation Analysis is used to calculate the approximate required pressure for soils to fracture creating paths for inadvertent return. This does not apply to rock of any kind, regardless how weathered or fractured, because fractured rock does not provide any cohesion and competent rock has too much strength for a typical HDD rig to fracture. This is shown graphically with the maximum mud pressure dropping to zero once the drill enters rock. RQD values and recovery percentages can provide insight into the drill's success. At the Stony Creek, the HDD will be designed such that the majority of the drill path will be located in a competent rock layer with high RQD values directly beneath the river. Chance encounters with unpredictable single fractures are the only concern at this point and they present a minimal risk.

The largest concern for an IR occurs at the highly weathered and fractured rock layer between the soil and the competent bedrock. The concern is a radial and horizontal translation of drilling fluid from the drill path toward the river. To mitigate this concern, the drill path is designed to maximize the distance between the drill path when it crosses this layer and the river bank. Standard drilling fluid characteristics may be enough to prevent a loss to formation via the "filter cake" that gets applied to the bore hole walls. If not, additives may be added to the drilling fluid to better fill the cracks and fractures until the loss stops. It is required in MVP Construction Specifications and the HDD Contingency Plan that the contractor monitor downhole pressure at all times during the pilot. The increased distance between drill path and river bank and constant monitoring will allow the contractor to identify fluid loss and remedy the situation before an IR reaches the creek.



In conclusion, all borings completed for Dan River and Stoney Creek show there is a high probability of success for each of the HDD's. Mitigation measures are highlighted in the Project's HDD Contingency Plan and will be followed in the event an issue arises. MVP Southgate will continue to analyze the initial profile to determine the optimal depth of cover while crossing each waterbody and will work with the Contractor to determine the final bore profile.

October 15, 2019
Kleinfelder Project No. 20201659.002A

Ms. Alina Lawrence
Design Engineer
Equitrans Midstream Corp.
2200 Energy Drive
Canonsburg, PA 15317

SUBJECT: Geotechnical Report of Subsurface Exploration
Mountain Valley Pipeline – Southgate
Dan River HDD Crossing
Eden, North Carolina

Dear Ms. Lawrence:

This report presents the results of a subsurface exploration performed for the subject project. This work was authorized by Mountain Valley Pipeline, LLC. (MVP) Purchase Order No. 152275 OC – Change Order #1 (dated September 9, 2019) and was conducted in accordance with Kleinfelder's August 29, 2019, Proposal for Geotechnical Engineering Services (No. MPEQTGTH.001C). The purpose of Kleinfelder's services was to explore the subsurface conditions at the site with respect to the installation of a new proposed pipeline and to provide general soil/rock profiles and parameters.

PROJECT INFORMATION

The project consists of the installation of approximately 70 miles of natural gas transmission line that extends from Transco Village, Virginia southward to Graham, North Carolina. The proposed alignment requires pipeline installation beneath the Dan River in Eden, North Carolina. We understand that horizontal direction drilling (HDD) techniques will be utilized to install the referenced pipeline.

MVP requested a boring be performed along the south side of the Dan River to determine the subsurface soil and rock conditions for use in the HDD design and analysis (to be performed by others). We understand that a boring along the north side of the Dan River was previously performed by others. Entry/exit locations, proposed drill lengths and pipe specifications were not provided at the time of this report.

EXPLORATION METHODS

Field Testing

Kleinfelder's field testing services for this site included the completion of 1 soil test boring. The boring was located approximately 1,565 feet north of Chumney Loop and approximately 675 feet east of NC Hwy 700 as shown on the Boring Location Plan, Figure 1, in the Appendix. The boring location was selected by MVP.

7343 West Friendly Avenue, Suite B, Greensboro, NC 27410 **p |** 336.668.0093 **f |** 336.668.3868

The boring was advanced to a depth of 176 feet below the ground surface (bgs) using wash rotary and coring techniques. Standard Penetration Tests were performed at 2.5 feet intervals in the upper 10 feet and 5 feet intervals thereafter to tricone refusal in general accordance with ASTM D 1586. Refusal materials were cored using an NQ sized diamond core barrel, to assess the character and continuity of the underlying bedrock. The coring was accomplished in general accordance with ASTM D 2113. The borehole was filled with grout using a tremie pipe after drilling completion. A Kleinfelder geotechnical engineer observed the drilling and logged the subsurface conditions. The soils were classified according to the Unified Soil Classification System (USCS). Soil and rock conditions encountered are shown on the boring log included in the Appendix.

Laboratory Testing

Selected soil samples were subjected to routine index testing to establish their engineering characteristics. The index testing consisted of natural water content determinations, Atterberg Limits tests, and percent fines determinations. The laboratory tests were performed in accordance with ASTM D 2216, D 4318, and D 1140, respectively. A total of 6 unconfined compressive strength tests were conducted on selected rock core samples. The results of the laboratory testing are presented in the following section and on the boring log included in the Appendix.

FINDINGS

Site Geology

According to readily available United States Geologic Survey (USGS) maps of North Carolina, the project site is in the Triassic Basins region of the Piedmont Physiographic Province. Bedrock at the site is within a sedimentary unit known as the Dan River Group of the Newark Supergroup. These non-marine sedimentary rock units are predominantly comprised of sandstone, siltstone, mudstone and conglomerates.

Igneous intrusive bodies of mafic crystalline rock, commonly referred to as diabase dikes and sills, are frequently found within the sedimentary units of the Triassic Basins. These linear rock units generally trend in a north-south or northwest-southeast direction. Igneous intrusions also occur as discontinuous layers and boulders within the Triassic Basin. Residual soils weathered from igneous intrusions (dikes and sills) can contain boulders and be wetter and softer than the surrounding Triassic soils.

Subsurface Conditions

The generalized subsurface conditions are described below. The boring log should be reviewed for soil descriptions and general stratification.

Surface materials consisted of agricultural vegetation. The topsoil thickness was negligible, however, cultivated soils were encountered in the upper foot. Triassic residual soils were present below the surface materials to a depth of 22.0 feet bgs. Triassic residual soils are formed by the in-place chemical weathering of the parent bedrock. The residual soils encountered in the boring generally consisted of moist lean to fat clay (CL/CH) in the upper 5.5 feet. Moist silty sand (SM) and sandy silt (ML) was encountered below the shallow soil down to weathered rock. SPT N-values recorded in the residual soils ranged from 4 to 79 blows per foot (bpf), with the majority between 6 and 12 bpf.

Weathered rock was encountered at a depth of 22.0 feet bgs. Weathered rock represents the transition between residual soil and bedrock and is defined as any residual material that exhibits a Standard Penetration Resistance of at least 100 bpf, but less than 50 blows per 2 inches. The weathered rock sampled as sandy silt.

Tricone refusal occurred on bedrock at a depth of 53.2 feet bgs. Tricone refusal is defined as negligible penetration of the roller bit under the full weight and down pressure of the drill rig. Upon encountering tricone refusal, rock coring was performed down to the boring termination depth of 176.0 feet bgs. The bedrock consisted of siltstone, mudstone, and sandstone. The recovery values ranged from 85 to 100 percent, with the majority measuring 100 percent recovery. The rock quality designation (RQD) values ranged from 25 to 100 percent, with the majority between 53 and 100 percent. Observed Moh's hardness values for the collected rock cores ranged from 1 to 8, with the majority between 1 and 4.

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling. Review of readily available groundwater information on the North Carolina Department of Environment Quality (NCDEQ) website https://www.ncwater.org/?page=343 indicates that the depth to groundwater in monitoring well (D 52L1) located in Rockingham County, North Carolina ranges from approximately 18 to 22 feet bgs.

Fluctuation in groundwater levels can occur with climatic and seasonal variations, with the highest groundwater levels generally expected between March and May. Seasonal low groundwater levels are generally expected between September and November. Therefore, subsurface water conditions at other times may be different from those described in this report.

Laboratory Testing Results

The results of the soil classification laboratory tests are summarized below in Table 1:

TABLE 1: SOIL CLASSIFICATION LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINES	USCS CLASS
DRS-HDD-1	8.1 – 9.6	29.9	28	25	3	37	SM
DRS-HDD-1	13.2 – 14.7	35.9	36	25	11	72	ML

The results of the rock core testing are summarized below in Table 2.

TABLE 2: ROCK CORE LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	YOUNGS MODULUS (KSI)
DRS-HDD-1	58.9 – 59.5	157.9	7,910	1,020
DRS-HDD-1	67.4 – 68.2	163.6	9,250	1,010
DRS-HDD-1	75.2 – 76.0	153.9	8,640	760
DRS-HDD-1	78.3 – 79.0	154.3	6,010	780
DRS-HDD-1	86.0 – 86.8	167.3	610	130
DRS-HDD-1	91.8 – 92.5	169.1	2,130	690

GENERAL SUBSURFACE PROFILE AND PARAMETERS

Generalized soil/rock profile and parameters for use in the Delft Geotechnics equation are presented below in Table 3. The profile is based on the subsurface conditions encountered at the boring. The transition between strata will vary across the alignment due to the limited number of borings performed and the prevailing geology.

TABLE 3: GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
RESIDUAL	0 – 5	CL/CH	125	0	400	--	160
	5 – 15	SM	110	30	0	--	100
	15 – 22	ML	78	38	120	--	380
WEATHERED ROCK	22 – 53	--	140	45	0	--	2,000
BEDROCK	53 – 85	--	155	--	--	5,000	32,000
	85 – 103	--	165	--	--	700	12,000
	103 – 128	--	160	--	--	6,000	32,000
	128 – 134	--	160	--	--	700	12,000
	134 – 154	--	160	--	--	5,000	32,000
	154 – 176	--	160	--	--	1,000	16,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

If HDD installation techniques are utilized, the bore should be designed to be deep enough such that the risk of hydraulic fracturing is low. The areas of greatest concern for hydraulic fracturing are near the exit location and where overburden cover of the drill path is smallest. Hydraulic fracture calculations should be performed to evaluate the potential risk and aid in selecting the proper depth of the bore path. The contractor should carefully evaluate the ground conditions identified in this report before selecting drilling equipment and tooling.

Difficulty in steering may occur at the interface of soil and rock if the alignment extends into the underlying weathered rock and bedrock. Attempting to construct a vertical curve at the transition between soil and rock is not recommended. Curves should be laid out all in soil or all in rock.

LIMITATIONS

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk.

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. The work performed was based on project information provided by MVP

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinions, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's Geotechnical Engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during foundation construction.

This report may be used only by MVP and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than 2 years from the date of the report.

CLOSURE

Kleinfelder appreciates the opportunity to provide services to you during this phase of the project. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,
KLEINFELDER, INC.
Firm License No. F-1312

Joshua D. Fregosi, PE
NC License No. 38602

Xavier C. Barrett, PE
Principal Professional

JDF/XCB:cas
Attachments

BORING LOCATION PLAN – FIGURE 1

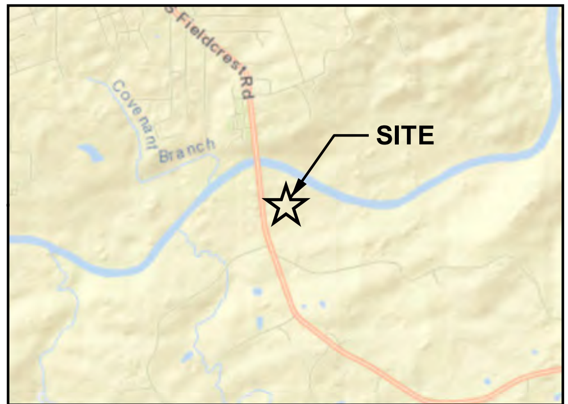
PLOTTED: 10/16/2019 10:29:14 AM BY: JFregosi

N

LEGEND

SOIL BORING

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2019 MICROSOFT CORPORATION.
COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200



N

VICINITY MAP

NOT TO SCALE

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0 200 400

1 " = 200 SCALE IN FEET

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PROJECT NO. 20201659.002A		EXPLORATION LOCATION PLAN AND VICINITY MAP	FIGURE
DRAWN BY:	JFregosi	Equitrans MVP Southgate Dan River HDD Dan River Eden, North Carolina	1
CHECKED BY:	J. Fregosi		
DATE:	10-16-2019		

GIS FILE PATH: \\azrgisstorp01\Working_clients_Automated_Exploration Plans

BORING LOGS

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20201659.002A OFFICE FILTER: GREENSBORO
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_GEO-LEG1 (GRAPHICS KEY) WITH USCS] PLOTTED: 10/15/2019 11:41 AM BY: JFregosi

SAMPLE/SAMPLER TYPE GRAPHICS

- NQ CORE SAMPLE (1.874 in. (47.6 mm.) core diameter)
- MUD ROTARY
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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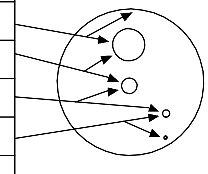
PROJECT NO.: 20201659.002A	GRAPHICS KEY
DRAWN BY: CD	Equitrans MVP Southgate Dan River HDD Dan River Eden, North Carolina
CHECKED BY: JDF	
DATE: 10/15/2019	

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT: Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20201659.002A

DRAWN BY: CD

CHECKED BY: JDF

DATE: 10/15/2019

SOIL DESCRIPTION KEY

Equitrans MVP Southgate Dan River HDD
Dan River
Eden, North Carolina

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	>6 ft. (>1.83 meters)
Slightly Fractured	2 - 6 ft. (0.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm)
Highly Fractured	2 - 8 in (50.80 - 203.30 mm)
Intensely Fractured	<2 in (<50.80 mm)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical / mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (Mpa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife.
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer.
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it.
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it.
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer.

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

APERTURE

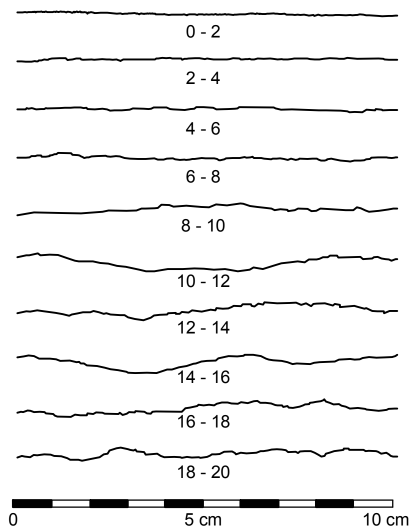
DESCRIPTION	CRITERIA [in (mm)]
Tight	<0.04 (<1)
Open	0.04 - 0.20 (1 - 5)
Wide	>0.20 (>5)

BEDDING CHARACTERISTICS

DESCRIPTION	Thickness [in (mm)]
Very Thick Bedded	>36 (>915)
Thick Bedded	12 - 36 (305 - 915)
Moderately Bedded	4 - 12 (102 - 305)
Thin Bedded	1 - 4 (25 - 102)
Very Thin Bedded	0.4 - 1 (10 - 25)
Laminated	0.1 - 0.4 (2.5 - 10)
Thinly Laminated	<0.1 (<2.5)

Bedding Planes — Planes dividing the individual layers, beds, or stratigraphy of rocks.
Joint — Fracture in rock, generally more or less vertical or traverse to bedding.
Seam — Applies to bedding plane with unspecified degree of weather.

JOINT ROUGHNESS COEFFICIENT (JRC)



From Barton and Choubey, 1977

RQD — Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.

CORE SAMPLER TYPE GRAPHICS

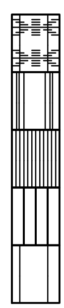
CORE SAMPLER

AQ CORE BARREL
(1.067 in. (27.1 mm.) core diameter)

AX CORE BARREL
(1.185 in. (30.1 mm.) core diameter)

BQ CORE BARREL
(1.433 in. (36.4 mm.) core diameter)

CONTINUOUS CORE SAMPLE
(2.000 in. (50.8 mm.) core diameter)



EX CORE BARREL
(0.846 in. (21.5 mm.) core diameter)

HQ CORE SAMPLE
(2.500 in. (63.5 mm.) core diameter)

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

NO RECOVERY CORE SAMPLE

NX CORE SAMPLE
(2.154 in. (54.7 mm.) core diameter)

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PROJECT NO.: 20201659.002A	ROCK DESCRIPTION KEY
DRAWN BY: CD	Equitrans MVP Southgate Dan River HDD Dan River Eden, North Carolina
CHECKED BY: JDF	
DATE: 10/15/2019	

Date Begin - End:	9/09/2019 - 9/13/2019	**Drilling Company:**	Trigon Exploration, LLC		**BORING LOG DRS-HDD-1**
Logged By:	C. Driscoll, C. Reynolds	**Drill Crew:**	R. Toothman		
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary		
Weather:	Cloudy	**Tricone Diameter:**	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.49540°
Longitude: -79.67856°
Approximate Ground Surface Elevation (ft.): 496
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
495			**TRIASSIC RESIDUAL** **Sandy Lean CLAY (CL)**: medium plasticity, brown, moist, medium stiff		BC=2 3 4	18"								
			Fat CLAY (CH): high plasticity, yellowish brown, moist, stiff		BC=2 4 6	18"								
490	5		**Silty SAND (SM)**: fine to medium-grained, low plasticity, yellowish brown, moist, medium dense		BC=4 5 7	18"								
			loose		BC=3 3 3	18"	SM	29.9			37	28	3	
485	10													
			Sandy SILT (ML): medium plasticity, brown, moist, soft		BC=1 2 2	18"	ML	35.9			72	36	11	
480	15		yellow, hard		BC=15 40 39	18"								
475	20													
			WEATHERED BEDROCK **Sampled as Sandy SILT (ML)**: fine to medium-grained, brown and gray		BC=50/5"	5"								
470	25													
					BC=50/3"	3"								
465	30													
					BC=50/4"	4"								
460	35													
					BC=50/2"	2"								

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PROJECT NO.: 20201659.002A		BORING LOG DRS-HDD-1
DRAWN BY:	CD	Equitrans MVP Southgate Dan River HDD Dan River Eden, North Carolina
CHECKED BY:	JDF	
DATE:	10/15/2019	

Date Begin - End:	9/09/2019 - 9/13/2019	**Drilling Company:**	Trigon Exploration, LLC		**BORING LOG DRS-HDD-1**
Logged By:	C. Driscoll, C. Reynolds	**Drill Crew:**	R. Toothman		
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary		
Weather:	Cloudy	**Tricone Diameter:**	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.49540°
Longitude: -79.67856°
Approximate Ground Surface Elevation (ft.): 496
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
455			**WEATHERED BEDROCK** **Sampled as Sandy SILT (ML)**: fine to medium-grained, brown and gray											
					BC=50/4"	4"								
450	45													
					BC=50/2"	2"								
445	50													
														Tricone refusal at 53.2 feet
			NON-CRYSTALLINE ROCK **TRIASSIC SILTSTONE**: reddish brown, moderately to slightly weathered, extremely weak to weak (R0 - R2), highly to intensely fractured, Moh's Hardness: 1-2		BC=50/0" RQD=41	NR 85%								4:00 min/0.8 ft 13:15 min/ft 8:30 min/ft
440	55				RQD=53	100%								5:00 min/ft 5:00 min/ft
			TRIASSIC SANDSTONE: greenish gray, slightly weathered to unweathered, weak to strong (R2 - R4), slightly to highly fractured, Moh's Hardness: 4-5						157.9					3:45 min/ft 5:30 min/ft 4:30 min/ft **Unc. Comp. Str.-Rock=** q_u: 7910 psi
435	60				RQD=92	100%								3:00 min/ft 2:45 min/ft 2:30 min/ft 4:00 min/ft 3:30 min/ft
430	65				RQD=92	100%			163.6					2:30 min/ft 2:15 min/ft 3:00 min/ft 3:30 min/ft 2:45 min/ft **Unc. Comp. Str.-Rock=** q_u: 9250 psi
425	70				RQD=88	100%			153.9					3:15 min/ft 2:15 min/ft 2:45 min/ft 3:15 min/ft 3:15 min/ft **Unc. Comp. Str.-Rock=** q_u: 8640 psi
420	75				RQD=67	100%			154.3					2:30 min/ft 2:45 min/ft 4:00 min/ft 5:15 min/ft

Date Begin - End:	9/09/2019 - 9/13/2019	**Drilling Company:**	Trigon Exploration, LLC	**BORING LOG DRS-HDD-1**
Logged By:	C. Driscoll, C. Reynolds	**Drill Crew:**	R. Toothman	
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary	
Weather:	Cloudy	**Tricone Diameter:**	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.49540°
Longitude: -79.67856°
Approximate Ground Surface Elevation (ft.): 496
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
415		**TRIASSIC MUDSTONE**: dark gray, slightly to moderately weathered, very weak to weak (R1 - R2), highly to intensely fractured, Moh's Hardness: 2-3		100% (cont.)								5:00 min/ft
			RQD=25	100%								**Unc. Comp. Str.-Rock=** q_u: 6010 psi 4:00 min/ft 4:15 min/ft 5:00 min/ft 4:00 min/ft
410	85	**TRIASSIC SILTSTONE**: grayish brown, slightly to moderately weathered, very weak to weak (R1 - R2), moderately to highly fractured, Moh's Hardness: 2-3										4:45 min/ft
			RQD=73	100%			167.3					**Unc. Comp. Str.-Rock=** q_u: 610 psi 7:45 min/ft 5:15 min/ft 4:45 min/ft 7:00 min/ft 3:30 min/ft
405	90	weak to medium strong (R2 - R3), Moh's Hardness: 6-7	RQD=58	100%			169.1					**Unc. Comp. Str.-Rock=** q_u: 2130 psi 4:15 min/ft 5:15 min/ft 7:15 min/ft 5:00 min/ft
400	95	very weak to weak (R1 - R2), Moh's Hardness: 2-3	RQD=78	100%								4:15 min/ft 4:30 min/ft 3:45 min/ft 4:15 min/ft 3:00 min/ft 4:15 min/ft
395	100		RQD=83	100%								3:15 min/ft 4:00 min/ft
		TRIASSIC SANDSTONE: white, unweathered, strong (R4), unfractured to moderately fractured, Moh's Hardness: 7-8										3:00 min/ft 3:45 min/ft 3:45 min/ft
390	105		RQD=100	100%								2:45 min/ft 2:45 min/ft 4:00 min/ft 2:45 min/ft 3:00 min/ft
385	110		RQD=100	100%								3:30 min/ft 3:15 min/ft 3:45 min/ft 4:30 min/ft 3:30 min/ft
380	115		RQD=100	100%								3:15 min/ft 3:30 min/ft 4:15 min/ft 4:30 min/ft

Date Begin - End: 9/09/2019 - 9/13/2019	**Drilling Company:** Trigon Exploration, LLC		**BORING LOG DRS-HDD-1**
Logged By: C. Driscoll, C. Reynolds	**Drill Crew:** R. Toothman		
Hor.-Vert. Datum: NAD83 - Not Available	**Drilling Equipment:** CME-55	**Hammer Type - Drop:** 140 lb. Auto - 30 in.	
Plunge: -90 degrees	**Drilling Method:** Mud Rotary		
Weather: Cloudy	**Tricone Diameter:** 3.88 in. O.D.		

FIELD EXPLORATION

Latitude: 36.49540°
Longitude: -79.67856°
Approximate Ground Surface Elevation (ft.): 496
Surface Condition: Grass

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
375			**TRIASSIC SANDSTONE**: white, unweathered, strong (R4), unfractured to moderately fractured, Moh's Hardness: 7-8		*(cont.)*	100% *(cont.)*								3:00 min/ft
	125				RQD=73	100%								3:00 min/ft 2:45 min/ft 2:45 min/ft 3:30 min/ft 2:30 min/ft
370	130		**TRIASSIC MUDSTONE**: dark gray, slightly weathered, very weak (R1), intensely to slightly fractured, Moh's Hardness: 1-2		RQD=95	100%								2:15 min/ft 3:30 min/ft 11:15 min/ft 10:45 min/ft 6:00 min/ft
365	135		**TRIASSIC SANDSTONE**: dark gray, unweathered, strong (R4), highly fractured to unfractured, Moh's Hardness: 6-7		RQD=100	100%								5:15 min/ft 7:30 min/ft 5:00 min/ft 4:45 min/ft 3:30 min/ft
360	140				RQD=100	100%								3:15 min/ft 2:45 min/ft 3:00 min/ft 3:45 min/ft 3:30 min/ft
355	145				RQD=100	100%								2:30 min/ft 3:30 min/ft 3:30 min/ft 4:15 min/ft 3:45 min/ft
350	150		**TRIASSIC MUDSTONE**: dark gray, unweathered, very weak (R1), moderately to highly fractured, Moh's Hardness: 1-2 **TRIASSIC SANDSTONE**: grayish brown, unweathered to moderately weathered, medium strong to strong (R3 - R4), moderately to intensely fractured, Moh's Hardness: 5-6		RQD=88	100%								3:30 min/ft 6:00 min/ft 4:15 min/ft 4:45 min/ft 4:00 min/ft
345	155		very weak to weak (R1 - R2), Moh's Hardness: 1-2 **TRIASSIC MUDSTONE**: grayish brown, unweathered, very weak to weak (R1 - R2), moderately to intensely fractured, Moh's Hardness: 2-3		RQD=53	100%								4:15 min/ft 3:15 min/ft 4:45 min/ft 6:30 min/ft 5:30 min/ft
340					RQD=65	100%								6:15 min/ft 6:45 min/ft 4:15 min/ft 4:15 min/ft

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PROJECT NO.: 20201659.002A		BORING LOG DRS-HDD-1
DRAWN BY: CD		Equitrans MVP Southgate Dan River HDD Dan River Eden, North Carolina
CHECKED BY: JDF		
DATE: 10/15/2019		

Date Begin - End:	9/09/2019 - 9/13/2019	Drilling Company:	Trigon Exploration, LLC	BORING LOG DRS-HDD-1
Logged By:	C. Driscoll, C. Reynolds	Drill Crew:	R. Toothman	
Hor.-Vert. Datum:	NAD83 - Not Available	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary	
Weather:	Cloudy	Tricone Diameter:	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.49540°
Longitude: -79.67856°
Approximate Ground Surface Elevation (ft.): 496
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
335			**TRIASSIC MUDSTONE**: grayish brown, unweathered, very weak to weak (R1 - R2), moderately to intensely fractured, Moh's Hardness: 2-3		RQD=63	100% *(cont.)* 100%								4:00 min/ft 4:30 min/ft 4:30 min/ft 5:00 min/ft 4:45 min/ft
330	165		**TRIASSIC SANDSTONE**: light gray, unweathered, medium strong (R3), moderately fractured, Moh's Hardness: 4-5		RQD=86	100%								3:45 min/ft 3:30 min/ft
			TRIASSIC MUDSTONE: brown, slightly weathered, weak (R2), moderately to highly fractured, Moh's Hardness: 3-4											3:45 min/ft 3:45 min/ft 3:30 min/ft
325	170		**TRIASSIC SANDSTONE**: light gray, slightly weathered, medium strong (R3), moderately to highly fractured, Moh's Hardness: 4-5		RQD=61	100%								3:00 min/ft
320	175		**TRIASSIC MUDSTONE**: dark gray, slightly to moderately weathered, very weak to weak (R1 - R2), highly to intensely fractured, Moh's Hardness: 3-4											3:45 min/ft 3:15 min/ft 4:15 min/ft 3:30 min/ft 3:30 min/ft
315	180													
310	185													
305	190													
300	195													

The boring was terminated at approximately 176 ft. below ground surface. The boring was backfilled with grout on September 16, 2019.

GROUNDWATER LEVEL INFORMATION:
Due to the mud rotary drilling technique to advance the boring, groundwater was not recorded during drilling or immediately after drilling completion. No groundwater was observed prior to introducing water for drilling/coring.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201659.002A	BORING LOG DRS-HDD-1
DRAWN BY: CD	Equitrans MVP Southgate Dan River HDD
CHECKED BY: JDF	Dan River
DATE: 10/15/2019	Eden, North Carolina

ROCK CORE PHOTOS

CORE PHOTOGRAPH
Boring B#2
CORE BOXES 1 & 2: 53.2 - 71.0 FEET

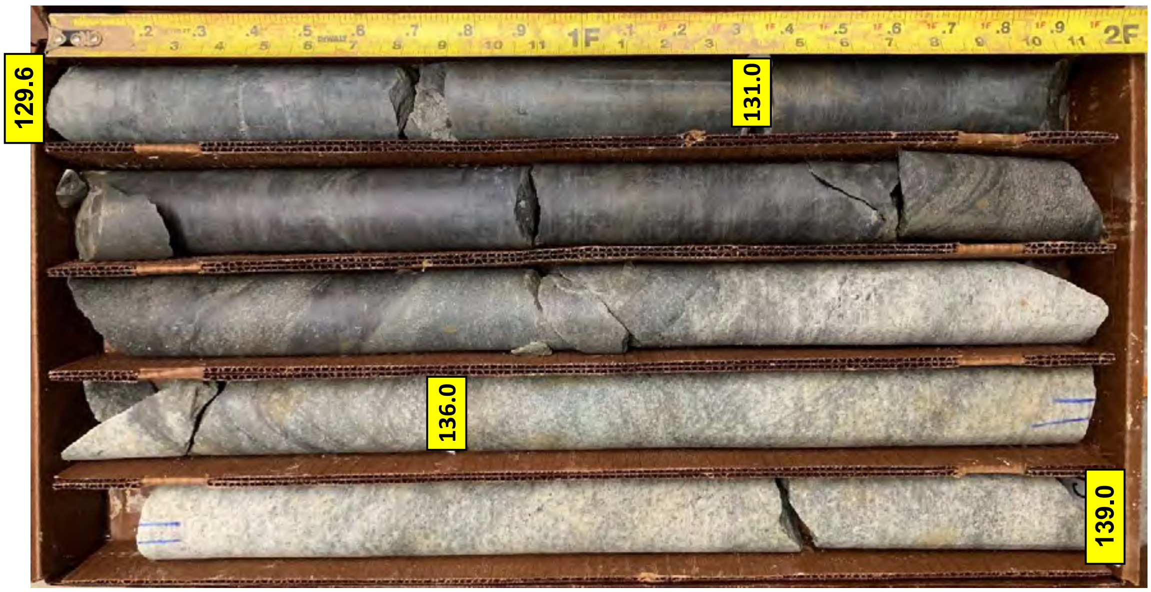
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 3 & 4: 71.0 - 91.0 FEET

CORE PHOTOGRAPH
Boring B#2
CORE BOXES 5 & 6: 91.0 - 110.2 FEET

CORE PHOTOGRAPH
Boring B#2
CORE BOXES 7 & 8: 110.2 - 129.6 FEET

CORE PHOTOGRAPH
Boring B#2

CORE BOXES 9 & 10: 129.6 - 148.4 FEET



CORE PHOTOGRAPH
Boring B#2
CORE BOXES 11 & 12: 148.4 - 167.9 FEET

CORE PHOTOGRAPH
Boring B#2
CORE BOXES 13 & 14: 167.9 - 176.0 FEET

LABORATORY TESTING RESULTS

Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
DRS-HDD-1	8.1 - 9.6	SILTY SAND (SM)	29.9				37	28	25	3	
DRS-HDD-1	13.2 - 14.7	SILT WITH SAND (ML)	35.9				72	36	25	11	

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic

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PROJECT NO.: 20201659.002A
DRAWN BY: CD
CHECKED BY: JDF
DATE: 10/15/2019

LABORATORY TEST
RESULT SUMMARY

Equitrans MVP Southgate Dan River HDD
Dan River
Eden, North Carolina

Exploration ID	Depth (ft.)	Sample Description	Unconfined Compressive Strength (psi)	UCS with Young's Modulus (tsf)	Triaxial Compressive Strength (tsf)	Triaxial with Young's Modulus (tsf)	Triaxial with Poisson's Ratio	Point Load Index (MPa)	Direct Shear Strength on Saw-Cut Surface (tsf)	Direct Shear Strength on Fracture Surface (tsf)	Direct Shear Strength Apparent Friction	Brazilian Splitting Tensile Strength (MPa)	Dry Unit Weight (pcf)	Specific Gravity	Moh's Hardness	Slake Durability	Cerhar Abrasivity Index
DRS-HDD-1	58.9 - 59.5		7910										157.9				
DRS-HDD-1	67.4 - 68.2		9250										163.6				
DRS-HDD-1	75.2 - 76.0		8640										153.9				
DRS-HDD-1	78.3 - 79.0		6010										154.3				
DRS-HDD-1	86.0 - 86.8		610										167.3				
DRS-HDD-1	91.8 - 92.5		2130										169.1				

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NA = Not Available

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PROJECT NO.: 20201659.002A
DRAWN BY: CD
CHECKED BY: JDF
DATE: 10/15/2019

ROCK LABORATORY TEST RESULT SUMMARY

Equitrans MVP Southgate Dan River HDD
Dan River
Eden, North Carolina

GBA DOCUMENT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific imes

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependen

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mol

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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October 14, 2019
Kleinfelder Project No. 20201659.001A

Ms. Alina Lawrence
Design Engineer
Equitrans Midstream Corp.
2200 Energy Drive
Canonsburg, PA 15317

SUBJECT: Geotechnical Report of Subsurface Exploration
Mountain Valley Pipeline – Southgate
Stoney Creek HDD Crossing
3131 NC Hwy 62 N, Burlington, North Carolina

Dear Ms. Lawrence:

This report presents the results of a subsurface exploration performed for the subject project. This work was authorized by Mountain Valley Pipeline, LLC. (MVP) Purchase Order No. 152275 OC (dated August 22, 2019) and was conducted in accordance with Kleinfelder's August 16, 2019, Proposal for Geotechnical Engineering Services (No. GSO19P99807). The purpose of Kleinfelder's services was to explore the subsurface conditions at the site with respect to the installation of a new proposed pipeline and to provide general soil/rock profiles and parameters.

PROJECT INFORMATION

The project consists of the installation of approximately 70 miles of natural gas transmission line that extends from Transco Village, Virginia southward to Graham, North Carolina. The proposed alignment requires pipeline installation beneath Stoney Creek in Burlington, NC. We understand that horizontal direction drilling (HDD) techniques will be utilized to install the referenced pipeline.

MVP requested a boring along the east side of Stoney Creek be performed to determine the subsurface soil and rock conditions for use in the HDD design and analysis to be performed by others. We understand that a boring along the west side of Stoney Creek was previously performed by others. Entry/exit locations, proposed drill lengths and pipe specifications were not provided at the time of this report.

EXPLORATION METHODS

Field Testing

Kleinfelder's field testing services for this site included the completion of 1 soil test boring. The boring was located approximately 1,950 feet south of NC Hwy 62 N and 270 feet east of Stoney Creek as shown on the Boring Location Plan, Figure 1, in the Appendix. The boring location was selected by MVP.

The boring was advanced to a depth of 175.7 feet below the ground surface (bgs) using wash rotary and coring techniques. Standard Penetration Tests were performed at 2.5 feet intervals in the upper 10 feet and 5 feet intervals thereafter to tricone refusal in general accordance with

7343 West Friendly Avenue, Suite B, Greensboro, NC 27410 p | 336.668.0093 f | 336.668.3868

ASTM D 1586. Refusal materials were cored using an NQ sized diamond core barrel, to assess the character and continuity of the underlying bedrock. The coring was accomplished in general accordance with ASTM D 2113. The borehole was measured for groundwater after drilling completion then filled with grout using a tremie pipe. A Kleinfelder geotechnical engineer observed the drilling and logged the subsurface conditions. The soils were classified according to the Unified Soil Classification System (USCS). Soil and rock conditions encountered are shown on the boring log included in the Appendix.

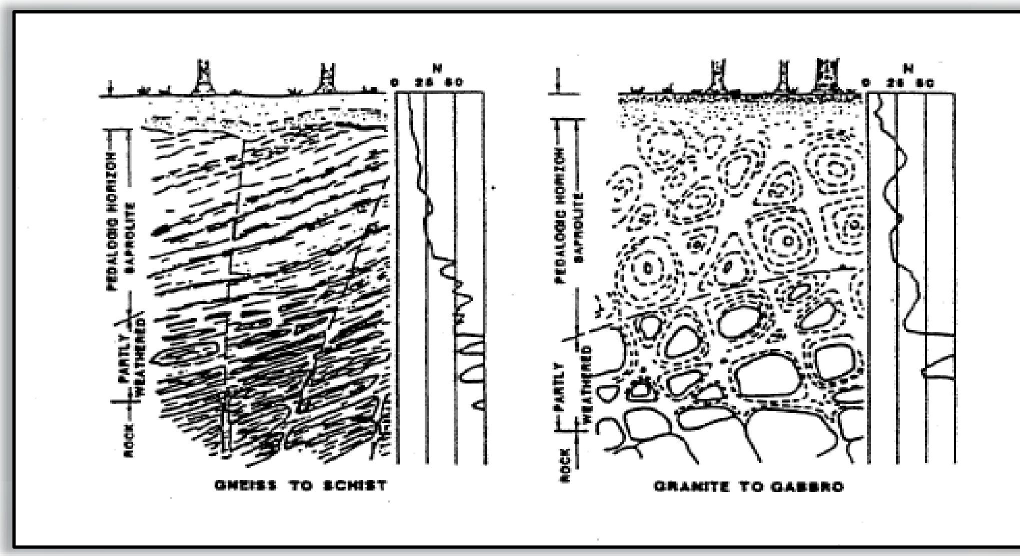
LABORATORY TESTING

Selected soil samples were subjected to routine index testing to establish their engineering characteristics. The index testing consisted of natural water content determinations, Atterberg Limits tests, and percent fines determinations. The laboratory tests were performed in accordance with ASTM D 2216, D 4318, and D 1140, respectively. A total of 6 unconfined compressive strength tests were conducted on selected rock core samples. The results of the laboratory testing are presented in the following section and on the boring log included in the Appendix.

FINDINGS

Site Geology

According to readily available United States Geologic Survey (USGS) maps of North Carolina, the project site is in the Milton Belt of the Piedmont Physiographic Province. This geologic unit is designated as containing metamorphosed gabbro and diorite bedrock. Piedmont residual soils immediately above the rock materials originate from the chemical weathering of the parent bedrock, and oftentimes maintain the same layering and lineation of the rock. Mica and quartz tend to decompose slower than other minerals and are commonly present within the soil strata. The top of rock is generally irregular and sloped, with the upper zone fractured. The fracturing generally decreases with depth. Typical geologic cross sections of a residual profile are included below.



Typical Piedmont Weathering Profiles

SUBSURFACE CONDITIONS

The generalized subsurface conditions are described below. The boring log should be reviewed for soil descriptions and general stratification.

Surface materials consisted of wooded underbrush. Topsoil thickness was negligible. Residual soils were present below the surface materials to a depth of 24.7 feet bgs. Residual soils are formed by the in-place chemical weathering of the parent bedrock. The residual soils encountered in the boring generally consisted of moist lean clay (CL) and elastic silt (MH) in the upper 11.5 feet. Moist silty sand (SM) was encountered below the shallow soil down to weathered rock. SPT N-values recorded in the residual soils ranged from 6 to 18 blows per foot (bpf).

Weathered rock was encountered at a depth of 24.7 feet bgs. Weathered rock represents the transition between residual soil and bedrock and is defined as any residual material that exhibits a Standard Penetration Resistance of at least 100 bpf, but less than 50 blows per 2 inches. No sample was recovered from the weathered rock.

Tricone refusal occurred on bedrock at a depth of 25 feet bgs. Tricone refusal is defined as negligible penetration of the roller bit under the full weight and down pressure of the drill rig. Upon encountering tricone refusal, rock coring was performed down to the boring termination depth of 175.7 feet bgs. The bedrock consisted of metamorphic granite and diorite. The recovery values ranged from 28 to 100 percent, with the majority between 88 and 100 percent. The rock quality designation (RQD) values ranged from 0 to 100 percent, with the majority between 72 and 94 percent. Observed Moh's hardness values ranged from 2 to 8, with the majority between 5 and 6 for the collected rock cores.

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling. Approximately 1 day after completion of drilling, the water level in the borehole was observed at approximately 22.2 feet bgs. Fluctuation in groundwater levels can occur with climatic and seasonal variations, with the highest groundwater levels generally expected between March and May. Seasonal low groundwater levels are generally expected between September and November. Therefore, subsurface water conditions at other times may be different from those described in this report.

LABORATORY TEST RESULTS

The results of the soil classification laboratory tests are summarized below in Table 1:

TABLE 1: SOIL CLASSIFICATION LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINES	USCS CLASS
B2	6.0 – 7.5	42.1	53	49	4	76	MH
B2	12.7 – 14.2	34.8	36	30	6	35	SM

The results of the rock core testing are summarized below in Table 2.

TABLE 2: ROCK CORE LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	YOUNGS MODULUS (KSI)
B2	63.5 – 64.0	181.8	20,160	2,960
B2	81.3 – 81.9	164.3	14,230	2,320
B2	93.5 – 94.1	181.7	8,100	1,380
B2	109.1 – 109.7	164.7	8,200	800
B2	116.1 – 116.7	179.1	17,150	2,370
B2	124.5 – 125.5	163.3	14,050	2,030

GENERAL SUBSURFACE PROFILE AND PARAMETERS

Generalized soil/rock profile and parameters for use in the Delft Geotechnics equation are presented below in Table 3. The profile is based on the subsurface conditions encountered at the boring. The transition between strata will vary across the alignment due to the limited number of borings performed and the prevailing geology.

TABLE 3: GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
RESIDUAL	0 – 11	CL/MH	125	16	350	--	135
RESIDUAL	11 – 20	SM	120	30	0	--	100
RESIDUAL	20 – 25	SM	68	32	0	--	150
BEDROCK	25 – 37	--	155	--	--	700	8,000
BEDROCK	37 – 85	--	175	--	--	13,000	100,000
BEDROCK	85 – 110	--	170	--	--	6,000	40,000
BEDROCK	110 – 175.7	--	172	--	--	10,000	72,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

If HDD installation techniques are utilized, the bore should be designed to be deep enough such that the risk of hydraulic fracturing is low. The areas of greatest concern for hydraulic fracturing are near the exit location and where overburden cover of the drill path is smallest. Hydraulic fracture calculations should be performed to evaluate the potential risk and aid in selecting the proper depth of the bore path. The contractor should carefully evaluate the ground conditions identified in this report before selecting drilling equipment and tooling.

Difficulty in steering may occur at the interface of soil and rock if the alignment extends into the underlying weathered rock and bedrock. Attempting to construct a vertical curve at the transition between soil and rock is not recommended. Curves should be laid out all in soil or all in rock.

LIMITATIONS

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk.

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. The work performed was based on project information provided by MVP

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinions, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's Geotechnical Engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during foundation construction.

This report may be used only by MVP and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than 2 years from the date of the report.

CLOSURE

Kleinfelder appreciates the opportunity to provide services to you during this phase of the project. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,
KLEINFELDER, INC.
Firm License No. F-1312

NORTH CAROLINA
PROFESSIONAL
SEAL
038602
ENGINEER
JOSHUA D. FREGOSI
10/14/19

Joshua D. Fregosi, PE
NC License No. 38602

Xavier C. Barrett, PE
Principal Professional

JDF/XCB:cas
Attachments

BORING LOCATION PLAN – FIGURE 1

PLOTTED: 10/10/2019 10:59:53 AM BY: JFregosi

N

LEGEND

SOIL BORING

N

VICINITY MAP

NOT TO SCALE

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2019 MICROSOFT CORPORATION. COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

0 200 400

1 " = 200 SCALE IN FEET

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PROJECT NO. 20201659.001A		EXPLORATION LOCATION PLAN AND VICINITY MAP	FIGURE
DRAWN BY:	JFregosi	Equitrans MVP Southgate Stoney Creek HDD 3131 North NC-62 Burlington, North Carolina	1
CHECKED BY:	J. Fregosi		
DATE:	10-10-2019		

GIS FILE PATH: \\azrgisstorp01\Working_clients_Automated_Exploration Plans

BORING LOGS

SAMPLE/SAMPLER TYPE GRAPHICS

- NQ CORE SAMPLE (1.874 in. (47.6 mm.) core diameter)
- MUD ROTARY
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20201659.001A	GRAPHICS KEY
	DRAWN BY: SBM	Equitrans MVP Southgate Stoney Creek HDD 3131 North NC-62 Burlington, North Carolina
	CHECKED BY: JDF	
	DATE: 10/10/2019	

PLOTTED: 10/10/2019 10:35 AM BY: JFregosi
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gINT FILE: Klf_gint_master_2020
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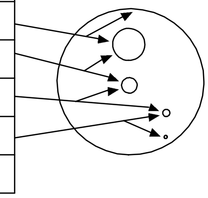
GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT: Secondary Constituent is Fine Grained	AMOUNT: Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20201659.001A

DRAWN BY: SBM

CHECKED BY: JDF

DATE: 10/10/2019

SOIL DESCRIPTION KEY

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	>6 ft. (>1.83 meters)
Slightly Fractured	2 - 6 ft. (0.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm)
Highly Fractured	2 - 8 in (50.80 - 203.30 mm)
Intensely Fractured	<2 in (<50.80 mm)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical / mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (Mpa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife.
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer.
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it.
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it.
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer.

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

APERTURE

DESCRIPTION	CRITERIA [in (mm)]
Tight	<0.04 (<1)
Open	0.04 - 0.20 (1 - 5)
Wide	>0.20 (>5)

BEDDING CHARACTERISTICS

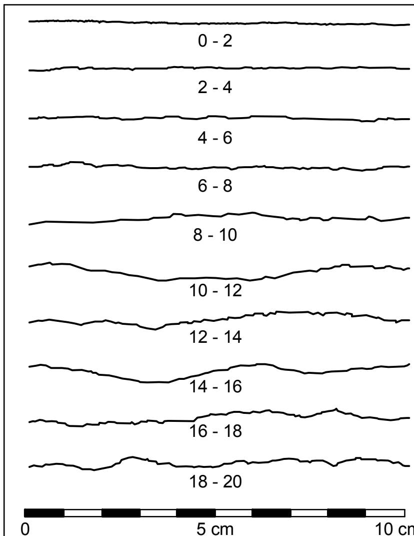
DESCRIPTION	Thickness [in (mm)]
Very Thick Bedded	>36 (>915)
Thick Bedded	12 - 36 (305 - 915)
Moderately Bedded	4 - 12 (102 - 305)
Thin Bedded	1 - 4 (25 - 102)
Very Thin Bedded	0.4 - 1 (10 - 25)
Laminated	0.1 - 0.4 (2.5 - 10)
Thinly Laminated	<0.1 (<2.5)

Bedding Planes — Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint — Fracture in rock, generally more or less vertical or traverse to bedding.

Seam — Applies to bedding plane with unspecified degree of weather.

JOINT ROUGHNESS COEFFICIENT (JRC)



From Barton and Choubey, 1977

RQD — Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.

CORE SAMPLER TYPE GRAPHICS

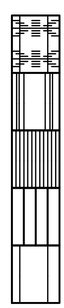
CORE SAMPLER

AQ CORE BARREL
(1.067 in. (27.1 mm.) core diameter)

AX CORE BARREL
(1.185 in. (30.1 mm.) core diameter)

BQ CORE BARREL
(1.433 in. (36.4 mm.) core diameter)

CONTINUOUS CORE SAMPLE
(2.000 in. (50.8 mm.) core diameter)



EX CORE BARREL
(0.846 in. (21.5 mm.) core diameter)

HQ CORE SAMPLE
(2.500 in. (63.5 mm.) core diameter)

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

NO RECOVERY CORE SAMPLE

NX CORE SAMPLE
(2.154 in. (54.7 mm.) core diameter)

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PROJECT NO.: 20201659.001A	ROCK DESCRIPTION KEY
DRAWN BY: SBM	Equitrans MVP Southgate Stoney Creek HDD 3131 North NC-62 Burlington, North Carolina
CHECKED BY: JDF	
DATE: 10/10/2019	

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20201659.001A OFFICE FILTER: GREENSBORO
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_GEO-LEG 3 (ROCK DESC KEY)] PLOTTED: 10/10/2019 10:37 AM BY: JFregosi

BORING LOG B-2

Date Begin - End:	8/28/2019 - 9/05/2019	**Drilling Company:**	Trigon Exploration, LLC		
Logged By:	D. Kubinski, S. Montgomery	**Drill Crew:**	R. Toothman		
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary		
Weather:	Sunny to Cloudy	**Tricone Diameter:**	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.14689°
Longitude: -79.40925°
Approximate Ground Surface Elevation (ft.): 579
Surface Condition: Wooded underbrush

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	**RESIDUAL** **Sandy Lean CLAY (CL)**: medium plasticity, reddish brown and red, moist, stiff, fine-grained sand	BC=3 5 6	18"								
575			BC=4 4 6	18"								
	5	**Elastic SILT with Sand (MH)**: high plasticity, yellowish brown and red, moist, stiff, medium to fine-grained sand, trace manganese	BC=3 4 6	18"	MH	42.1			76	53	4	
570			BC=2 2 4	18"								
	10											
		Silty SAND (SM): medium to fine-grained, low plasticity, tan, olive, and gray, moist, loose, trace mica	BC=2 4 4	18"	SM	34.8			35	36	6	
565	15											
560		non-plastic, medium dense	BC=3 4 6	18"								
	20											
555		white and brown, trace maganese, saprolitic	BC=6 7 11	18"								Hard drilling starting at 24.7 ft
	25	**WEATHERED BEDROCK** **Sampled as Silty SAND (SM)**: fine to medium-grained, white and brown	BC=50/1"	NR								Tricone refusal at 25.0 ft 1:51 min/0.7 ft
			RQD=0	100%								
550	30	**CRYSTALLINE ROCK** **Metamorphic GRANITE**: tan, white, and olive, fine to medium-grained, slightly weathered, medium strong to strong (R3 - R4), highly to moderately fractured (0-30° and 30-60°), Moh's Hardess = 5-6	RQD=18	66%								3:11 min/ft 3:36 min/ft 3:58 min/ft 3:06 min/ft 1:21 min/ft
545	35	**DIORITE**: gray, white, and black, fine to medium-grained, highly weathered to decomposed, extremely weak to very weak (R0 - R1), highly fractured to intensely fractured, Moh's Hardness = 2-3	RQD=0	28%								2:26 min/ft 2:35 min/ft 2:35 min/ft 1:18 min/ft 1:35 min/ft
540		**DIORITE**: gray, white, and black, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30° and 30-60°), Moh's Hardness = 5-6	RQD=84	100%								1:10 min/ft 3:20 min/ft 3:48 min/ft 3:24 min/ft 3:07 min/ft

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PROJECT NO.:	20201659.001A
DRAWN BY:	SBM
CHECKED BY:	JDF
DATE:	10/10/2019

BORING LOG B-2

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

Date Begin - End:	8/28/2019 - 9/05/2019	**Drilling Company:**	Trigon Exploration, LLC
Logged By:	D. Kubinski, S. Montgomery	**Drill Crew:**	R. Toothman
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	Sunny to Cloudy	**Tricone Diameter:**	3.88 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION

Latitude: 36.14689°
Longitude: -79.40925°
Approximate Ground Surface Elevation (ft.): 579
Surface Condition: Wooded underbrush

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
535	45		**DIORITE**: gray, white, and black, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30° and 30-60°), Moh's Hardness = 5-6		RQD=100	100%								3:11 min/ft 3:25 min/ft 3:32 min/ft 3:08 min/ft 3:35 min/ft
530	50				RQD=90	100%								3:43 min/ft 3:36 min/ft 3:39 min/ft 5:52 min/ft 4:18 min/ft
525	55				RQD=98	100%								3:45 min/ft 3:50 min/ft 3:08 min/ft 3:45 min/ft 3:44 min/ft
520	60				RQD=89	100%								4:29 min/ft 3:31 min/ft 3:43 min/ft 3:29 min/ft 3:05 min/ft
515	65		intensely fractured (64.7 - 65.7 ft)		RQD=76	100%			181.8					3:26 min/ft 3:15 min/ft 3:20 min/ft 3:75 min/ft 4:10 min/ft **Unc. Comp. Str.-Rock=** q_u: 20160 psi
510	70				RQD=96	100%								4:10 min/ft 3:23 min/ft 3:09 min/ft 3:33 min/ft 4:47 min/ft
505	75				RQD=94	96%								4:35 min/ft 5.69 min/ft 4:41 min/ft 4:73 min/ft 3:21 min/ft
500					RQD=74	98%								4:32 min/ft 5:28 min/ft 4:40 min/ft 6:50 min/ft 5:04 min/ft

LABORATORY RESULTS

Date Begin - End:	8/28/2019 - 9/05/2019	**Drilling Company:**	Trigon Exploration, LLC	**BORING LOG B-2**
Logged By:	D. Kubinski, S. Montgomery	**Drill Crew:**	R. Toothman	
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary	
Weather:	Sunny to Cloudy	**Tricone Diameter:**	3.88 in. O.D.	

FIELD EXPLORATION

Latitude: 36.14689°
Longitude: -79.40925°
Approximate Ground Surface Elevation (ft.): 579
Surface Condition: Wooded underbrush

Approximate Elevation (feet)	Depth (feet)	Lithologic Description
495	85	**Metamorphic GRANITE**: tan, white, and olive, medium to coarse-grained, unweathered to slightly weathered, medium strong to strong (R3 - R4), highly to moderately fractured (0-30° and 30-60°), Moh's Hardess = 5-6, high mica content
490	90	**DIORITE**: gray, white, and black, fine to medium-grained, unweathered to slightly weathered, medium strong strong (R3 - R4), slightly fractured to moderately fractured (0-30° and 30-60°), Moh's Hardness = 5-6
485, 480	95, 100	
475	100	**Metamorphic GRANITE**: tan, white, and red, fine to medium-grained, unweathered to slightly weathered, medium strong to strong (R3 - R4), slightly fractured to moderately fractured (0-30°), Moh's Hardness = 5-6, garnet inculsions
	105	**DIORITE**: gray, white, and black, fine to medium-grained, unweathered to slightly weathered, medium strong to strong (R3 - R4), slightly fractured to moderately fractured (0-30°), Moh's Hardness = 5-6
470	110	**Metamorphic GRANITE**: tan and white, fine to medium-grained, unweathered to slightly weathered, medium strong to strong (R3 - R4), slightly fractured to moderately fractured (0-30° and 30-60°), Moh's Hardness = 5-6
465, 460	115	**DIORITE**: gray, white, black, and gold, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30°), Moh's Hardness = 6-7, containing pyrite

Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
RQD=79	94%			164.3					3:28 min/ft 1:17 min/ft 4:55 min/ft 4:37 min/ft 3:51 min/ft **Unc. Comp. Str.-Rock=** q_u: 14230 psi
RQD=92	100%								4:20 min/ft 3:32 min/ft 5:00 min/ft 5:41 min/ft 3:35 min/ft
RQD=90	100%			181.7					5:50 min/ft 5:06 min/ft 5:02 min/ft 5:01 min/ft 5:05 min/ft **Unc. Comp. Str.-Rock=** q_u: 8100 psi
RQD=84	100%								5:07 min/ft 4:49 min/ft 5:13 min/ft 4:43 min/ft 5:31 min/ft
RQD=93	100%								6:55 min/ft 6:38 min/ft 5:33 min/ft 5:49 min/ft 2:34 min/ft
RQD=92	100%			164.7					4:20 min/ft 4:29 min/ft 5:11 min/ft 5:15 min/ft 6:57 min/ft **Unc. Comp. Str.-Rock=** q_u: 8200 psi
RQD=91	100%								6:53 min/ft 5:48 min/ft 5:05 min/ft 4:46 min/ft 4:56 min/ft
RQD=94	100%			179.1					6:45 min/ft 3:24 min/ft 4:26 min/ft 4:28 min/ft 4:32 min/ft

Date Begin - End:	8/28/2019 - 9/05/2019	Drilling Company:	Trigon Exploration, LLC		**BORING LOG B-2**
Logged By:	D. Kubinski, S. Montgomery	Drill Crew:	R. Toothman		
Hor.-Vert. Datum:	NAD83 - Not Available	Drilling Equipment:	CME-55	Hammer Type - Drop:	140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary		
Weather:	Sunny to Cloudy	Tricone Diameter:	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.14689°
Longitude: -79.40925°
Approximate Ground Surface Elevation (ft.): 579
Surface Condition: Wooded underbrush

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			DIORITE: gray, white, black, and gold, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30°), Moh's Hardness = 6-7, containing pyrite		RQD=86	100%								**Unc. Comp. Str.-Rock=** q_u: 17150 psi; 6:42 min/ft; 5:46 min/ft; 9:06 min/ft; 5:32 min/ft
455	125		**Metamorphic GRANITE**: tan, white, and red, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30° and 30-60°), Moh's Hardness = 6-7, garnet inclusions		RQD=72	92%			163.3					5:40 min/ft; **Unc. Comp. Str.-Rock=** q_u: 14050 psi; 7:00 min/ft; 10:10 min/ft; 6:12 min/ft; 6:03 min/ft
450	130		**DIORITE**: gray, white, and black, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30° and 0-60°), Moh's Hardness = 5-6											6:26 min/ft
					RQD=67	100%								7:21 min/ft; 7:14 min/ft; 5:87 min/ft; 7:14 min/ft; 6:93 min/ft
445	135				RQD=98	100%								5:17 min/ft; 6:46 min/ft; 6:56 min/ft; 4:28 min/ft; 3:44 min/ft
440	140				RQD=58	100%								7:30 min/ft; 4:88 min/ft; 5:30 min/ft; 5:40 min/ft; 3:88 min/ft
435	145				RQD=72	96%								6:24 min/ft; 5:38 min/ft; 5:06 min/ft; 5:49 min/ft; 5:06 min/ft
430	150				RQD=76	97%								6:17 min/ft; 5:33 min/ft.; 6:40 min/ft; 5:33 min/ft; 4:10 min/ft
425	155				RQD=68	88%								8:12 min/ft; 6:13 min/ft; 5:03 min/ft; 16:55 min/ft; 12:35 min/ft
420														

OFFICE FILTER: GREENSBORO

PROJECT NUMBER: 20201659.001A

gINT FILE: Klf_gint_master_2020 gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

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PROJECT NO.: 20201659.001A
DRAWN BY: SBM
CHECKED BY: JDF
DATE: 10/10/2019

BORING LOG B-2

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

Date Begin - End:	8/28/2019 - 9/05/2019	**Drilling Company:**	Trigon Exploration, LLC
Logged By:	D. Kubinski, S. Montgomery	**Drill Crew:**	R. Toothman
Hor.-Vert. Datum:	NAD83 - Not Available	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	Sunny to Cloudy	**Tricone Diameter:**	3.88 in. O.D.

BORING LOG B-2

Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION

Latitude: 36.14689°
Longitude: -79.40925°
Approximate Ground Surface Elevation (ft.): 579
Surface Condition: Wooded underbrush

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Metamorphic GRANITE: tan and white, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 - R5), slightly fractured to moderately fractured (0-30°), Moh's Hardness = 7-8		RQD=88	100%								4:56 min/ft 7:25 min/ft 10:18 min/ft 12:02 min/ft 9:09 min/ft
415	165		**DIORITE**: gray, white, black, and dark green, fine to medium-grained, unweathered to slightly weathered, strong to very strong (R4 -R5), slightly fractured to moderately fractured (0-30° and 0-60°), Moh's Hardness = 5-6		RQD=87	100%								10:20 min/ft 7:23 min/ft 6:57 min/ft 6:07 min/ft 12:12 min/ft
410	170				RQD=94	100%								5:14 min/ft 5:29 min/ft 5:47 min/ft 6:09 min/ft 6:38 min/ft
405	175													
400	180													
395	185													
390	190													
385	195													
380														

The boring was terminated at approximately 175.7 ft. below ground surface. The boring was backfilled with grout on September 06, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 22.2 ft. below ground surface 1 day after drilling completion.
Due to the mud rotary drilling technique to advance the boring, groundwater was not recorded during drilling or immediately after drilling completion.

GENERAL NOTES:
Boring was located in the field by Kleinfelder utalizing a hand-held GPS unit. Boring elevation was estimated using Google Earth. The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201659.001A
DRAWN BY: SBM
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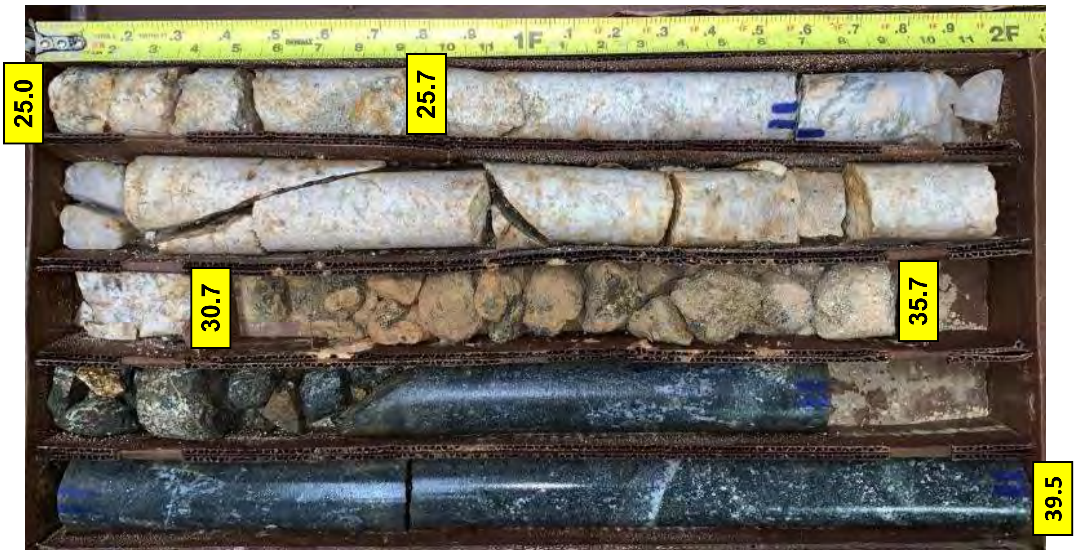
DATE: 10/10/2019

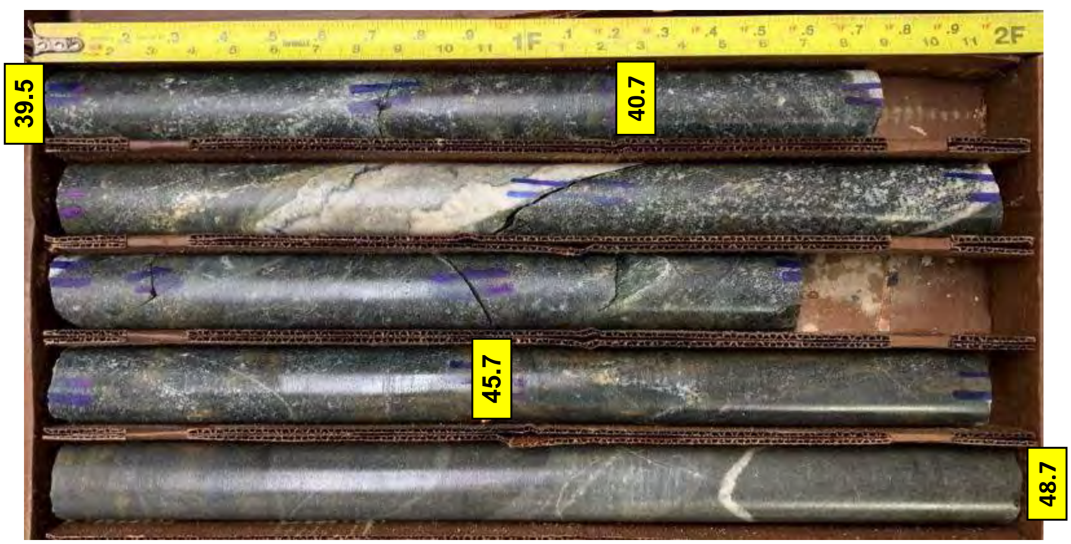
BORING LOG B-2

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

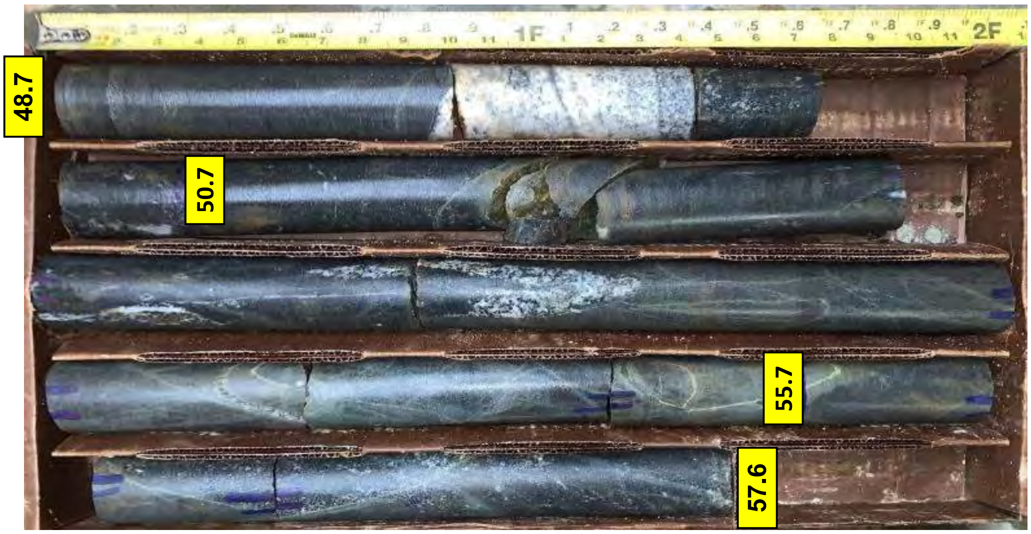
ROCK CORE PHOTOS

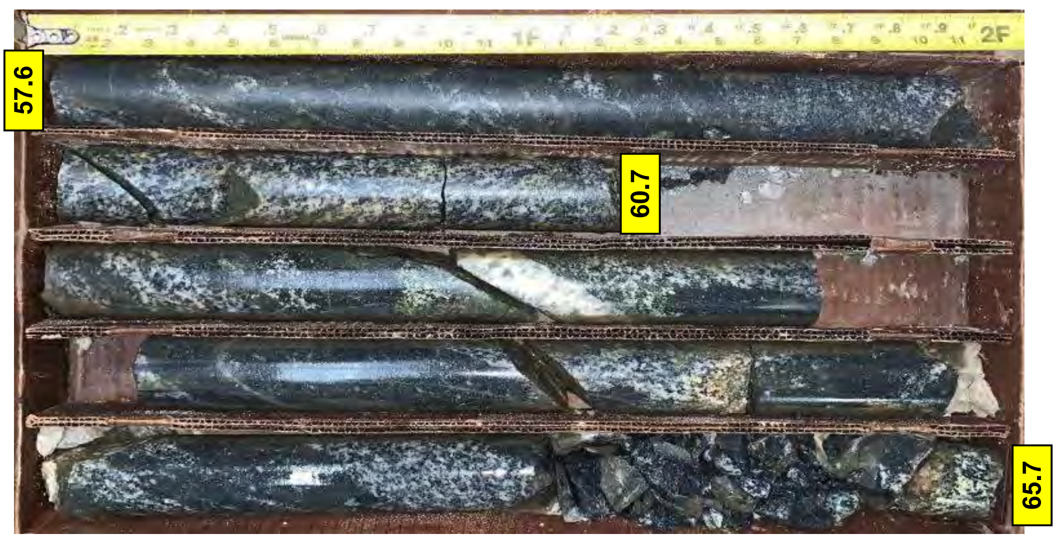
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 1 & 2: 25.0 - 48.7 FEET



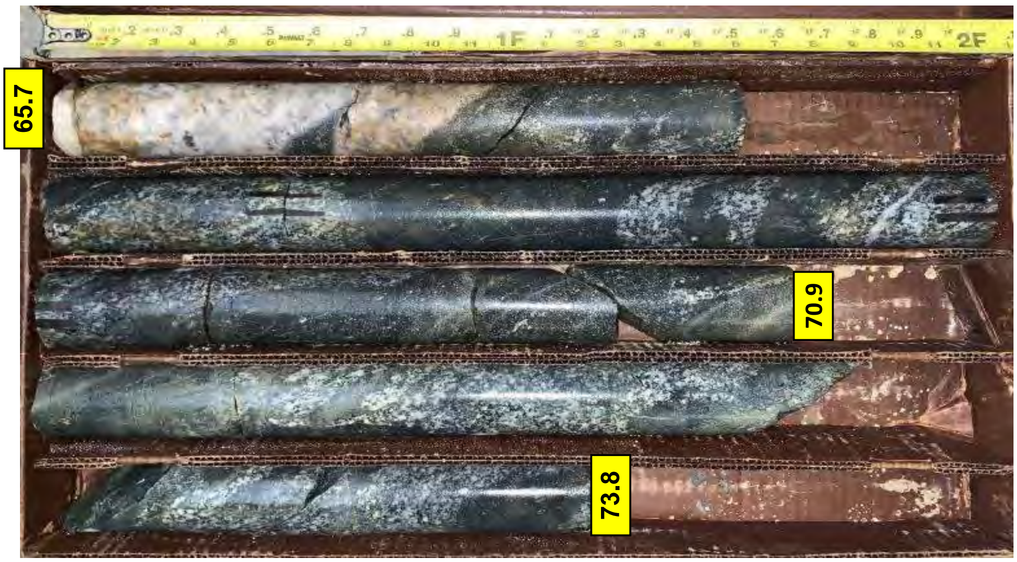


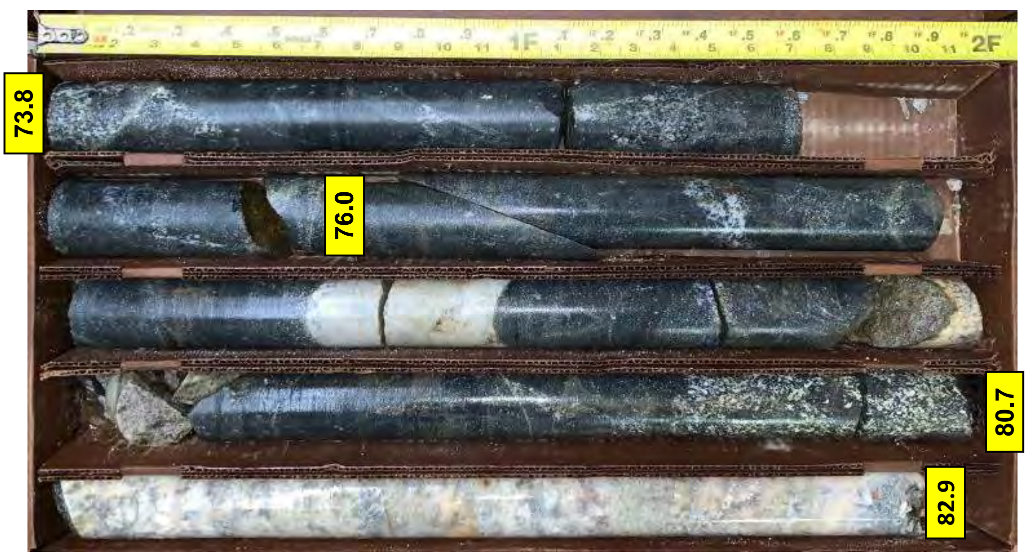
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 3 & 4: 48.7 - 65.7 FEET



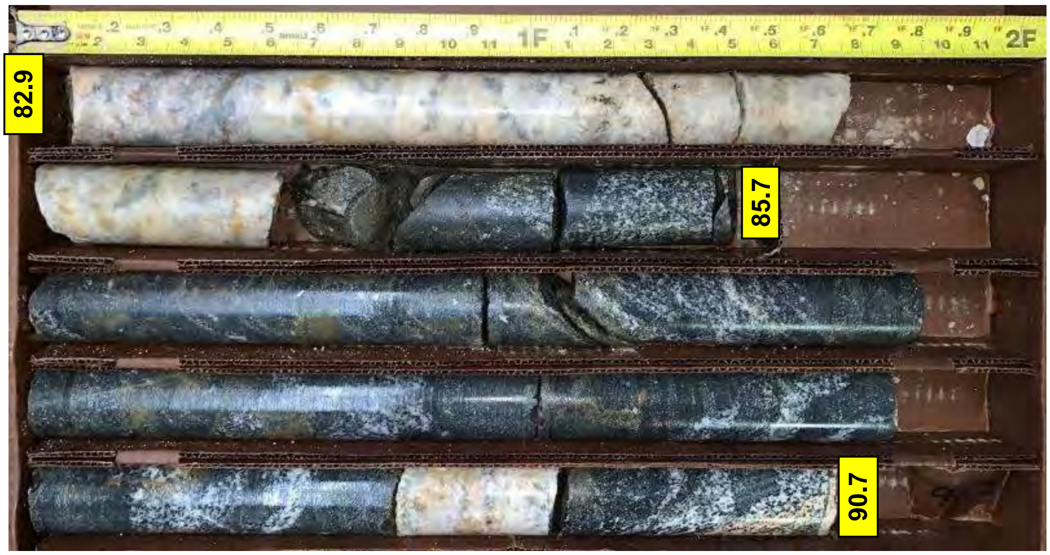


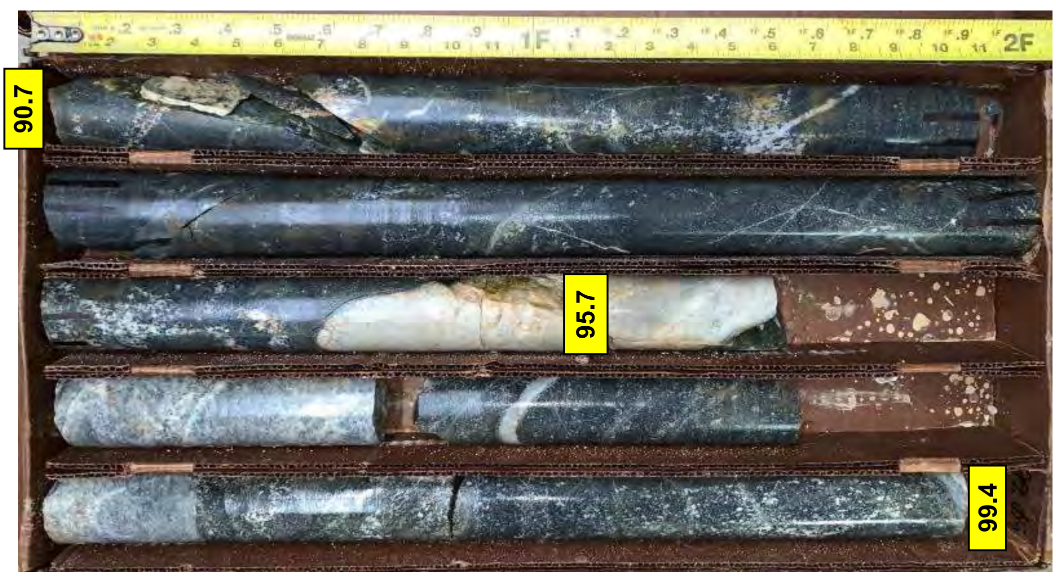
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 5 & 6: 65.7 - 82.9 FEET



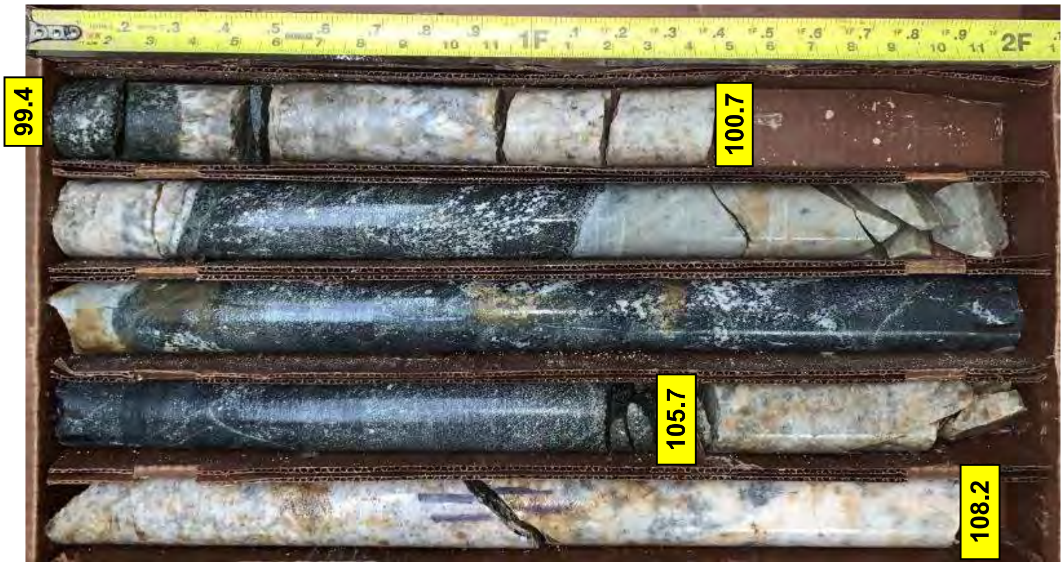


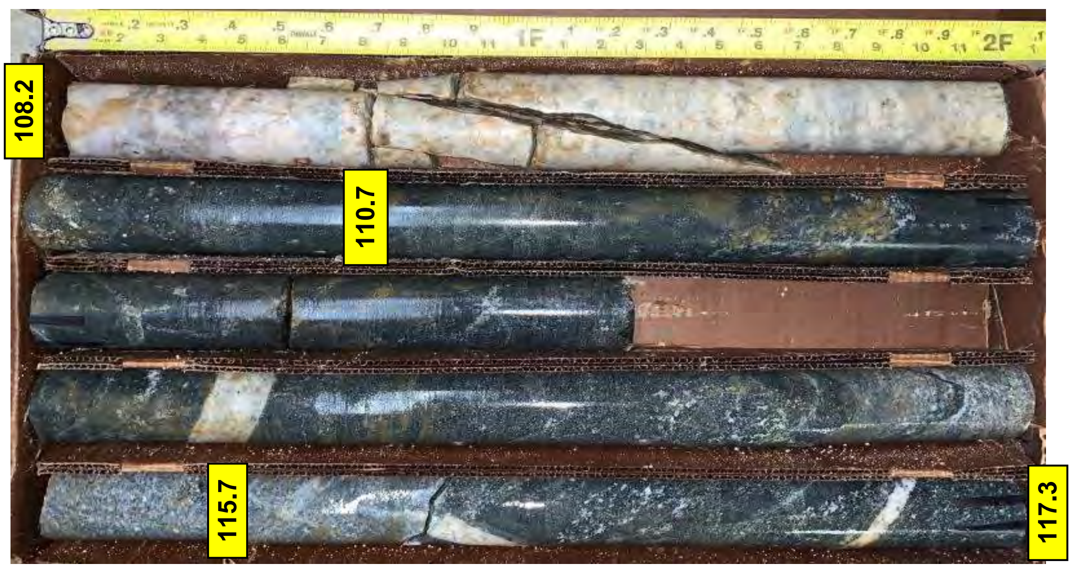
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 7 & 8: 82.9 - 99.4 FEET



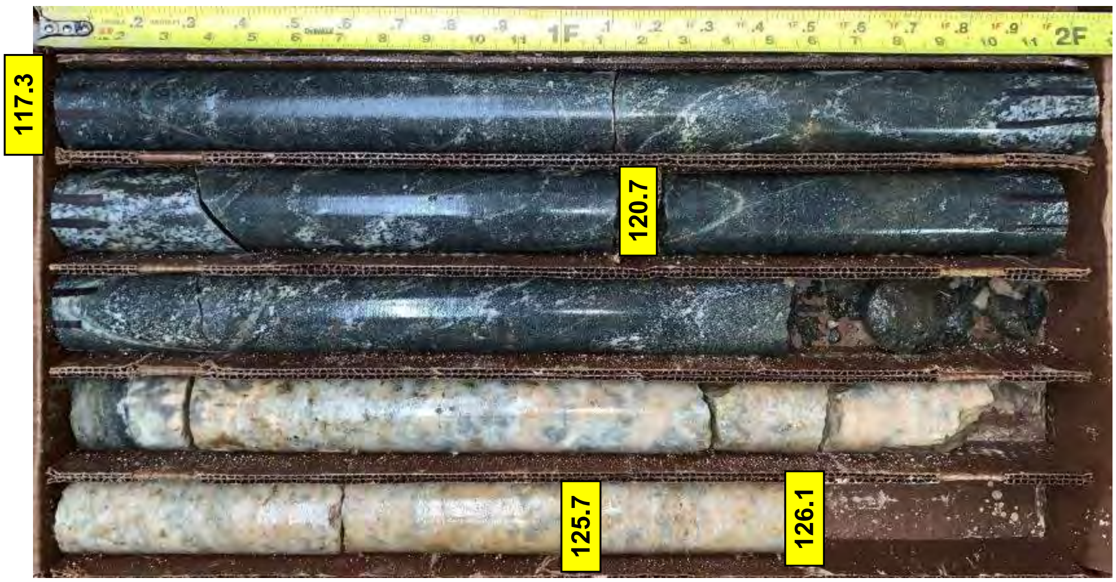


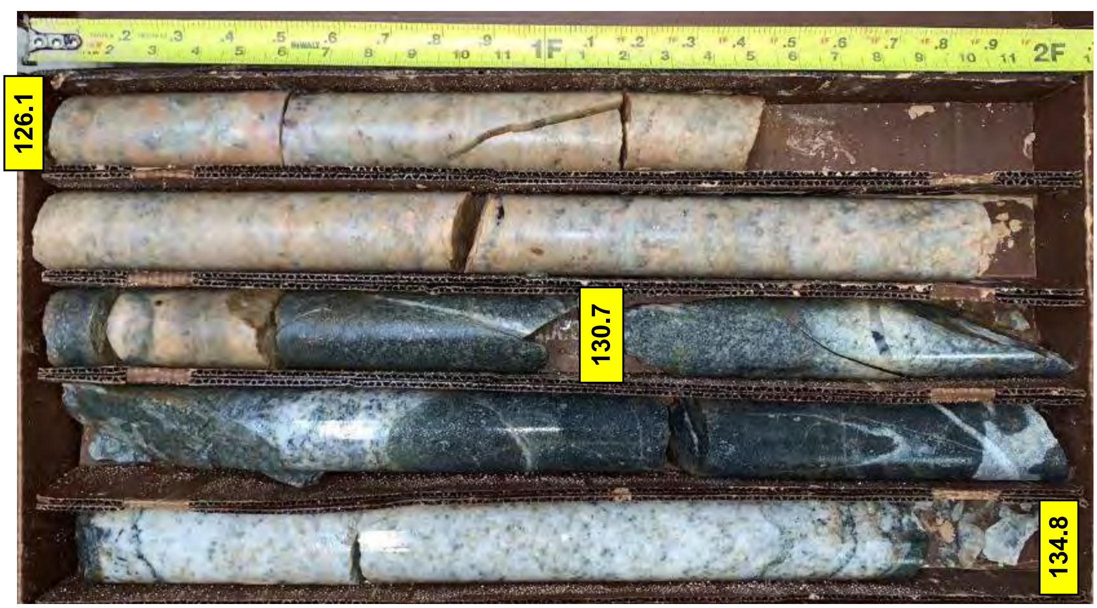
CORE PHOTOGRAPH
Boring B#2
CORE BOXES 9 & 10: 99.4 - 117.3 FEET



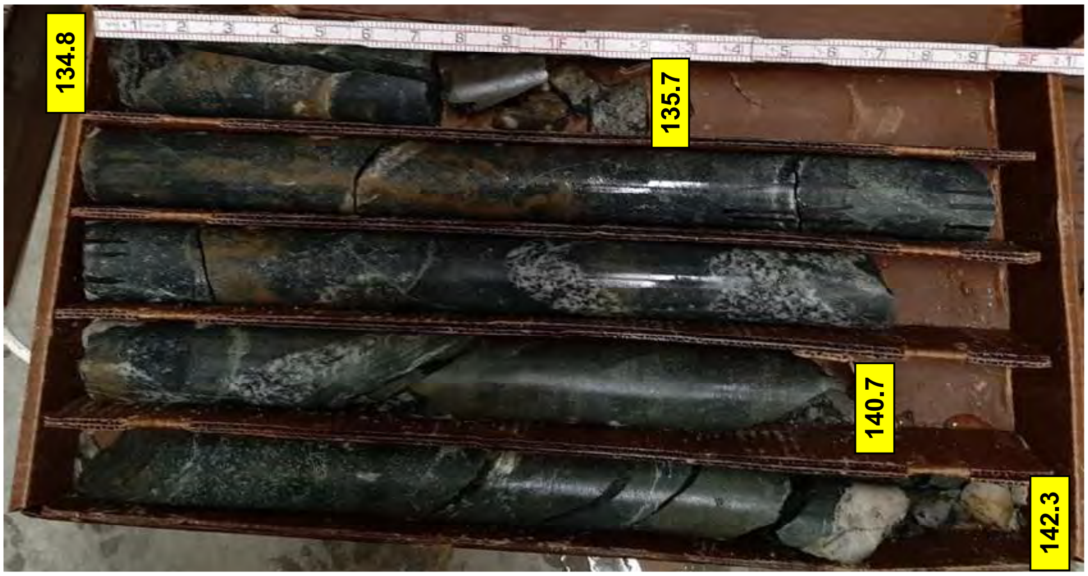


CORE PHOTOGRAPH
Boring B#2
CORE BOXES 11 & 12: 117.3 - 134.8 FEET

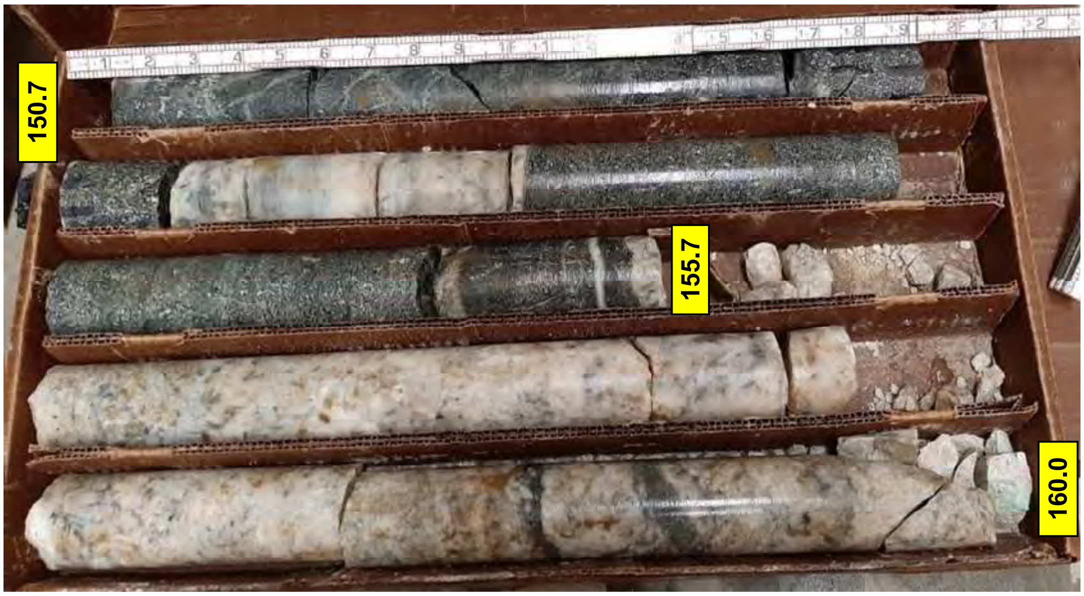


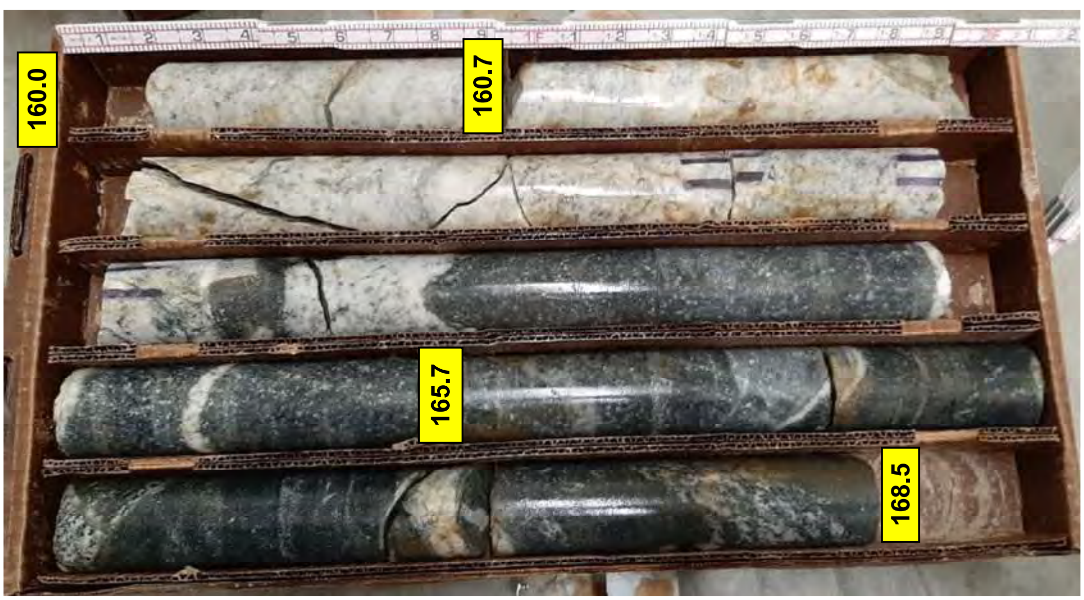


CORE PHOTOGRAPH
Boring B#2
CORE BOXES 13 & 14: 134.8 - 150.7 FEET



CORE PHOTOGRAPH
Boring B#2
CORE BOXES 15 & 16: 150.7 - 168.5 FEET





CORE PHOTOGRAPH
Boring B#2
CORE BOXES 17: 168.5 - 175.7 FEET

LABORATORY TESTING RESULTS

Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-2	6.0 - 7.5	ELASTIC SILT WITH SAND (MH)	42.1				76	53	49	4	
B-2	12.7 - 14.2	SILTY SAND (SM)	34.8				35	36	30	6	

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic

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PROJECT NO.: 20201659.001A
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LABORATORY TEST
RESULT SUMMARY

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

Exploration ID	Depth (ft.)	Sample Description	Unconfined Compressive Strength (psi)	UCS with Young's Modulus (psi)	Triaxial Compressive Strength (tsf)	Triaxial with Young's Modulus (tsf)	Triaxial with Poisson's Ratio	Point Load Index (MPa)	Direct Shear Strength on Saw-Cut Surface (tsf)	Direct Shear Strength on Fracture Surface (tsf)	Direct Shear Strength Apparent Friction	Brazilian Splitting Tensile Strength (MPa)	Dry Unit Weight (pcf)	Specific Gravity	Moh's Hardness	Slake Durability	Cerhar Abrasivity Index
B-2	63.5 - 64.0		20160										181.8				
B-2	81.3 - 81.9		14230										164.3				
B-2	93.5 - 94.1		8100										181.7				
B-2	109.1 - 109.7		8200										164.7				
B-2	116.1 - 116.7		17150										179.1				
B-2	124.5 - 125.5		14050										163.3				

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NA = Not Available

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PROJECT NO.: 20201659.001A
DRAWN BY: SBM
CHECKED BY: JDF
DATE: 10/10/2019

ROCK LABORATORY TEST RESULT SUMMARY

Equitrans MVP Southgate Stoney Creek HDD
3131 North NC-62
Burlington, North Carolina

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Project

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependen

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mol

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

MVP Southgate Project

Docket No. CP19-14-000

Geotechnical Report of Subsurface Exploration - Highways

October 2019

August 2, 2019
Kleinfelder Project No. 20200583.001A

Ms. Alina Lawrence
Design Engineer
Equitrans Midstream Corp.
2200 Energy Drive
Canonsburg, PA 15317

SUBJECT: Geotechnical Report of Subsurface Exploration
Mountain Valley Pipeline – Southgate
US58 and US29 Crossings
Pittsylvania Co., Virginia

Dear Ms. Lawrence:

This report presents the results of a subsurface exploration performed for the subject project. This work was authorized by Mountain Valley Pipeline, LLC. (MVP) Purchase Order No. 150803 OC (dated May 15, 2019) and was conducted in accordance with Kleinfelder's May 6, 2019, Proposal for Geotechnical Engineering Services (No. MPEQTGTH.001C). The purpose of Kleinfelder's services was to explore the subsurface conditions at the site with respect to the installation of a new proposed pipeline and to provide general soil/rock profiles and parameters. The subsurface exploration report for the 3 North Carolina crossings are issued in a separate report.

PROJECT INFORMATION

The project consists of the installation of approximately 70 miles of natural gas transmission line that extends from Transco Village, Virginia southward to Graham, North Carolina (see Site Vicinity Map, Figure 1, in the Appendix). The installation requires 5 individual roadway crossings along the alignment. We understand that horizontal direction drilling (HDD) or conventional bore techniques will be utilized to install the pipeline beneath the referenced roadways. Entry/exit locations, proposed drill lengths and pipe specifications were not provided at the time of this report. The proposed Virginia roadway crossings are as follows:

ROADWAY	COUNTY	LATITUDE	LONGITUDE	BORINGS	BORING LABELS
US29	Pittsylvania, VA	36.781461	-79.394111	2	VA29-B1 and B2
US58	Pittsylvania, VA	36.610962	-79.563807	1	VA58-B1

EXPLORATION METHODS

Field Testing

Kleinfelder's field testing services in Virginia included the completion of 3 soil test borings. The borings were located within the VDOT right-of-way along the respective roadways as shown on the Boring Location Plan, Figure 2, in the Appendix. The boring locations were selected by Kleinfelder and were approved for drilling by MVP.

3200 Gateway Centre Blvd. Suite 100, Morrisville, NC 27560 **p |** 919.755.5011 **f |** 919.755.1414

The borings were advanced to depths ranging between 50 and 51 feet below the ground surface (bgs) using wash rotary and coring techniques. Standard Penetration Tests were performed at 2.5 feet intervals in the upper 10 feet and 5 feet thereafter to auger refusal in general accordance with ASTM D 1586. Refusal materials were cored using an NQ sized diamond core barrel, to assess the character and continuity of the underlying bedrock. The coring was accomplished in general accordance with ASTM D 2113. The boreholes were measured for groundwater after drilling completion then were filled with grout using a tremie pipe. A Kleinfelder geotechnical engineer observed the drilling and logged the subsurface conditions. The soils were classified according to the Unified Soil Classification System (USCS). The boring logs are included in the Appendix.

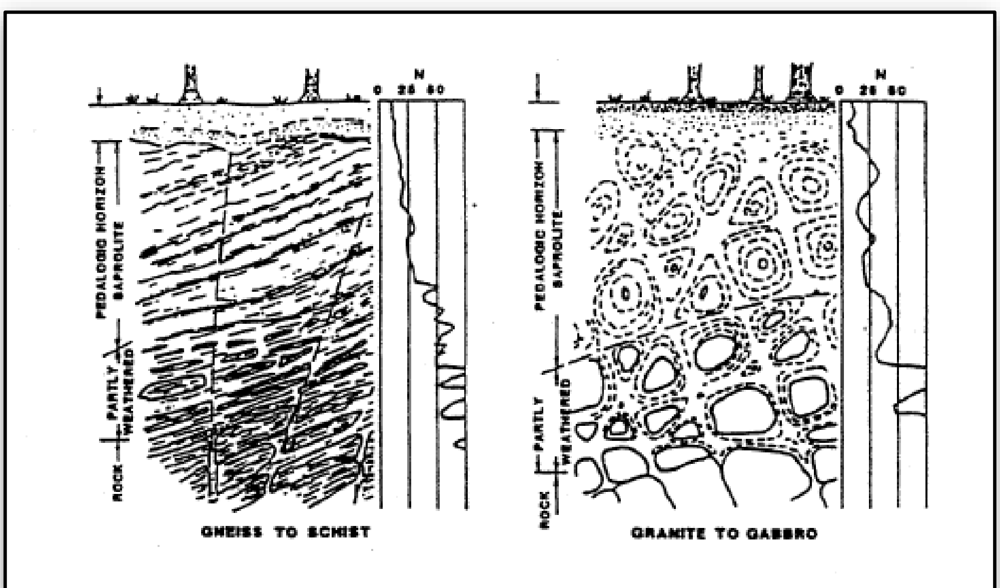
LABORATORY TESTING

Selected soil samples were subjected to routine index testing to establish their engineering characteristics. The index testing consisted of natural water content determinations, Atterberg Limits tests, and percent fines determinations. The laboratory tests were performed in accordance with ASTM D 2216, D 4318, and D 1140, respectively. A total of 4 unconfined compressive strength tests were conducted on selected rock core samples. The results of the laboratory testing are presented in the following section and on the individual boring logs included in the Appendix.

FINDINGS

Site Geology

According to readily available United States Geologic Survey (USGS) maps of Virginia, the project sites are in the Fork Mountain Formation of the Piedmont Physiographic Province. This geologic unit is designated as containing metamorphosed gneiss, schist, and metaclastic quartzite bedrock. Piedmont residual soils immediately above the rock materials originate from the chemical weathering of the parent bedrock, and oftentimes maintain the same layering and lineation of the rock. Mica and quartz tend to decompose slower than other minerals and are commonly present within the soil strata. The top of rock is generally irregular and sloped, with the upper zone fractured. The fracturing generally decreases with depth. Typical geologic cross sections of a residual profile are included below.



Typical Piedmont Weathering Profiles

SUBSURFACE CONDITIONS

The generalized subsurface conditions are described below. For soil descriptions and general stratification at a particular boring location, the respective boring log should be reviewed.

Surface materials consisted of grass at each boring. Topsoil thickness was negligible. Residual soils were present below the surface materials in each boring. Residual soils are formed by the in-place chemical weathering of the parent bedrock. The residual soils encountered in the borings generally consisted of moist shallow high plasticity (fat) clay (CH), moist low plasticity sandy clay (CL), and sandy silt (ML) in the upper 5 feet. Moist silty sand (SM) was encountered below the shallow soil down to weathered rock or boring termination depths. SPT N-values recorded in the residual soils ranged from 5 to 40 blows per foot (bpf), with the majority ranging from 8 to 21 bpf. Boring VA58-B1 was terminated in residuum.

Weathered rock was encountered in borings VA29-B1 and VA29-B2 at depths ranging from 17 to 22 feet bgs. Weathered rock represents the transition between residual soil and bedrock and is defined as any residual material that exhibits a Standard Penetration Resistance of at least 100 bpf, but less than 50 blows per 2 inches. The weathered rock sampled as silty sand.

Auger refusal occurred on bedrock in borings VA29-B1 and VA29-B2 at depths ranging from 32.6 to 46.4 feet bgs. Auger refusal is defined as negligible penetration of the auger bit under the full weight and down pressure of the drill rig. Bedrock was cored to the respective boring termination depths. The bedrock consisted of metamorphosed gneiss with recovery values ranging from 92 to 100 percent, and rock quality designation (RQD) values ranging from 48 to 67 percent. Moh's hardness values of 4 were observed in the cored rock samples.

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling.

LABORATORY TEST RESULTS

The results of the soil classification laboratory tests are summarized below in Table 1:

TABLE 1: SOIL CLASSIFICATION LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINES	USCS CLASS
VA29-B1	8.5 – 10	29.1	NP	NP	NP	16	SM
VA29-B1	18.5 – 20	33.2	NP	NP	NP	18	SM
VA29-B2	6 – 7.5	23.5	41	21	20	49	SC
VA29-B2	13.5 – 15	30.7	NP	NP	NP	11	SM
VA58-B1	13.5 – 15	33.7	NP	NP	NP	37	SM
VA58-B1	38.5 – 40	20.7	NP	NP	NP	21	SM
VA58-B1	43.5 – 45	28.1	NP	NP	NP	37	SM

NP=Non-Plastic

The results of the rock core testing are summarized below in Table 2.

TABLE 2: ROCK CORE LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	YOUNGS MODULUS (KSI)
VA29-B1	50 – 50.6	179.3	18,370	2,000
VA29-B2	36.6 – 37.1	178.6	10,350	2,440
VA29-B2	40.6 – 41.1	171.2	12,850	1,720
VA29-B2	47.4 – 48.0	165.4	18,540	3,050

GENERAL SUBSURFACE PROFILE AND PARAMETERS

Generalized soil/rock profiles and parameters for use in the Delft Geotechnics equation are presented below in Table 3 for the US29 crossing and in Table 3 for the US58 crossing. The profiles are based on the subsurface conditions encountered at the boring locations. The transition between strata will vary across the alignment due to the limited number of borings performed and the prevailing geology.

TABLE 3: US29 CROSSING - GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
BORING VA29-B1							
RESIDUAL	0 – 3	CH	120	0	350	--	145
RESIDUAL	3 – 22	SM	125	32	0	--	110
WEATHERED ROCK	22 – 46.5	--	140	45	0	--	2,000
BEDROCK	46.5 – 50	--	165	--	--	10,000	64,000
BORING VA29-B2							
RESIDUAL	0 – 3	ML	120	28	100	--	145
RESIDUAL	3 – 6	CH	120	0	350	--	120
RESIDUAL	6 – 17	SC-SM	125	32	0	--	120
WEATHERED ROCK	17 – 33.5	--	140	45	0	--	2,000
BEDROCK	33.5 - 50	--	165	--	--	10,000	64,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT

NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

TABLE 4: US58 CROSSING - GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
BORING VA58-B1							
RESIDUAL	0 – 6	CH/CL	120	0	350	--	200
RESIDUAL	6 – 18	SM	125	30	0	--	100
RESIDUAL	18 – 50	SM	125	36	0	--	175

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling. Review of readily available groundwater information on the United State Geologic Survey (USGS) website https://www.usgs.gov/centers/water-dashboard/ground?state=va,wv indicates that the average depth to groundwater in monitoring well (30C 1 SOW 010) located in Patrick County, VA is approximately 15 feet bgs.

Fluctuation in groundwater levels can occur with climatic and seasonal variations, with the highest groundwater levels generally expected between March and May. Seasonal low groundwater levels are generally expected between September and November. Therefore, subsurface water conditions at other times may be different from those described in this report.

If HDD installation techniques are utilized the bore should be designed deep enough such that the risk of hydraulic fracturing is low. The areas of greatest concern for hydraulic fracturing are near the exit location and where overburden cover of the drill path is smallest near the exit end of the bore. Hydraulic fracture calculations should be performed to evaluate the potential risk and aid in selecting the proper depth of the bore path. The contractor should carefully evaluate the ground conditions identified in this report before selecting drilling equipment and tooling.

Difficulty in steering may occur at the interface of soil and rock if the alignment extends into the underlying weathered rock and bedrock. Attempting to construct a vertical curve at the transition between soil and rock is not recommended. Curves should be laid out all in soil or all in rock.

LIMITATIONS

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk.

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. The work performed was based on project information provided by MVP

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinions, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's Geotechnical Engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during foundation construction.

This report may be used only by MVP and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

CLOSURE

Kleinfelder appreciates the opportunity to provide services to you during this phase of the project. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,
KLEINFELDER, INC.
VA License No. 1954900

COMMONWEALTH OF VIRGINIA XAVIER C. BARRETT No. 42174 8/2/19 PROFESSIONAL ENGINEER

Joshua D. Fregosi, PE*
Senior Professional
Licensed in NC, OH, PA, WV

Xavier C. Barrett, PE
VA License No. 42174

JDF/XCB:cas
Attachments

VICINITY MAP – FIGURE 1

PLOTTED: 7/31/2019 6:39:21 PM BY: JFregosi

N

LEGEND

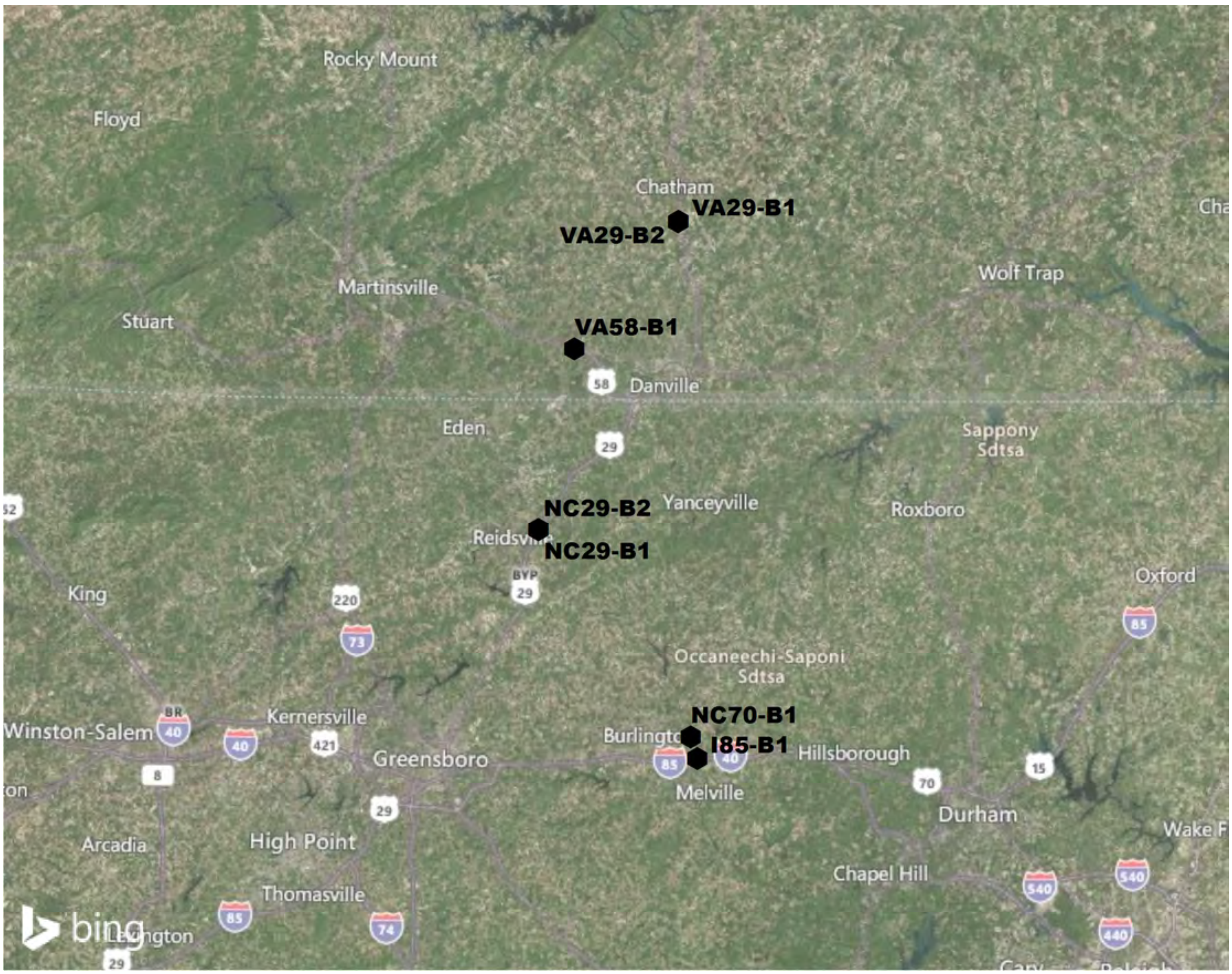
⬢ SOIL BORING

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2019 MICROSOFT CORPORATION.
COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

N

VICINITY MAP

NOT TO SCALE



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1 " = 80000 SCALE IN FEET

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PROJECT NO. 20200583.001A		SITE VICINITY MAP	FIGURE
DRAWN BY:	JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	1
CHECKED BY:	XCB		
DATE:	07-31-2019		

BORING LOCATION PLAN – FIGURES 2 AND 3

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LEGEND

SOIL BORING

NOTE:
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1 " = 100 SCALE IN FEET

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PROJECT NO. 20200583.001A		BORING LOCATION PLAN	FIGURE
DRAWN BY:	JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	2
CHECKED BY:	XCB		
DATE:	07-31-2019		

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LEGEND

SOIL BORING

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0 200 400

1 " = 200 SCALE IN FEET

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PROJECT NO. 20200583.001A		BORING LOCATION PLAN	FIGURE
DRAWN BY:	JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	3
CHECKED BY:	XCB		
DATE:	07-31-2019		

GIS FILE PATH: \\azrgisstorp01\Working_clients_Automated_Exploration Plans

BORING LOGS

SAMPLE/SAMPLER TYPE GRAPHICS

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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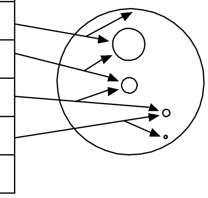
PROJECT NO.: 20200583.001A	GRAPHICS KEY
DRAWN BY: JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH
CHECKED BY: XCB	
DATE: 7/31/19	

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT: Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20200583.001A
DRAWN BY: JDF
CHECKED BY: XCB
DATE: 7/31/19

SOIL DESCRIPTION KEY

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	>6 ft. (>1.83 meters)
Slightly Fractured	2 - 6 ft. (0.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm)
Highly Fractured	2 - 8 in (50.80 - 203.30 mm)
Intensely Fractured	<2 in (<50.80 mm)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical / mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (Mpa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife.
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer.
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it.
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it.
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer.

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

APERTURE

DESCRIPTION	CRITERIA [in (mm)]
Tight	<0.04 (<1)
Open	0.04 - 0.20 (1 - 5)
Wide	>0.20 (>5)

BEDDING CHARACTERISTICS

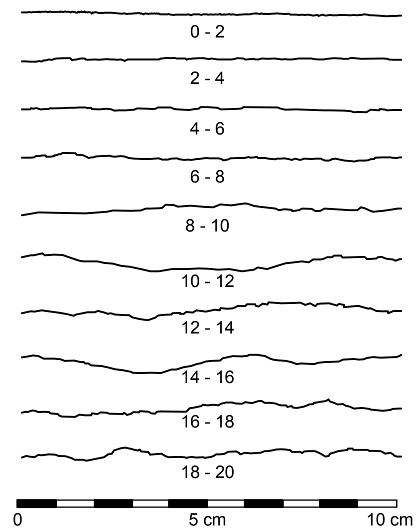
DESCRIPTION	Thickness [in (mm)]
Very Thick Bedded	>36 (>915)
Thick Bedded	12 - 36 (305 - 915)
Moderately Bedded	4 - 12 (102 - 305)
Thin Bedded	1 - 4 (25 - 102)
Very Thin Bedded	0.4 - 1 (10 - 25)
Laminated	0.1 - 0.4 (2.5 - 10)
Thinly Laminated	<0.1 (<2.5)

Bedding Planes — Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint — Fracture in rock, generally more or less vertical or traverse to bedding.

Seam — Applies to bedding plane with unspecified degree of weather.

JOINT ROUGHNESS COEFFICIENT (JRC)



From Barton and Choubey, 1977

RQD — Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.

CORE SAMPLER TYPE GRAPHICS

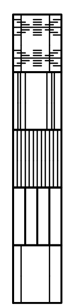
CORE SAMPLER

AQ CORE BARREL
(1.067 in. (27.1 mm.) core diameter)

AX CORE BARREL
(1.185 in. (30.1 mm.) core diameter)

BQ CORE BARREL
(1.433 in. (36.4 mm.) core diameter)

CONTINUOUS CORE SAMPLE
(2.000 in. (50.8 mm.) core diameter)



EX CORE BARREL
(0.846 in. (21.5 mm.) core diameter)

HQ CORE SAMPLE
(2.500 in. (63.5 mm.) core diameter)

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

NO RECOVERY CORE SAMPLE

NX CORE SAMPLE
(2.154 in. (54.7 mm.) core diameter)

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20200583.001A	ROCK DESCRIPTION KEY
	DRAWN BY: JDF CHECKED BY: XCB DATE: 7/31/19	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

BORING LOG VA29-B1

Date Begin - End: 6/20/2019 - 6/21/2019
Logged By: C. Driscoll
Hor.-Vert. Datum: NAD83 - NAVD88
Plunge: -90 degrees
Weather: 85°F Clear
Drilling Company: Trigon
Drill Crew: R Toothman
Drilling Equipment: CME-55
Drilling Method: Mud Rotary
Exploration Diameter: 3.88 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.78170° N
Longitude: -79.39296° E
Approximate Ground Surface Elevation (ft.): 680.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Residual **Fat CLAY with Sand (CH)**: red, moist, medium stiff	13		BC=4 2 3	18"								
			Silty SAND (SM): fine to medium-grained, brown, moist, loose to medium dense, with mica	14		BC=4 6 6	18"								
675	5			15		BC=4 4 8	18"								
				16		BC=6 5 7	18"	SM	29.1			16	NP	NP	
670	10														
				17		BC=4 4 5	18"								
665	15														
				18		BC=4 5 5	9"	SM	33.2			18	NP	NP	
660	20														
			Weathered Bedrock: Sampled as: dark brown to brown, medium to fine, silty sand with mica.	19		BC=50/3"	3"								
655	25														
				20		BC=50/3"	3"								
650	30														
				21		BC=50/3"	3"								

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PROJECT NO.: 20200583.001A
DRAWN BY: J FREGOSI
CHECKED BY: J FREGOSI
DATE: 7/25/2019

BORING LOG VA29-B1

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

Date Begin - End:	6/20/2019 - 6/21/2019	Drilling Company:	Trigon	BORING LOG VA29-B1
Logged By:	C. Driscoll	Drill Crew:	R Toothman	
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary	
Weather:	85°F Clear	Exploration Diameter:	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.78170° N
Longitude: -79.39296° E
Approximate Ground Surface Elevation (ft.): 680.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Weathered Bedrock: Sampled as: dark brown to brown, medium to fine, silty sand with mica.												
				22		BC=50/2"	2"								
640	40														
						BC=50/0"	NR								
635	45														
			Crystalline Bedrock **Metamorphosed GNEISS**: gray and black, slightly weathered, strong, highly fractured. Moh's Hardness = 4	R-1		BC=50/0" RQD=55	NR 100%								3:20 min/ft.
630	50														**Unc. Comp. Str.=** q_u: 18370 psi
625	55														
620	60														
615	65														

The boring was terminated at approximately 51 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on June 21, 2019. Rock was encountered at a depth of 46.5 ft. during this exploration. Coring started at a depth of 46.5 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.
Caving was observed at a depth of 47.8 ft. below ground surface.

KLEINFELDER
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PROJECT NO.: 20200583.001A	BORING LOG VA29-B1
DRAWN BY: J FREGOSI	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH
CHECKED BY: X BARRETT	
DATE: 7/25/2019	

Date Begin - End:	6/24/2019 - 6/25/2019	**Drilling Company:**	Trigon
Logged By:	C. Driscoll	**Drill Crew:**	R Toothman
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.78134° N
Longitude: -79.39424° E
Approximate Ground Surface Elevation (ft.): 645.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Residual **Sandy SILT (ML)**: fine to medium-grained, reddish brown, moist, medium stiff, with mica fragments	S-23		BC=3 4 4	18"								
640	5		**Fat CLAY (CH)**: brown, moist, medium stiff	S-24		BC=2 3 4	18"								
			Clayey SAND (SC): fine to medium-grained, tan, moist, loose	S-25		BC=2 3 3	18"	SC	23.5			49	41	20	
635	10			S-26		BC=3 3 5	18"								
			Silty SAND (SM): fine to medium-grained, dark brown, moist, loose, with mica fragments	S-27		BC=5 4 5	18"		30.7			11	NP	NP	
630	15														
			Weathered Rock: Sampled as: brown, medium to coarse, silty sand	S-28		BC=9 8 50/2"	14"								
625	20														
620	25			S-29		BC=50/2"	2"								
				S-30		BC=50/2"	2"								
615	30														
			Crystalline Rock **Metamorphosed GNEISS**: gray white, slightly to moderately weathered, strong, moderately to highly fractured. Moh's Hardness = 4	R-1		RQD=67	92%								5:05 min/ft.

KLEINFELDER
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PROJECT NO.: 20200583.001A
DRAWN BY: A KATARI
CHECKED BY: J FREGOSI
DATE: 7/25/2019

BORING LOG VA29-B2

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

Date Begin - End:	6/24/2019 - 6/25/2019	Drilling Company:	Trigon		
Logged By:	C. Driscoll	Drill Crew:	R Toothman		
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop:	140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary		
Weather:	90°F Clear	Exploration Diameter:	3.88 in. O.D.		

BORING LOG VA29-B2

Latitude: 36.78134° N
Longitude: -79.39424° E
Approximate Ground Surface Elevation (ft.): 645.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Crystalline Rock **Metamorphosed GNEISS**: gray white, slightly to moderately weathered, strong, moderately to highly fractured. Moh's Hardness = 4 (36' - 39') intensely fractured	R-2		RQD=60	100%								4:30 min/ft. **Unc. Comp. Str.=** q_u: 10350 psi
605	40		R-3		RQD=56	93%								5:10 min/ft. **Unc. Comp. Str.=** q_u: 12850 psi
		(43' - 50.4') highly to intensely fractured												
600	45		R-4		RQD=48	96%								3:33 min/ft. **Unc. Comp. Str.=** q_u: 18540 psi
595	50													
590	55													
585	60													
580	65													

The boring was terminated at approximately 50.5 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on June 25, 2019. Rock was encountered at a depth of 32.5 ft. during this exploration. Coring started at a depth of 32.5 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.
Caving was observed at a depth of 48.9 ft. below ground surface.

Date Begin - End:	6/20/2019 - 6/21/2019	**Drilling Company:**	Trigon
Logged By:	C. Driscoll	**Drill Crew:**	R. Toothman
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.

BORING LOG VA58-B1

Hammer Type - Drop: 140 lb. Auto - 30 in.

Latitude: 36.61116° N
Longitude: -79.56439° E
Approximate Ground Surface Elevation (ft.): 794.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Residual **Fat CLAY (CH)**: red, moist, very stiff	31	BC=3 5 11	18"								
790	5	**Sandy Lean CLAY (CL)**: red, moist, very stiff, with mica	32	BC=7 9 11	18"								
		Silty SAND (SM): fine to medium-grained, red tan, moist, loose to medium dense	33	BC=3 4 3	18"								
785	10		34	BC=3 3 4	18"								
780	15		35	BC=3 4 4	18"	SM	33.7			37	NP	NP	
775	20	tan	36	BC=7 6 15	18"								
770	25		37	BC=7 10 12	18"								
765	30		38	BC=4 8 10	18"								
760			39	BC=12 15 14	18"								

Date Begin - End:	6/20/2019 - 6/21/2019	Drilling Company:	Trigon	BORING LOG VA58-B1
Logged By:	C. Driscoll	Drill Crew:	R. Toothman	
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary	
Weather:	90°F Clear	Exploration Diameter:	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.61116° N
Longitude: -79.56439° E
Approximate Ground Surface Elevation (ft.): 794.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Silty SAND (SM): fine to medium-grained, red tan, moist, loose to medium dense												
755	40		dense	40		BC=10 15 20	18"	SM	20.7			21	NP	NP	
750	45			41		BC=12 8 13	18"	SM	28.1			37	NP	NP	
745	50		dense	42		BC=26 20 20	18"								
740	55														
735	60														
730	65														
725															

The boring was terminated at approximately 50 ft. below ground surface. The boring was backfilled with grout on June 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.
Caving was observed at a depth of 48.3 ft. below ground surface.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20200583.001A	BORING LOG VA58-B1
DRAWN BY: C DRISCOLL	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH
CHECKED BY: J FREGOSI	
DATE: 7/25/2019	

August 2, 2019
Kleinfelder Project No. 20200583.001A

Ms. Alina Lawrence
Design Engineer
Equitrans Midstream Corp.
2200 Energy Drive
Canonsburg, PA 15317

SUBJECT: Geotechnical Report of Subsurface Exploration
Mountain Valley Pipeline – Southgate
US29, US70 Bypass and I85/I40 Crossings
Rockingham County and Alamance County, North Carolina

Dear Ms. Lawrence:

This report presents the results of a subsurface exploration performed for the subject project. This work was authorized by Mountain Valley Pipeline, LLC. (MVP) Purchase Order No. 150803 OC (dated May 15, 2019) and was conducted in accordance with Kleinfelder's May 6, 2019, Proposal for Geotechnical Engineering Services (No. MPEQTGTH.001C). The purpose of Kleinfelder's services was to explore the subsurface conditions at the site with respect to the installation of a new proposed pipeline and to provide general soil/rock profiles and parameters. The subsurface exploration report for the 2 Virginia crossings are issued in a separate report.

PROJECT INFORMATION

The project consists of the installation of approximately 70 miles of natural gas transmission line that extends from Transco Village, Virginia southward to Graham, North Carolina (see Site Vicinity Map, Figure 1, in the Appendix). The installation requires 5 individual roadway crossings along the alignment. We understand that horizontal direction drilling (HDD) or conventional bore techniques will be utilized to install the pipeline beneath the referenced roadways. Entry/exit locations, proposed drill lengths and pipe specifications were not provided at the time of this report. The proposed North Carolina roadway crossings are as follows:

ROADWAY	COUNTY	LATITUDE	LONGITUDE	BORINGS	BORING LABELS
US29	Rockingham, NC	36.371727	-79.621376	2	NC29-B1 and B2
US70 Byp.	Alamance, NC	36.096520	-79.370002	1	NC70-B1
I85/I40	Alamance, NC	36.068667	-79.359832	1	I85-B1

EXPLORATION METHODS

Field Testing

Kleinfelder's field testing services in North Carolina included the completion of 4 soil test borings. The borings were located within the NCDOT right-of-way along the respective roadways as shown on the Boring Location Plan, Figure 2 through Figure 4, in the Appendix. The boring locations were selected by Kleinfelder and were approved for drilling by MVP.

3200 Gateway Centre Blvd. Suite 100, Morrisville, NC 27560 **p |** 919.755.5011 **f |** 919.755.1414

The borings were advanced to depths ranging between 50 and 51 feet below the ground surface (bgs) using wash rotary and coring techniques. Standard Penetration Tests were performed at 2.5 feet intervals in the upper 10 feet and 5 feet thereafter to auger refusal in general accordance with ASTM D 1586. Refusal materials were cored using an NQ sized diamond core barrel, to assess the character and continuity of the underlying bedrock. The coring was accomplished in general accordance with ASTM D 2113. The boreholes were measured for groundwater after drilling completion then were filled with grout using a tremie pipe. A Kleinfelder geotechnical engineer observed the drilling and logged the subsurface conditions. The soils were classified according to the Unified Soil Classification System (USCS). The boring logs are included in the Appendix.

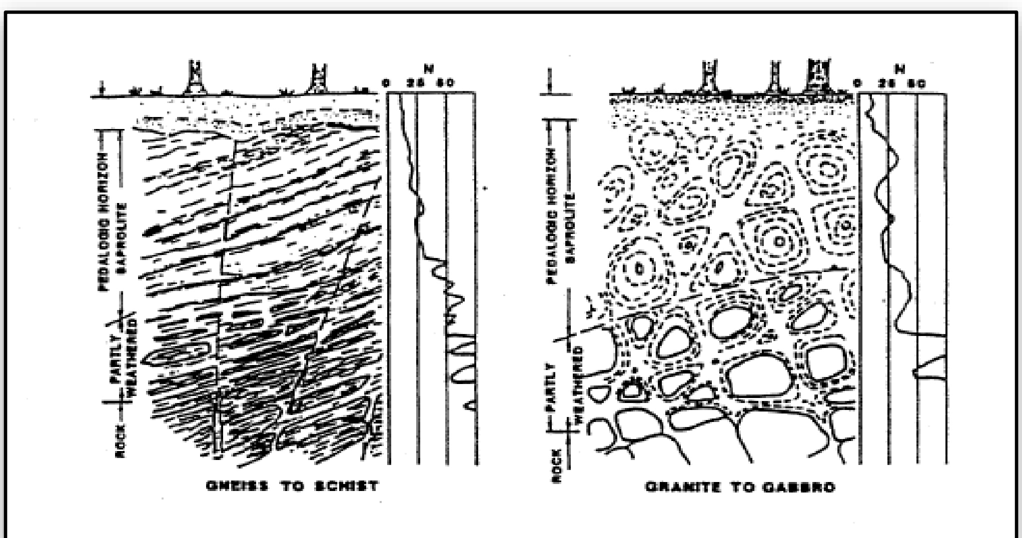
LABORATORY TESTING

Selected soil samples were subjected to routine index testing to establish their engineering characteristics. The index testing consisted of natural water content determinations, Atterberg Limits tests, and percent fines determinations. The laboratory tests were performed in accordance with ASTM D 2216, D 4318, and D 1140, respectively. A total of 10 unconfined compressive strength tests were conducted on selected rock core samples. The results of the laboratory testing are presented in the following section and on the individual boring logs included in the Appendix.

FINDINGS

Site Geology

According to readily available United States Geologic Survey (USGS) maps of Virginia, the project sites are in the Milton and Carolina Slate Belts of the Piedmont Physiographic Province. These geologic units are designated as containing metamorphosed gneiss/granite, mica schist, and metavolcanic basalt bedrock. Piedmont residual soils immediately above the rock materials originate from the chemical weathering of the parent bedrock, and oftentimes maintain the same layering and lineation of the rock. Mica and quartz tend to decompose slower than other minerals and are commonly present within the soil strata. The top of rock is generally irregular and sloped, with the upper zone fractured. The fracturing generally decreases with depth. Typical geologic cross sections of a residual profile are included below.



Typical Piedmont Weathering Profiles

SUBSURFACE CONDITIONS

The generalized subsurface conditions are described below. For soil descriptions and general stratification at a particular boring location, the respective boring log should be reviewed.

Surface materials consisted of grass at each boring. Topsoil thickness was negligible. Residual soils were present below the surface materials in each boring. Residual soils are formed by the in-place chemical weathering of the parent bedrock. The residual soils encountered in the borings generally consisted of moist shallow lean clay (CL) and moist sandy silt (ML) in the upper 5 feet. Moist silty sand (SM) and clayey sand (SC) was encountered below the shallow soil down to weathered rock or boring termination depths. Interbedded boulder layers were encountered in boring I85-B1 at depths of 4, 8.5, and 18 feet bgs. The boulder layers ranged in thickness from 0.5 to 2 feet. SPT N-values recorded in the residual soils ranged from 6 to 98 blows per foot (bpf), with the majority ranging from 11 to 31 bpf.

Weathered rock was encountered in each boring, except I85-B1, at depths ranging from 17 to 32.5 feet bgs. Weathered rock represents the transition between residual soil and bedrock and is defined as any residual material that exhibits a Standard Penetration Resistance of at least 100 bpf, but less than 50 blows per 2 inches. The weathered rock sampled as silty sand.

Auger refusal occurred on bedrock in each boring at depths ranging from 21.6 to 39.4 feet bgs. Auger refusal is defined as negligible penetration of the auger bit under the full weight and down pressure of the drill rig. Bedrock was cored to the respective boring termination depths. The bedrock consisted of metamorphosed gneiss/granite and metavolcanic basalt with recovery values ranging from 43 to 100 percent, and rock quality designation (RQD) values ranging from 0 to 100 percent. Moh's hardness values ranging from 1 to 7 were observed in the cored rock samples.

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling.

LABORATORY TEST RESULTS

The results of the soil classification laboratory tests are summarized below in Table 1:

TABLE 1: SOIL CLASSIFICATION LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINES	USCS CLASS
NC29-B1	6 – 7.5	18.8	NP	NP	NP	24	SM
NC29-B1	13.5 – 15	19.1	NP	NP	NP	17	SM
NC29-B2	6 – 7.5	23.4	41	21	20	12	SM
NC29-B2	13.5 – 15	21.5	NP	NP	NP	16	SM
NC70-B1	13.5 – 15	21.6	NP	NP	NP	41	SM
NC70-B1	28.5 – 30	18.2	32	30	2	34	SM
I85-B1	6 – 7.5	17.7	28	22	6	35	SC-SM
I85-B1	13.5 - 15	22.6	31	27	4	49	SM

NP=Non-Plastic

The results of the rock core testing are summarized below in Table 2.

TABLE 2: ROCK CORE LABORATORY TEST RESULTS

BORING	DEPTH (FEET)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	YOUNGS MODULUS (KSI)
NC29-B1	32.7 -33.3	170.0	14,250	1,970
NC29-B1	40.7 – 41.3	182.6	8,450	930
NC29-B1	45.8 – 46.5	158.6	6,420	1,090
NC29-B2	23.8 – 24.4	177.4	6,560	1,000
NC29-B2	36.7 – 37.3	163.0	4,050	600
NC29-B2	48.7 – 49.3	160.9	5,620	870
NC70-B1	42.3 – 43.0	178.6	8,450	1,240
NC70-B1	45.0 – 45.7	184.0	4,660	1,460
I85-B1	30.8 – 31.3	179.3	18,530	2,850
I85-B1	40.6 – 41.2	179.2	15,770	2,770

GENERAL SUBSURFACE PROFILE AND PARAMETERS

Generalized soil/rock profiles and parameters for use in the Delft Geotechnics equation are presented below in Table 3 for the US29 crossing, Table 4 for the US70 Byp. Crossing, and Table 5 for the I85/I40 crossing. The profiles are based on the subsurface conditions encountered at the boring locations. The transition between strata will vary across the alignment due to the limited number of borings performed and the prevailing geology.

TABLE 3: US29 CROSSING - GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
BORING NC29-B1							
RESIDUAL	0 – 17	SM	125	34	0	--	155
WEATHERED ROCK	17 – 23	--	140	45	0	--	2,000
BEDROCK	23 – 50	--	160	--	--	4,000	30,000
BORING NC29-B2							
RESIDUAL	0 – 17	SM	125	34	0	--	155
WEATHERED ROCK	17 – 24	--	140	45	0	--	2,000
BEDROCK	24 - 50	--	160	--	--	4,000	30,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

TABLE 4: US70 BYP CROSSING - GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
BORING NC70-B1							
RESIDUAL	0 – 12	ML	125	32	150	--	180
RESIDUAL	12 – 33	SM	130	38	0	--	250
WEATHERED ROCK	33 – 40	--	140	45	0	--	2,500
BEDROCK	40 – 50	--	165	--	--	4,000	48,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)

TABLE 5: I85/I40 CROSSING - GENERAL SUBSURFACE PROFILE AND PARAMETERS

STRATA TYPE	DEPTH (FEET)	USCS TYPE[1]	UNIT WEIGHT[2] (PCF)	FRICTION ANGLE (DEG)	COHESION (PSF)	UCS[3] (PSI)	SHEAR MODULUS (KSF)
BORING I85 / I40-B1							
RESIDUAL	0 – 22	SC[4]	125	30	200	--	100
BEDROCK	22 – 50	--	165	--	--	10,000	72,000

NOTE 1 – UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
NOTE 2 – TOTAL UNIT WEIGHT
NOTE 3 – UNCONFINED COMPRESSIVE STRENGTH (UCS)
NOTE 4 – WITH INTERBEDDED BOULDER LAYERS

Groundwater was not observed during drilling prior to the introduction of water for wash rotary drilling. Review of readily available groundwater information on the North Carolina Department of Environment Quality (NCDEQ) website https://www.ncwater.org/?page=343 indicates that the depth to groundwater in monitoring well (D 52L1) located in Rockingham County, North Carolina ranges from approximately 18 to 22 feet bgs.

Fluctuation in groundwater levels can occur with climatic and seasonal variations, with the highest groundwater levels generally expected between March and May. Seasonal low groundwater levels are generally expected between September and November. Therefore, subsurface water conditions at other times may be different from those described in this report.

If HDD installation techniques are utilized the bore should be designed deep enough such that the risk of hydraulic fracturing is low. The areas of greatest concern for hydraulic fracturing are near the exit location and where overburden cover of the drill path is smallest near the exit end of the bore. Hydraulic fracture calculations should be performed to evaluate the potential risk and aid in selecting the proper depth of the bore path. The contractor should carefully evaluate the ground conditions identified in this report before selecting drilling equipment and tooling.

Difficulty in steering may occur at the interface of soil and rock if the alignment extends into the underlying weathered rock and bedrock. Attempting to construct a vertical curve at the transition between soil and rock is not recommended. Curves should be laid out all in soil or all in rock.

LIMITATIONS

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk.

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. The work performed was based on project information provided by MVP

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinions, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's Geotechnical Engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during foundation construction.

This report may be used only by MVP and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than 2 years from the date of the report.

CLOSURE

Kleinfelder appreciates the opportunity to provide services to you during this phase of the project. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,
KLEINFELDER, INC.
Firm License No. F-1312

Joshua D. Fregosi, PE	Xavier C. Barrett, PE
NC License No. 38602	Principal Professional

JDF/XCB:cas
Attachments

VICINITY MAP – FIGURE 1

PLOTTED: 7/31/2019 6:39:21 PM BY: JFregosi

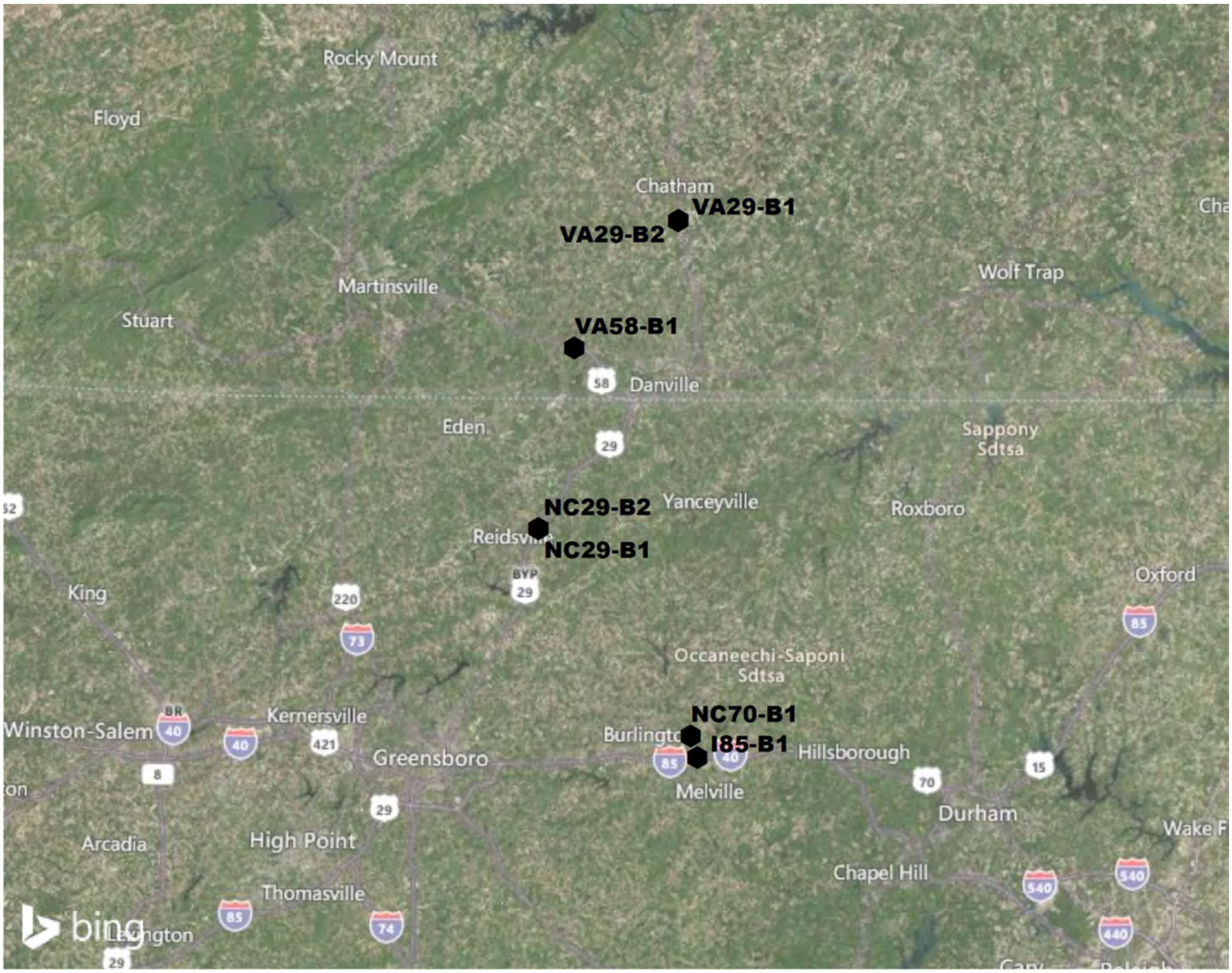
N

LEGEND

⬢ SOIL BORING

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS
COMPILED BY ESRI PRODUCTS AND 2019 MICROSOFT CORPORATION.
COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

VICINITY MAP NOT TO SCALE



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0 80000 160000

1 " = 80000 SCALE IN FEET

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Bright People. Right Solutions.

PROJECT NO. 20200583.001A		SITE VICINITY MAP	FIGURE
DRAWN BY:	JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	1
CHECKED BY:	XCB		
DATE:	07-31-2019		

GIS FILE PATH: \\azrgisstorp01\Working_clients_Automated_Exploration Plans

BORING LOCATION PLAN – FIGURES 2 THROUGH 4

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N

LEGEND

SOIL BORING

N VICINITY MAP NOT TO SCALE

NOTE:
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COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

0 100 200

1 " = 100 SCALE IN FEET

KLEINFELDER Bright People. Right Solutions.	PROJECT NO. 20200583.001A DRAWN BY: JDF CHECKED BY: XCB DATE: 07-31-2019	BORING LOCATION MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	FIGURE 2

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N

LEGEND

SOIL BORING

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COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

VICINITY MAP

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0 200 400

1 " = 200 SCALE IN FEET

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PROJECT NO. 20200583.001A		BORING LOCATION	FIGURE 3
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CHECKED BY:	XCB		
DATE:	07-31-2019		

GIS FILE PATH: \\azrgisstorp01\Working_clients_Automated_Exploration Plans

LEGEND

SOIL BORING

NOTE:
BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS
COMPILED BY ESRI PRODUCTS AND 2019 MICROSOFT CORPORATION.
COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE NORTH CAROLINA FIPS 3200

VICINITY MAP

NOT TO SCALE

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0 200 400

1 " = 200 SCALE IN FEET

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PROJECT NO. 20200583.001A		BORING LOCATION	FIGURE 4
DRAWN BY:	JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	
CHECKED BY:	XCB		
DATE:	07-31-2019		

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BORING LOGS

SAMPLE/SAMPLER TYPE GRAPHICS

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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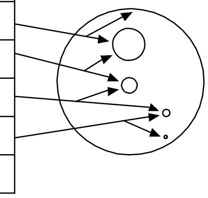
PROJECT NO.: 20200583.001A	GRAPHICS KEY	
DRAWN BY: JDF	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH	
CHECKED BY: XCB		
DATE: 7/31/19		

PLOTTED: 07/31/2019 06:01 PM BY: JFregosi
OFFICE FILTER: GREENSBORO
PROJECT NUMBER: 20200583.001A
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_GEO-LEG1 (GRAPHICS KEY) WITH USCS]

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

	AMOUNT	
Term of Use	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20200583.001A

DRAWN BY: JDF

CHECKED BY: XCB

DATE: 7/31/19

SOIL DESCRIPTION KEY

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	>6 ft. (>1.83 meters)
Slightly Fractured	2 - 6 ft. (0.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm)
Highly Fractured	2 - 8 in (50.80 - 203.30 mm)
Intensely Fractured	<2 in (<50.80 mm)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical / mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (Mpa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife.
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer.
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it.
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it.
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer.

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

APERTURE

DESCRIPTION	CRITERIA [in (mm)]
Tight	<0.04 (<1)
Open	0.04 - 0.20 (1 - 5)
Wide	>0.20 (>5)

BEDDING CHARACTERISTICS

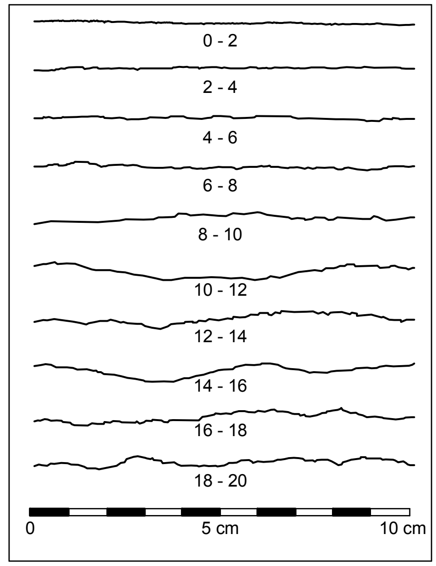
DESCRIPTION	Thickness [in (mm)]
Very Thick Bedded	>36 (>915)
Thick Bedded	12 - 36 (305 - 915)
Moderately Bedded	4 - 12 (102 - 305)
Thin Bedded	1 - 4 (25 - 102)
Very Thin Bedded	0.4 - 1 (10 - 25)
Laminated	0.1 - 0.4 (2.5 - 10)
Thinly Laminated	<0.1 (<2.5)

Bedding Planes — Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint — Fracture in rock, generally more or less vertical or traverse to bedding.

Seam — Applies to bedding plane with unspecified degree of weather.

JOINT ROUGHNESS COEFFICIENT (JRC)



From Barton and Choubey, 1977

RQD — Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.

CORE SAMPLER TYPE GRAPHICS

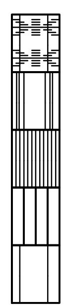
CORE SAMPLER

AQ CORE BARREL (1.067 in. (27.1 mm.) core diameter)

AX CORE BARREL (1.185 in. (30.1 mm.) core diameter)

BQ CORE BARREL (1.433 in. (36.4 mm.) core diameter)

CONTINUOUS CORE SAMPLE (2.000 in. (50.8 mm.) core diameter)



EX CORE BARREL (0.846 in. (21.5 mm.) core diameter)

HQ CORE SAMPLE (2.500 in. (63.5 mm.) core diameter)

NQ CORE SAMPLE (1.874 in. (47.6 mm.) core diameter)

NO RECOVERY CORE SAMPLE

NX CORE SAMPLE (2.154 in. (54.7 mm.) core diameter)

Date Begin - End:	6/28/2019 - 7/08/2019	**Drilling Company:**	Trigon
Logged By:	C Carroll	**Drill Crew:**	R Toothman
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.

BORING LOG I85-B1

Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION

Latitude: 36.06846° N
Longitude: -79.35955° E
Approximate Ground Surface Elevation (ft.): 499.00
Surface Condition: Grass

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Fill **Sandy Lean CLAY (CL)**: fine to coarse-grained, brown, moist, stiff, medium dense, trace gravel	S1	BC=5 6 5	3"								
495			S2	BC=25 50/6"	12"								
	5	**BOULDERS**: Sampled as: dary grey silty gravel											
		Fill **Clayey SAND (SC)**: fine to coarse-grained, brown, moist, loose, trace gravel	S3	BC=3 2 4	6"	SC-SM	17.7			35	28	6	
490		**BOULDERS**	S4 / R-1	BC=50/1" RQD=17	NR 44%								
	10	**Residual Soils** **Clayey SAND (SC)**: fine to coarse-grained, reddish brown, moist, medium dense, high plasticity											
485			S5	BC=4 8 17	18"	SM	22.6			49	31	4	
	15												
480		**BOULDERS**	S7 / R-2	BC=50/1" RQD=0	NR 75%								
	20	mud rotary through soil											
		Crystalline Rock **Mafic Metavolcanic BASALT**: fine to medium-grained, grayish green and white, slightly weathered, medium strong to strong, moderately fractured, thickly bedded, Moh's Hardness = 5	R-3	RQD=100	98%								3:45 min/ft.
475	25		R-4	RQD=65	99%								3:30 min/ft.
470		highly fractured, highly weathered (29.0'-30.0')											4:00 min/ft.
	30		R-5	RQD=100	100%								**Unc. Comp. Str.=** q_u: 18530 psi 3:30 min/ft.
465		Moh's Hardness = 5											2:45 min/ft.

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PROJECT NO.: 20200583.001A

DRAWN BY: C CARROLL

CHECKED BY: J FREGOSI

DATE: 7/25/2019

BORING LOG I85-B1

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

Date Begin - End:	6/28/2019 - 7/08/2019	**Drilling Company:**	Trigon	**BORING LOG I85-B1**
Logged By:	C Carroll	**Drill Crew:**	R Toothman	
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary	
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.06846° N
Longitude: -79.35955° E
Approximate Ground Surface Elevation (ft.): 499.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
460			**Crystalline Rock** **Mafic Metavolcanic BASALT**: fine to medium-grained, grayish green and white, slightly weathered, medium strong to strong, moderately fractured, thickly bedded, Moh's Hardness = 5 highly fractured, 45 degree dip (38.0'-38.5')	R-6		RQD=87	100%								2:40 min/ft. 3:00 min/ft.
	40			R-7		RQD=90	100%								**Unc. Comp. Str.=** q_u: 15770 psi 2:00 min/ft. 3:10 min/ft.
455	45		Moh's Hardness = 5	R-8		RQD=80	100%								2:35 min/ft. 3:00 min/ft.
450	50														
445	55														
440	60														
435	65														
430															

The boring was terminated at approximately 50 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on July 08, 2019. Rock was encountered at a depth of 8.5 ft. during this exploration. Coring started at a depth of 8.5 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
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PROJECT NO.: 20200583.001A
DRAWN BY: C CARROLL
CHECKED BY: J FREGOSI
DATE: 7/25/2019

BORING LOG I85-B1

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

BORING LOG NC29-B1

Date Begin - End:	6/17/2019 - 6/17/2019	**Drilling Company:**	Trigon
Logged By:	C. Driscoll	**Drill Crew:**	R. Toothman
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary
Weather:	80°F Clear	**Exploration Diameter:**	3.88 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.37094° N
Longitude: -79.62143° E
Approximate Ground Surface Elevation (ft.): 661.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
660		**Silty SAND (SM)**: fine to medium-grained, non-plastic, brown, moist, loose to medium dense	1	BC=3 3 5	18"								
	5		2	BC=6 7 8	18"								
655			3	BC=6 9 8	18"	SM	18.8			24	36	2	
			4	BC=7 6 8	18"								
650	10												
			5	BC=11 15 18	18"	SM	19.1			17	NP	NP	
645	15	dense											
		Weathered Bedrock: Sampled as: brown, coarse to fine, silty sand	6	BC=50/2"	2"								
640	20												
		Crystalline Rock **Metamorphosed GNEISS**: brown, white-gray, slightly to moderately weathered, medium strong to strong, medium to highly fractured. Moh's Hardness = 4 to 5	R-1	BC=50/0" RQD=70	NR 85%								2:45 min/ft.
635	25		R-2	RQD=88	93%								2:15 min/ft.
630	30		R-3	RQD=78	90%								2:20 min/ft.
													Unc. Comp. Str.= q_u: 14250 psi

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PROJECT NO.: 20200583.001A
DRAWN BY: C DRISCOLL
CHECKED BY: J FREGOSI
DATE: 7/25/2019

BORING LOG NC29-B1

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

Date Begin - End:	6/17/2019 - 6/17/2019	Drilling Company:	Trigon		BORING LOG NC29-B1
Logged By:	C. Driscoll	Drill Crew:	R. Toothman		
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop:	140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary		
Weather:	80°F Clear	Exploration Diameter:	3.88 in. O.D.		

Latitude: 36.37094° N
Longitude: -79.62143° E
Approximate Ground Surface Elevation (ft.): 661.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
625			**Crystalline Rock** **Metamorphosed GNEISS**: brown, white-gray, slightly to moderately weathered, medium strong to strong, medium to highly fractured. Moh's Hardness = 4 to 5	R-4		RQD=73	93%								2:15 min/ft.
	40														
620				R-5		RQD=60	88%								**Unc. Comp. Str.=** q_u: 8450 psi 2:00 min/ft.
	45														
615			**Crystalline Rock** **Metamorphosed GNEISS**: gray brown, highly weathered, weak, intensely fractured. Moh's Hardness = 1	R-6		RQD=60	83%								1:30 min/ft. **Unc. Comp. Str.=** q_u: 6420 psi
	50														
610															
	55														
605															
	60														
600															
	65														
595															

The boring was terminated at approximately 50.5 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on June 17, 2019. Rock was encountered at a depth of 22.5 ft. during this exploration. Coring started at a depth of 22.5 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.
Caving was observed at a depth of 48.2 ft. below ground surface.

PLOTTED: 07/31/2019 09:24 PM BY: JFregosi

Date Begin - End:	6/18/2019 - 6/19/2019	Drilling Company:	Trigon	BORING LOG NC29-B2
Logged By:	C. Driscoll	Drill Crew:	R. Toothman	
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary	
Weather:	80°F Clear	Exploration Diameter:	3.88 in. O.D.	

Latitude: 36.37159° N
Longitude: -79.62167° E
Approximate Ground Surface Elevation (ft.): 650.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Residual **Silty SAND (SM)**: fine to medium-grained, brown, moist, medium dense	7		BC=6 4 7	18"								
645	5			8		BC=5 6 10	18"								
				9		BC=8 9 9	18"		23.4			12	NP	NP	
640	10			10		BC=5 8 10	18"								
				11		BC=19 22 40	18"	SM	21.5			16	NP	NP	
635	15		very dense												
			Weathered Bedrock: Sampled as: brown, coarse to medium, silty sand	12		BC=45 50/3"	9"								
630	20														
625	25		**Crystalline Bedrock** **Metamorphosed GNEISS**: white tan, moderately to highly weathered, medium strong, medium to highly fractured. Moh's Hardness = 3 to 4	R-1		BC=50/0" RQD=40	NR 78%								**Unc. Comp. Str.=** q_u: 6560 psi 3:00 min/ft.
				R-2		RQD=0	43%								2:45 min/ft.
620	30			R-3		RQD=60	93%								3:15 min/ft.
			dark brown, (32.5 - 34.5) decomposed, intensely fractured. Moh's Hardness = 1												

OFFICE FILTER: GREENSBORO

PROJECT NUMBER: 20200583.001A

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20200583.001A OFFICE FILTER: GREENSBORO
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

KLEINFELDER Bright People. Right Solutions.

PROJECT NO.: 20200583.001A	BORING LOG NC29-B2
DRAWN BY: C DRISCOLL	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH
CHECKED BY: J FREGOSI	
DATE: 7/25/2019	

Date Begin - End:	6/18/2019 - 6/19/2019	Drilling Company:	Trigon	BORING LOG NC29-B2
Logged By:	C. Driscoll	Drill Crew:	R. Toothman	
Hor.-Vert. Datum:	NAD83 - NAVD88	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Mud Rotary	
Weather:	80°F Clear	Exploration Diameter:	3.88 in. O.D.	

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.37159° N
Longitude: -79.62167° E
Approximate Ground Surface Elevation (ft.): 650.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			gray, slightly weathered, strong. Moh's Hardness = 4												
			Crystalline Bedrock **Metamorphosed GNEISS**: white tan, moderately to highly weathered, medium strong, medium to highly fractured. Moh's Hardness = 3 to 4	R-4		RQD=76	93%								2:45 min/ft. **Unc. Comp. Str.=** q_u: 4050 psi
610	40														
				R-5		RQD=91	100%								2:45 min/ft.
605	45														
				R-6		RQD=83	92%								2:30 min/ft. **Unc. Comp. Str.=** q_u: 5620 psi
600	50														
595	55														
590	60														
585	65														

The boring was terminated at approximately 50.5 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on June 19, 2019. Rock was encountered at a depth of 24 ft. during this exploration. Coring started at a depth of 24 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.
Caving was observed at a depth of 47.2 ft. below ground surface.

KLEINFELDER
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PROJECT NO.: 20200583.001A	BORING LOG NC29-B2
DRAWN BY: C DRISCOLL	MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH
CHECKED BY: J FREGOSI	
DATE: 7/25/2019	

Date Begin - End:	6/27/2019 - 6/27/2019	**Drilling Company:**	Trigon		**BORING LOG NC70-B1**
Logged By:	C Carroll	**Drill Crew:**	R Toothman		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary		
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.09679° N
Longitude: -79.36987° E
Approximate Ground Surface Elevation (ft.): 522.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Residual Soils **Sandy SILT (ML)**: yellowish brown, moist, stiff	S1		BC=3 5 6	18"								
520															
	5		very stiff	S2		BC=6 7 10	18"								
515			hard, Saprolitic	S3		BC=5 13 18	18"								
	10		olive yellow, very stiff	S4		BC=8 8 16	18"								
510			**Silty SAND (SM)**: fine-grained, light brownish gray, moist, dense												
				S5		BC=6 12 19	18"	SM	21.6			41	32	2	
	15														
505															
	20		very dense	S6		BC=23 41 57	18"								
500															
	25		olive yellow, dense	S7		BC=11 24 26	18"								
495															
	30		very dense	S8		BC=16 19 22	18"	SM	18.2			34	NP	NP	
490															
			Weathered Rock: Sampled as: olive gray, fine to medium grained, silty sand	S9		BC=50/3.5"	4"								

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PROJECT NO.: 20200583.001A

DRAWN BY: C CARROLL

CHECKED BY: J FREGOSI

DATE: 7/25/2019

BORING LOG NC70-B1

MOUNTAIN VALLEY PIPELINE ROADWAY CROSSING GEOTECH

Date Begin - End:	6/27/2019 - 6/27/2019	**Drilling Company:**	Trigon		**BORING LOG NC70-B1**
Logged By:	C Carroll	**Drill Crew:**	R Toothman		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Mud Rotary		
Weather:	90°F Clear	**Exploration Diameter:**	3.88 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.09679° N
Longitude: -79.36987° E
Approximate Ground Surface Elevation (ft.): 522.00
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr Blows/6 in. RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
485			**Weathered Rock**: Sampled as: olive gray, fine to medium grained, silty sand	S10		BC=50/3"	3"								
	40		**Crystalline Rock** **Metamorphosed GRANITE**: bluish gray and white, slightly weathered, strong, moderately fractured to slightly fractured, thickly bedded, fine to medium grained, 45 degree dip, Moh's Hardness = 4 to 5 Moh's Hardness = 6 to 7	S11		BC=50/0"	NR								
				R-1		RQD=100	100%								
480				R-2		RQD=100	100%								**Unc. Comp. Str.=** q_u: 8450 psi 5:50 min/ft. 3:30 min/ft. 3:40 min/ft.
	45			R-3		RQD=100	100%								**Unc. Comp. Str.=** q_u: 4660 psi 3:15 min/ft. 4:20 min/ft. 3:45 min/ft.
475															
	50														
470															
	55														
465															
	60														
460															
	65														
455															

The boring was terminated at approximately 50 ft. below ground surface on Crystalline Rock. The boring was backfilled with grout on June 27, 2019. Rock was encountered at a depth of 39.5 ft. during this exploration. Coring started at a depth of 39.5 ft.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

MVP Southgate Project

Docket No. CP19-14-000

Scour Analysis

October 2019

Geosyntec Consultants of NC, P.C.

SOUTHGATE PIPELINE STREAM CROSSING BURIAL RECOMMENDATIONS

Revision 0

Prepared for

Mountain Valley Pipeline, LLC
2200 Energy Drive
Canonsburg, PA 15317

Prepared by

Geosyntec Consultants of NC, PC
10777 Westheimer Rd., Suite 900
Houston, TX 77042

Geosyntec Project No. TXG0072

Report No. TXG0072-0600-R-001 Rev. 0

October 15, 2019

Geosyntec consultants

Geosyntec Consultants of NC, PC

Southgate Pipeline Stream Crossing Burial Recommendations

Revision 0

Prepared for

Mountain Valley Pipeline, Inc.
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Canonsburg, PA 15317

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Houston, TX 77042

10/15/19
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COMMONWEALTH OF VIRGINIA RODOLFO B. SANCIO Lic. No. 0402059188 PROFESSIONAL ENGINEER

Project TXG0072

Report No. TXG0072-0600-R-001 Rev. 0

October 15, 2019

Geosyntec consultants

Geosyntec Consultants of NC, P.C.

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ACRONYMS AND ABBREVIATIONS

1-D	one-dimensional
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
cfs	cubic feet per second
DEM	digital elevation model
FHWA	Federal Highway Administration
ft	feet
ft/s	feet per second
ft/s^2	feet per square second
ft^2/s	square feet per second
HEC-RAS	Hydrologic Engineering Center River Analysis System
HSA	horizontal setback analysis
LiDAR	light detection and ranging
LWD	large woody debris
mm	millimeter
MVP	Mountain Valley Pipeline, LLC
OHWM	ordinary high water mark
PHMSA	Pipeline and Hazardous Materials Safety Administration
PRCI	Pipeline Research Council International
sq mi	square mile
USGS	United States Geological Survey

1. INTRODUCTION

Mountain Valley Pipeline, LLC (MVP) intends to permit, design, construct, and operate an extension of the Mountain Valley Pipeline, called MVP Southgate, from its currently approved end point in Pittsylvania County, Virginia, to an interconnect location in Alamance County, North Carolina. The proposed pipeline will consist of 72 miles of 24-inch diameter pipe. The pipeline layout as of 20 September 2019 is shown in Figure 1-1.

The route for the new pipeline traverses perennial, intermittent, and ephemeral streams. Over time, streams migrate horizontally and vertically, therefore, the pipeline needs to be buried sufficiently away from the existing banks and sufficiently deep below the thalweg to minimize pipeline exposure during the design life. The pipeline will be buried underneath the streams to mitigate against exposure that can lead to hydrotechnical hazards that could compromise the integrity of the structure, such as hydrodynamic loading, debris impact, fatigue caused by vortex induced vibration, etc. MVP requested that Geosyntec Consultants of NC, P.C. (Geosyntec) develop recommendations for pipeline burial that will minimize exposure during the lifetime of the project.

This technical report documents Geosyntec's methods and initial recommendations for stream crossing burial depth and stream bank setback for 64 streams[1] along the MVP Southgate pipeline that exhibit a width greater than 10-feet (ft),[2] as defined by MVP and shown on Figure 1-1. Recommendations are provided based on a Phase 1 desktop study, which involves the use of data and parameters that are not based on site-specific data and therefore carry a significant amount of uncertainty. The proposed recommendations have been updated at four select stream/tributary crossings through acquisition of additional field data during a Phase 2 reconnaissance-level field study to reduce uncertainty. This approach is consistent with the Pipeline Research Council International (PRCI) guidance document "Guidelines for Management of Geohazards Affecting the Engineering and Construction of New Oil and Natural Gas Pipelines" Sancio et al. (2018).

[1] MVP initially indicated 65 stream crossings for the domain of this analysis, however, 2 of the stream crossings were redundant.

[2] The stream width as defined by MVP was the length of the pipeline crossing between the right and left bank ordinary high-water marks that were delineated by others. The measurement was taken along the proposed pipe alignment which in some cases was not perpendicular to the stream or waterbody resulting in a larger reported stream width than the actual bankfull stream width, which is typically measured perpendicular to flow at a riffle.

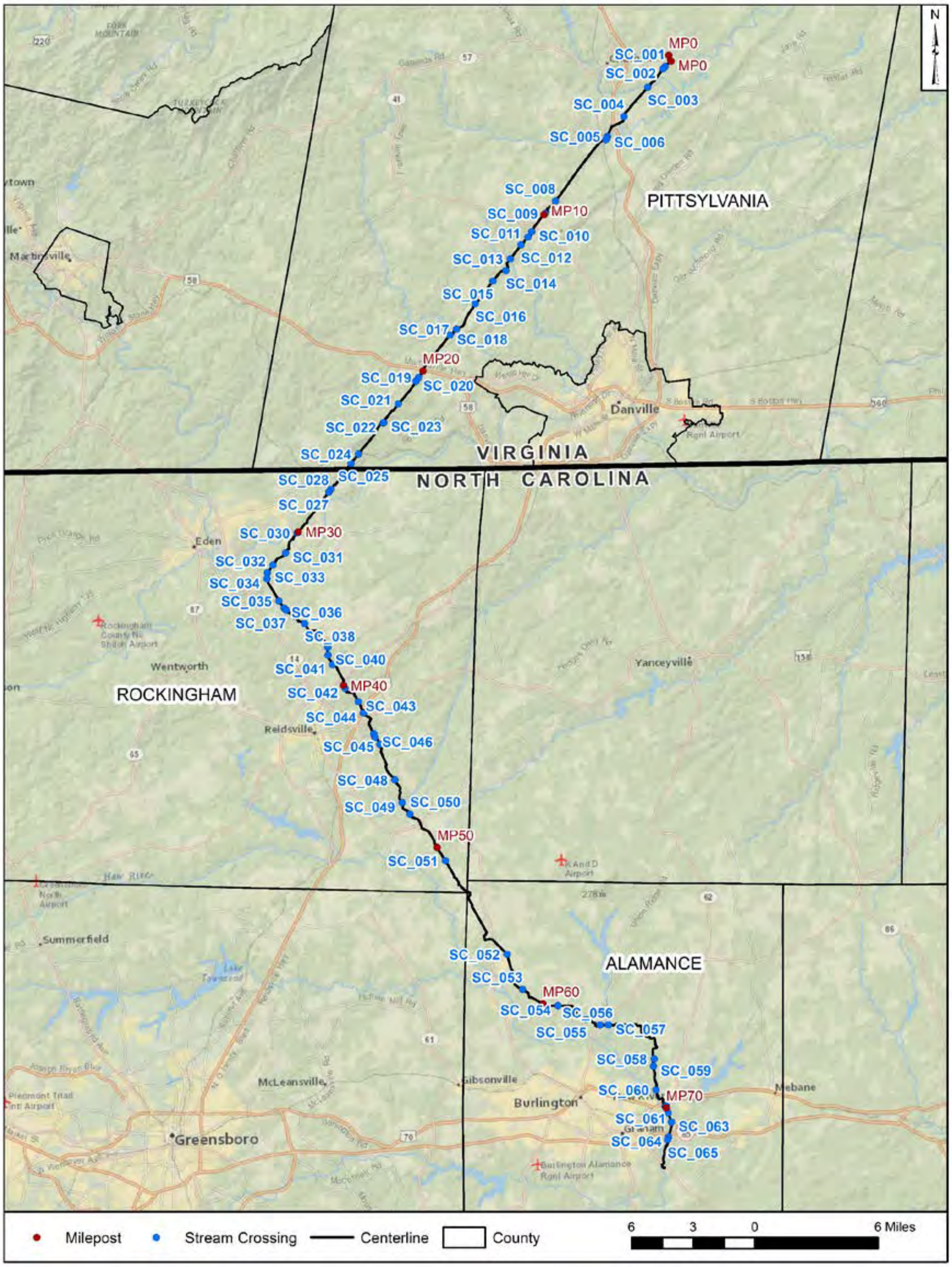


Figure 1-1. MVP Southgate 72-mile Long Pipeline Layout (Dated 20 September 2019) and Stream Crossing Map

2. CONSIDERATIONS FOR DESIGN AT STREAM CROSSINGS

2.1 Overview

There are no specific regulatory guidance that define the methods that should be followed for selecting appropriate pipeline burial depths adjacent to and below stream crossings, and little is provided regarding minimum pipeline burial. API RP 1133 (2017) provides some recommendations and guidance for overall risk management, but no specifics regarding burial depth. Therefore, operators are given flexibility to define the pipeline burial depth. Existing guidance by the Pipeline and Hazardous Materials Safety Administration (PHMSA), Bureau of Land Management (BLM), and Code of Federal Regulations (CFR) is summarized below.

2.2 PHMSA Advisory Bulletin

PHMSA Advisory Bulletin ADB-2015-01 indicates that

> *"operators are urged to take the following actions to prevent and mitigate damage to pipeline facilities and ensure public and environmental safety in areas affected by flooding:*
>
> 1. *Utilize experts in river flow, such as hydrologists or fluvial geomorphologists, to evaluate a river's potential for scour or channel migration at each pipeline river crossing.*
> 2. *Evaluate each pipeline crossing of a river to determine the pipeline's installation method and determine if that method (and the pipeline's current condition) is sufficient to withstand the risks posed by anticipated flood conditions, river scour, or river channel migration. In areas prone to these conditions and risks, consider installing pipelines using horizontal directional drilling to help place pipelines below elevations of maximum scour and outside the limits of lateral channel migration.*
> 3. *Determine the maximum flow or flooding conditions at rivers where pipeline integrity is at risk in the event of flooding (e.g., where scour can occur) and have contingency plans to shut down and isolate those pipelines when those conditions occur."*

2.3 Bureau of Land Management Guidance

The BLM (Fogg and Hadley, 2007) developed guidance for placing pipelines that cross above or below the surface of stream channels to prevent inundation or exposure of the pipe to the hydraulic forces of flood events. The BLM indicate that

> *"an analysis of channel degradation and scour should be completed to ensure the pipelines are not exposed and broken during extreme runoff events. Without such analysis, channels should be excavated to bedrock and pipelines placed beneath all alluvial material."*
>
> *"Once a determination is made on how to bury the pipeline at the stream crossing, the elevation of the pipe should be held constant across the floodplain."*

It is Geosyntec's opinion that the BLM's use of "should" is a recommendation that scour and degradation analyses should be performed to estimate the burial depth and pipeline elevation within the floodplain at a stream crossing.

2.4 The Law on Pipeline Cover

Title 49 CFR Part 192, §192.327 (c.f., Appendix C), provides minimum pipeline burial depths in soil and rock according to class location (as defined in 49 CFR Part 192 §192.5). No guidance is provided for "streams", other than for "navigable rivers or streams" where the minimum burial in soil is 4 ft and in consolidated rock it is 2 ft. The minimum burial across "drainage ditches" is 36 inches in soil and 24 inches in consolidated rock.

2.5 Summary

The methods described in Sections 4 and 4.2 of this document comply with the requirements in PHMSA Advisory Bulletin ADB-2015-01 and guidance by the BLM. Minimum burial proposed for the 64 crossings will meet the requirements of 49 CFR Part 192, §192.327.

3. CHARACTERISTICS OF THE STREAMS ALONG THE PIPELINE

Characteristics of the stream crossings along the proposed MVP Southgate pipeline are summarized below based on key factors that influence channel morphology, including hydrology, channel geometry, and bed and bank material. These characterizations serve as inputs to the horizontal setback analysis (HSA) and vertical migration analysis.

3.1 Hydrology

3.1.1 Drainage Area

The drainage area tributary to the 64 stream crossings evaluated was calculated using United States Geological Survey (USGS) StreamStats Batch Processing Tool (http://streamstatsags.cr.usgs.gov/ss_bp/) and refined with manual edits where necessary. Drainage area for the 64 stream crossings range between 0.03 square miles and 1,722 square miles. A histogram of drainage area for the stream crossings of interest is provided on Figure 3-1.

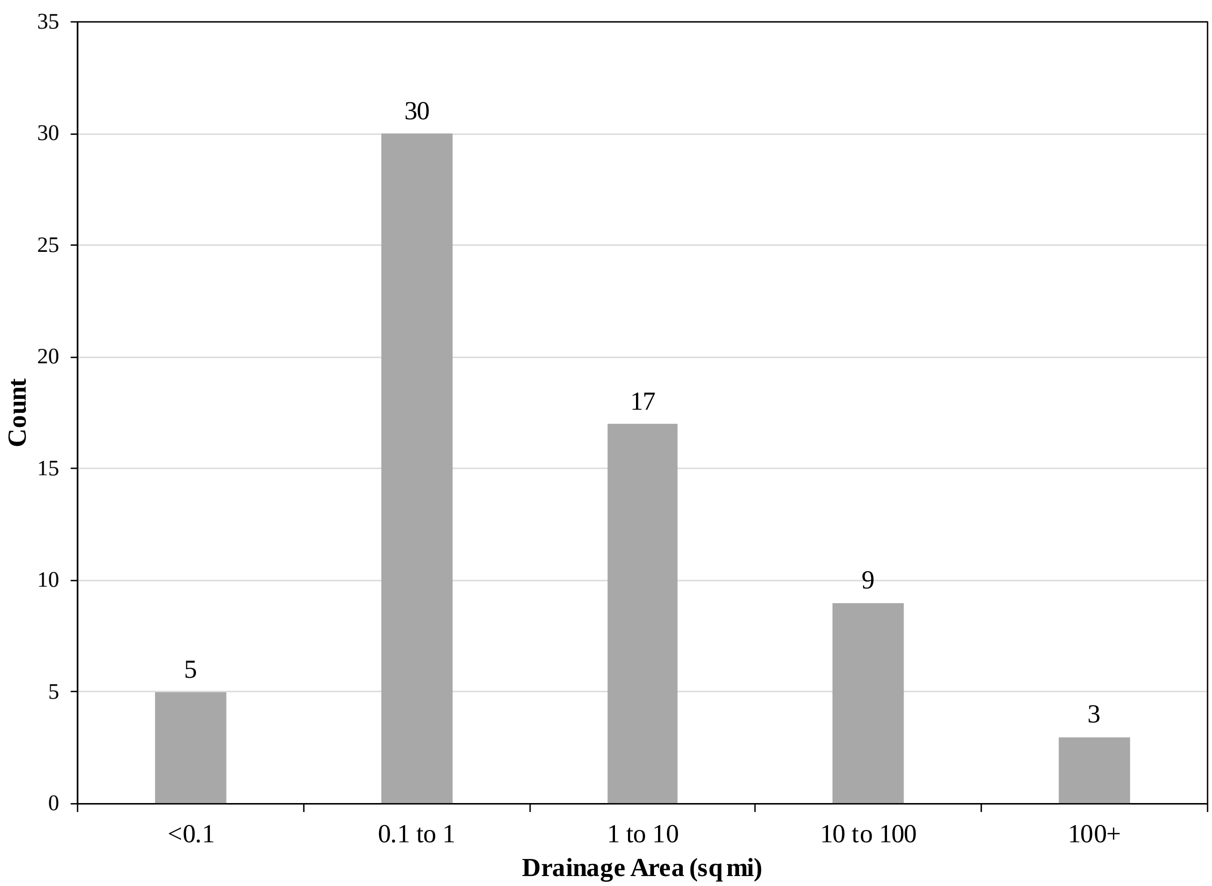


Figure 3-1. Histogram of Drainage Area Tributary to Stream Crossings of Interest

3.1.2 Urbanization

When present in the watershed, urbanization can be an important factor that influences geomorphic change of streams. Land development modifies natural watershed and stream hydrologic (water) and geomorphic (landform) processes by introducing impervious surfaces and drainage infrastructure that in turn changes runoff volume, timing, duration, frequency, and increases in peak discharge. These changes to runoff patterns caused by land use modifications are referred to as “hydromodification.” Unless managed, hydromodification can cause channel erosion (i.e., enlargement), channel migration, or sedimentation (referred to as “hydromodification impacts”). Such impacts may be associated with degradation of stream conditions and eventually pipeline exposure.

The imperviousness of the drainage areas tributary to the stream crossings evaluated was assessed using the drainage area delineations and the 2011 National Land Cover Dataset (NLCD). Watershed imperviousness ranges between 0% and 44%. Thirteen of the 64 crossings have tributary imperviousness greater than 5%, indicating that urbanization is of significance for 20% of the stream crossings. A histogram of watershed imperviousness is provided on Figure 3-2.

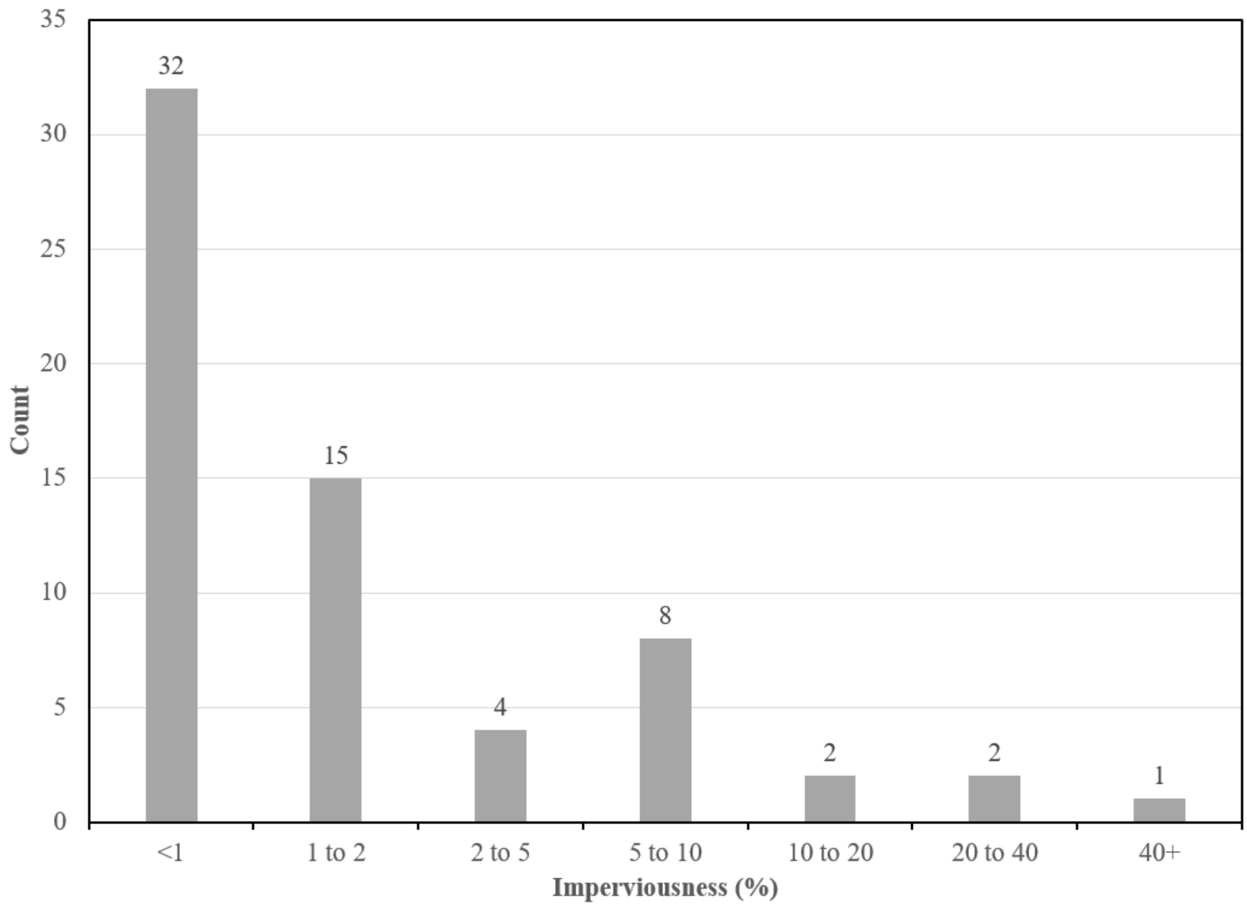


Figure 3-2. Histogram of Imperviousness Tributary to Stream Crossings of Interest

3.1.3 Peak Flows

Peak flows associated with the 2-, 5-, 10-, 25-, 50-, 100-, and 200-year return periods were calculated using empirical relationships derived for Virginia (Austin et al., 2011) and North Carolina (Feaster et al., 2014) streams. Additionally, peak flows associated with bankfull conditions were calculated using regional hydraulic geometry relationships empirically derived for Virginia (Lotspeich, 2009) and North Carolina (Harman et al., 2000) streams. The proposed MVP Southgate Pipeline alignment resides entirely in the Piedmont physiographic province, so the equations associated with this province were used. The peak flow relationships for Virginia and North Carolina are shown on Figure 3-3 and Figure 3-4, respectively, and are expressed as a function of drainage area.

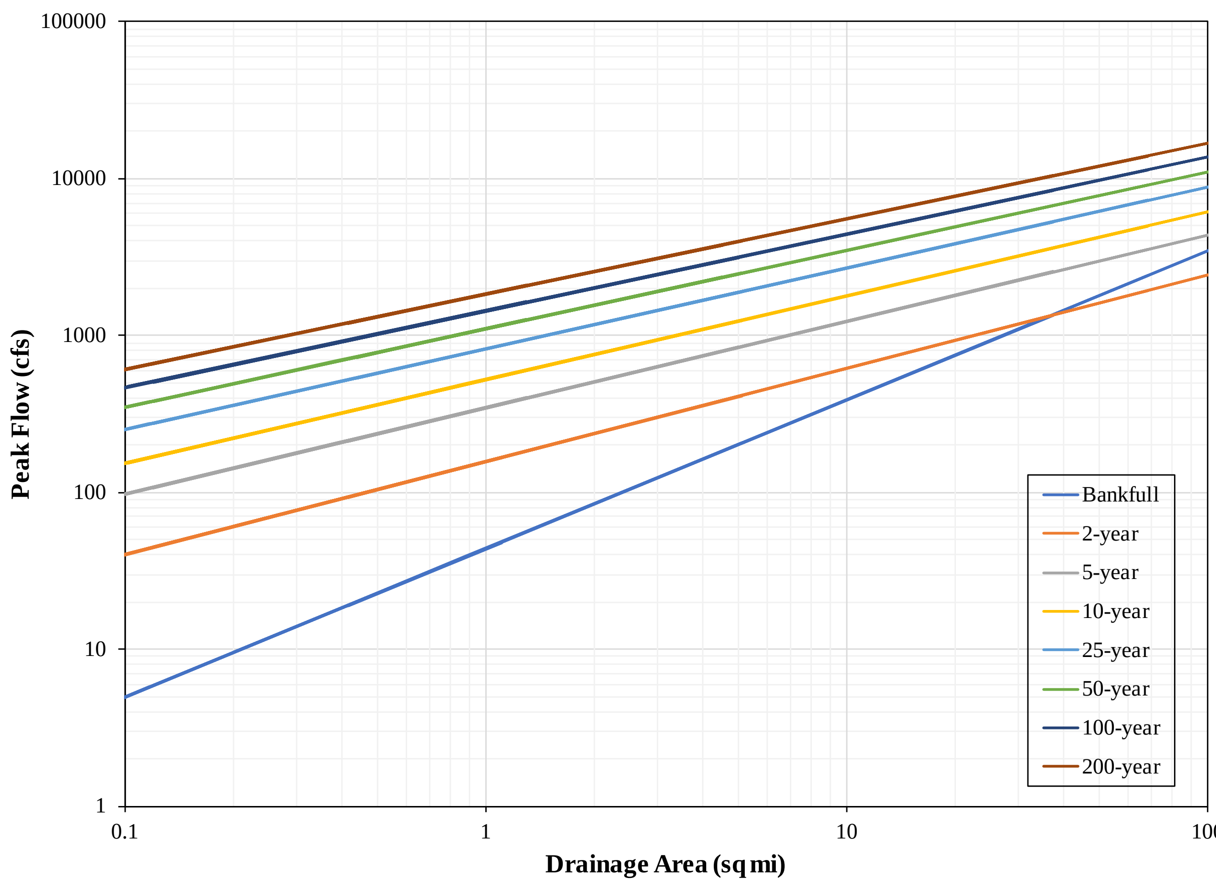


Figure 3-3. Empirical Peak Flow Relationships for Virginia

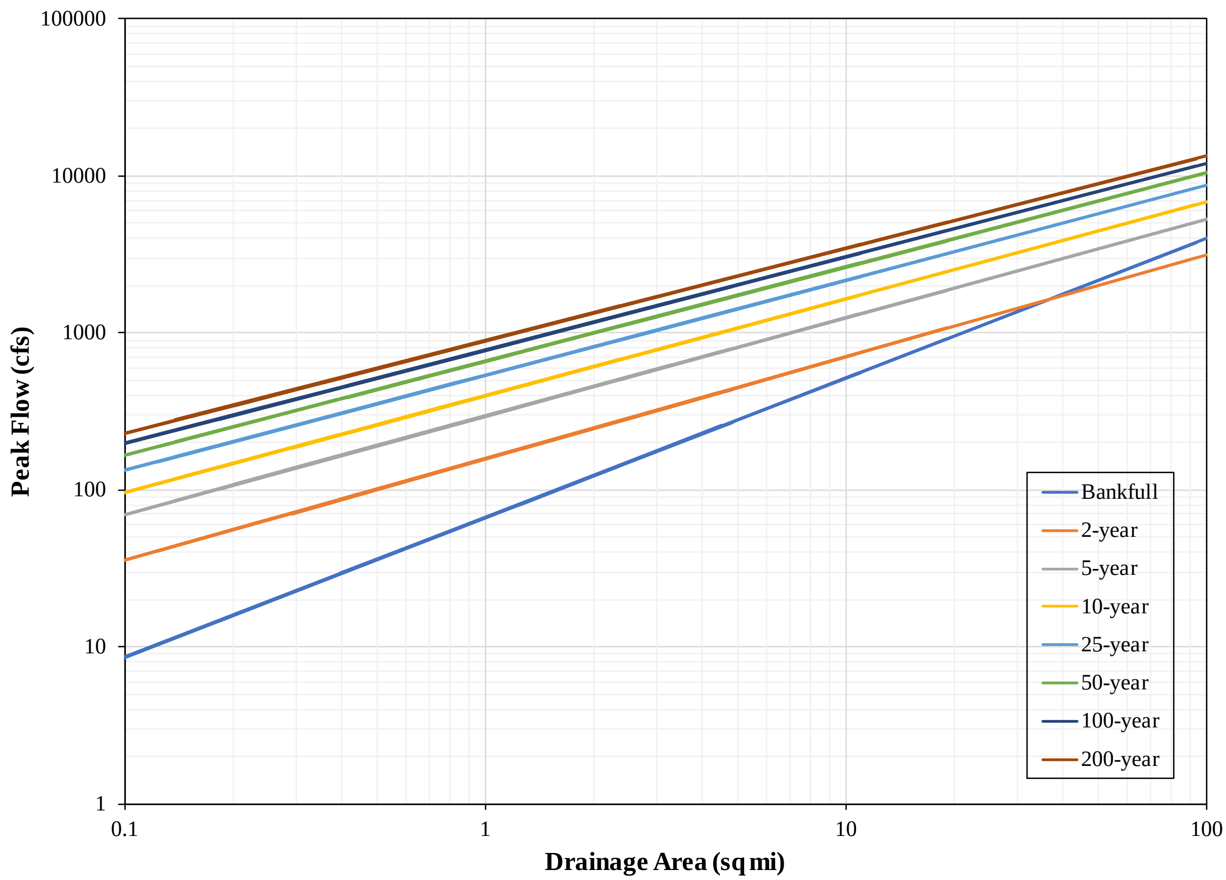


Figure 3-4. Empirical Peak Flow Relationship for North Carolina

3.2 Channel Geometry

3.2.1 Planform

Planform geometry was characterized by estimating the radius of curvature for stream meanders at the crossings of interest. Estimated radius of curvature ranges between 11 and 4,400 ft. The distribution of radius of curvature is shown on Figure 3-5 and generally has a positive correlation with drainage area (i.e., radius of curvature increases as drainage area increases). Active channel[3] width at stream crossings was also characterized based on reviewing aerial imagery and the light ranging and detection (LiDAR) digital elevation model (DEM) hillshade image in plan view. This is discussed further in Section 3.2.3.

[3] The active channel represents the break in topography associated with "top of bank" or nearest high bank which is the most recent abandoned terrace or predominant floodplain in the topography surrounding the stream crossing.

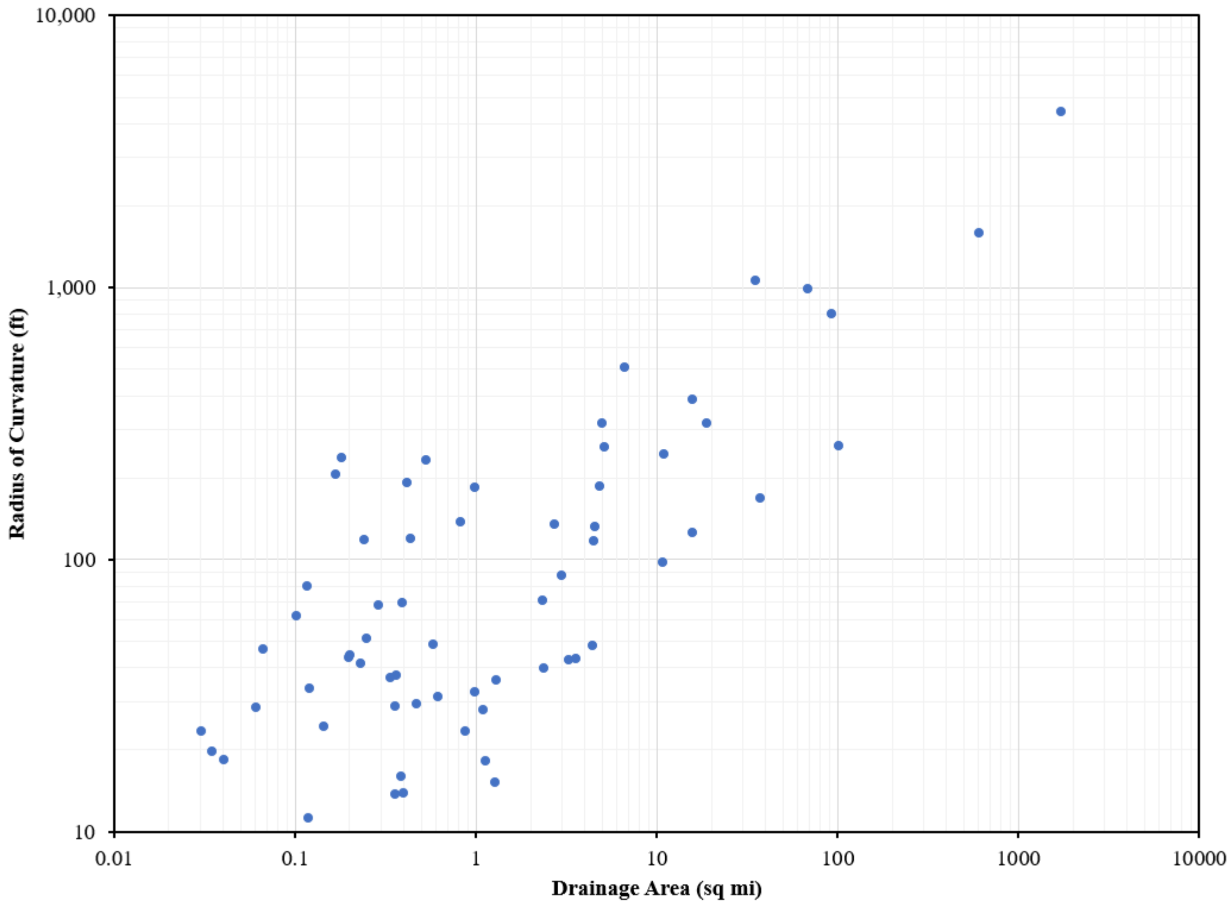


Figure 3-5. Plot of Radius of Curvature vs. Drainage Area

3.2.2 Longitudinal Slope

Longitudinal slope was calculated using the LiDAR-based DEM provided by MVP Southgate and stream flow path in vicinity to the pipeline crossings. Calculated longitudinal slope ranges between 0.05% and 11%. The distribution of longitudinal slope is shown on Figure 3-6 and has a negative correlation with drainage area (i.e., slope decreases as drainage area increases).

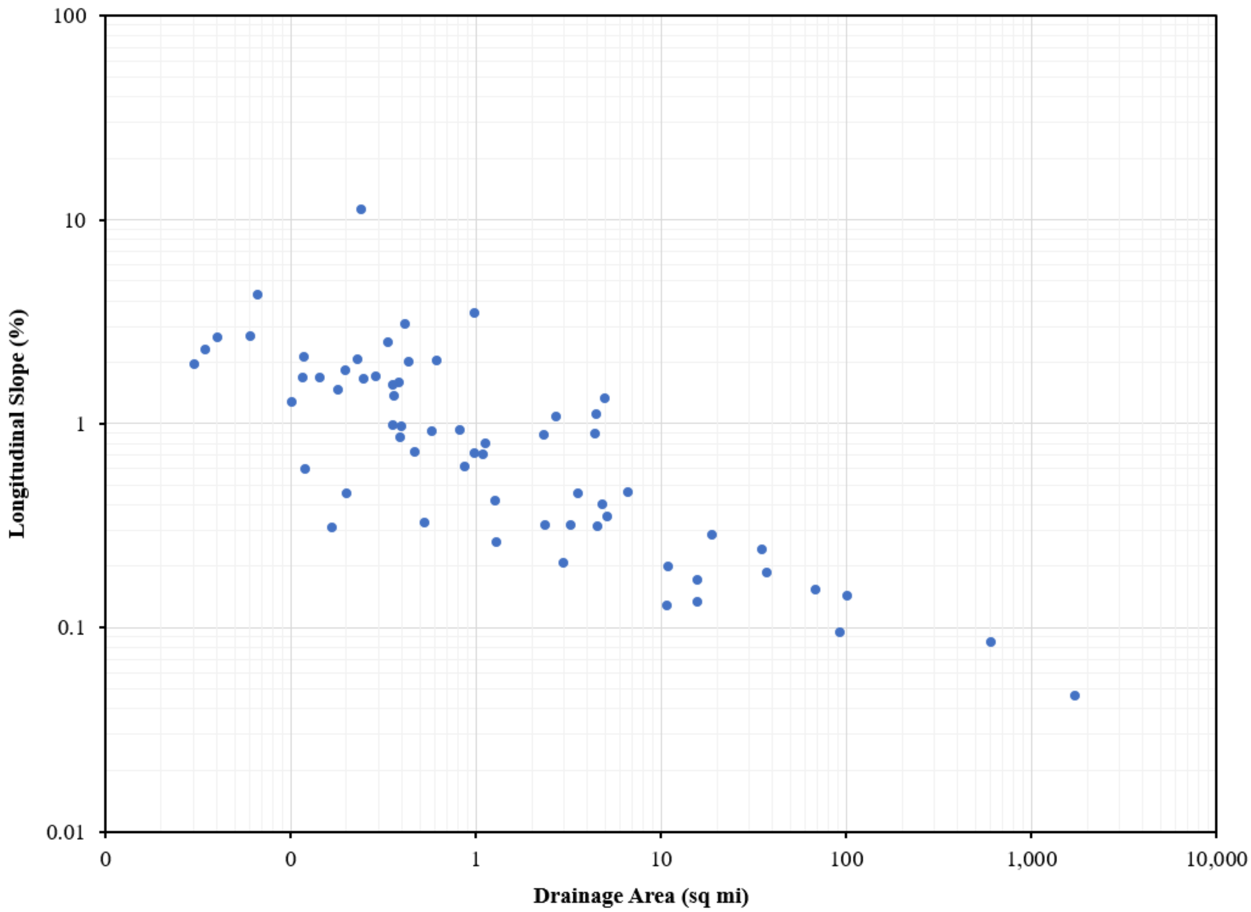


Figure 3-6. Plot of Longitudinal Slope vs. Drainage Area

3.2.3 Cross Section

Cross section dimensions (i.e., bankfull width and depth) were calculated for each stream crossing in two ways. First, regional hydraulic geometry relationships were used to calculate empirical bankfull width and depth for both Virginia (Lotspeich, 2009) and North Carolina (Harman et al., 2000). These hydraulic geometry relationships are based on data collected from non-urban streams. Second, site-specific width and depth dimensions of the active channel were estimated by (1) cutting cross sections from the LiDAR-based DEM at each crossing perpendicular to flow; (2) defining the horizontal limits of the active channel (i.e., top of bank width) by reviewing available aerial imagery and the DEM hillshade in plan view as well as reviewing the cross section geometry; and (3) subtracting the minimum elevation of the top of active channel (i.e., top of bank, terrace, or floodplain) by the thalweg elevation (i.e., low point) to calculate the active channel depth[4]. Distributions of the active channel and empirical bankfull dimensions are shown in Figure 3-7 and Figure 3-8. Both channel width and depth have a positive correlation with drainage area.

[4] Because the aerial LiDAR did not penetrate the water surface, the bed elevation was lowered in cross section for those crossings where substantial water surface was present at the time of the LiDAR survey.

Additionally, the active channel dimensions are generally greater than the empirically derived bankfull dimensions. This is particularly the case for crossings with smaller drainage area.

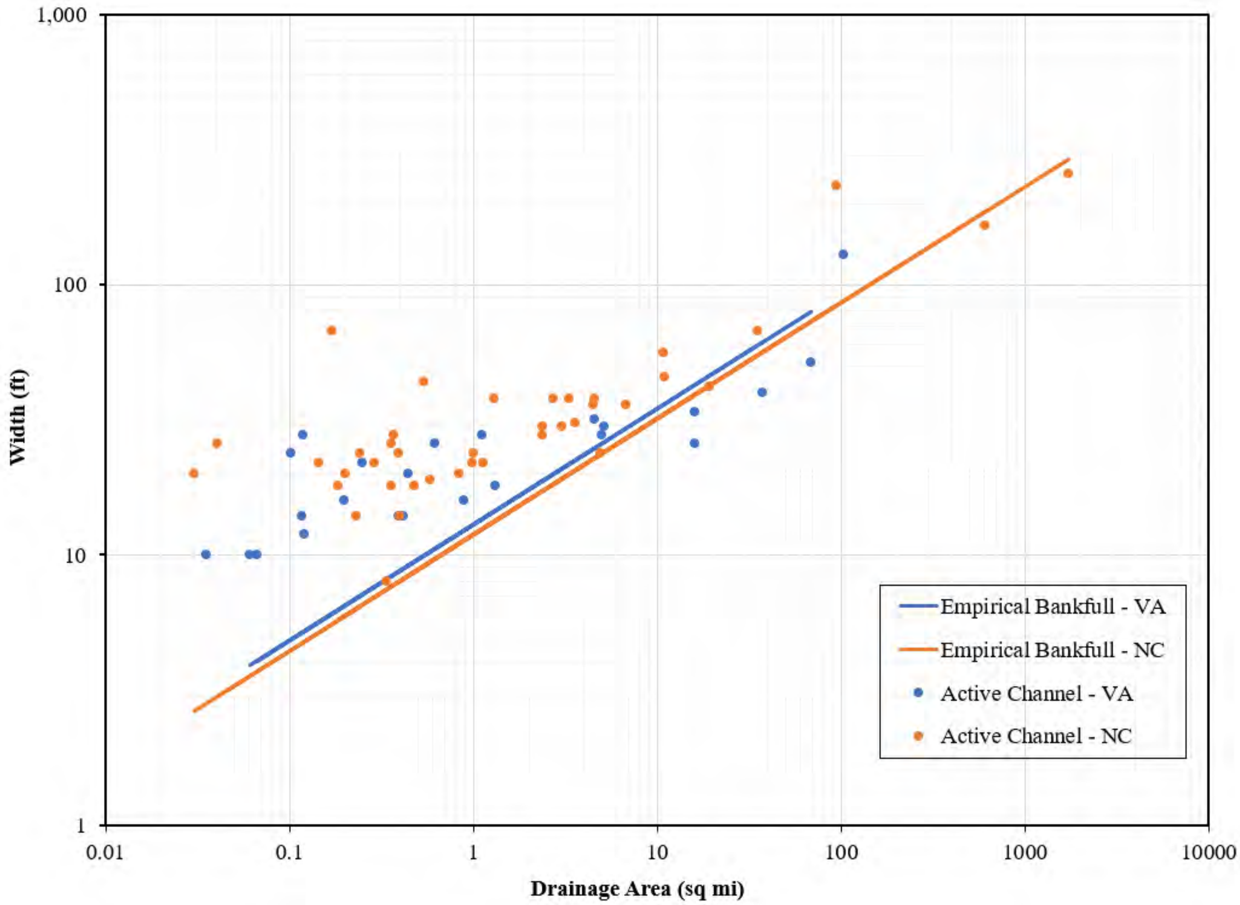


Figure 3-7. Plot of Active Channel and Empirical Bankfull Width vs. Drainage Area

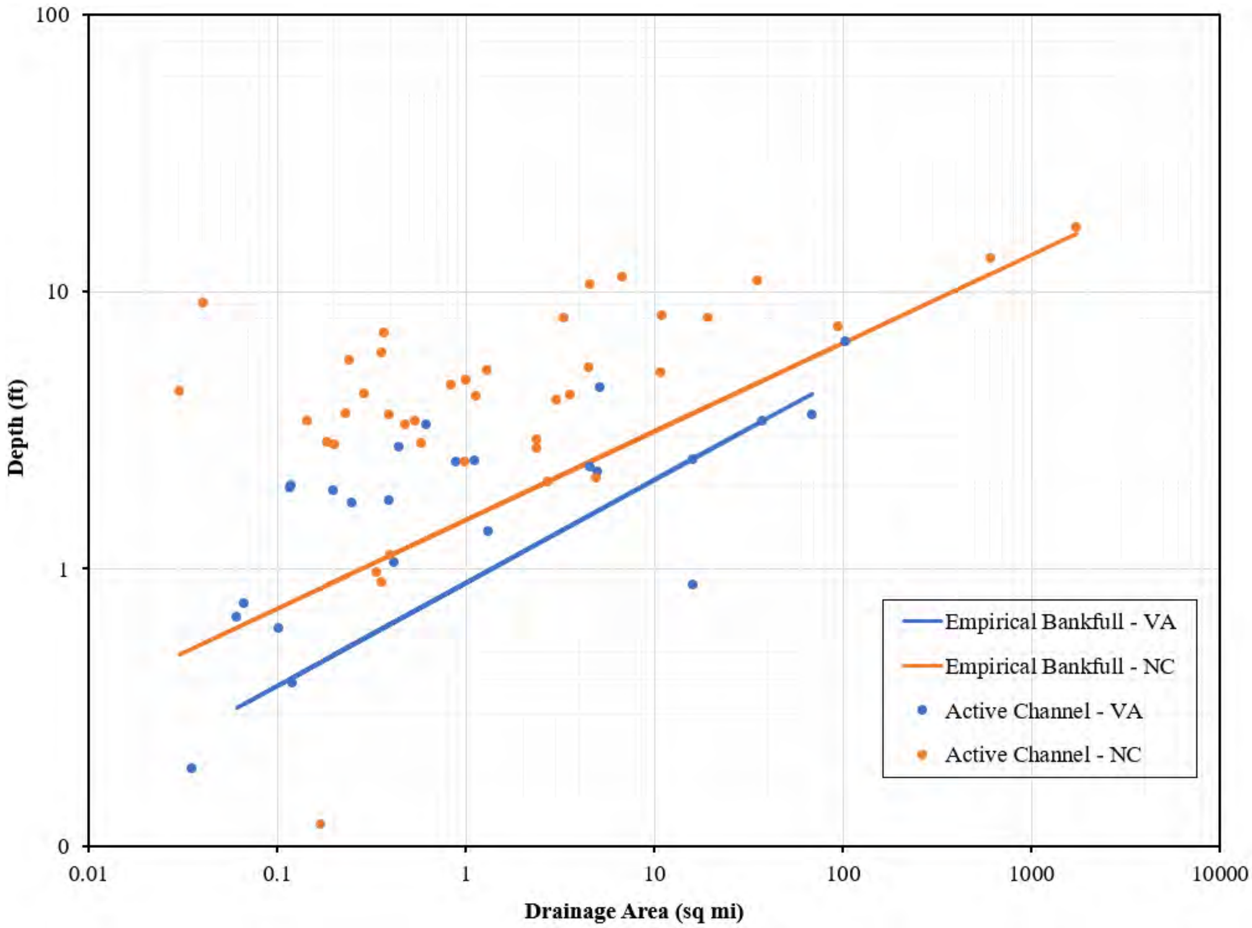


Figure 3-8. Plot of Active Channel and Empirical Bankfull Depth vs. Drainage Area

3.3 Bed and Bank Material

3.3.1 Stream Bed Particle Size

Grain size distribution data of the stream bed was not available for this Phase 1 desktop analysis. However, Geosyntec's past stream observations during Phase 2 field reconnaissance in the region indicate that streams beds in the Piedmont physiographic province typically consist of a mix of sand and gravel with rock exposure in some locations. The fraction of sand comprising the bed sediment generally increases with drainage area. Given the lack of available data for bed material at the stream crossings of interest, a sand bed was conservatively assumed for all stream crossings, except those four streams in which Geosyntec conducted a Phase 2 study. Characterization of the stream bed particle size distribution at more streams, as part of additional Phase 2 reconnaissance-level field studies, could provide a basis for less conservative burial depths than those presented herein which were calculated with sand beds.

3.3.2 Bedrock in Stream Bed

Data on exposed or shallow bedrock along the stream bed was not available for the Phase 1 desktop analysis. Field verification of bedrock at the stream bed through a Phase 2 reconnaissance-level field study could provide a basis for less conservative burial depths than those presented herein. Of the four Phase 2 streams visited only one had observable bedrock at the stream bed (i.e., SC_037); thus, the minimum burial depth was revised to 2-ft in bedrock (e.g., measured from stream bed to top of pipe).

3.3.3 Hydraulic Roughness

Manning's hydraulic roughness (n-value) was assigned to the land surface based on review of the aerial imagery, provided by MVP Southgate, at the crossings of interest. The n-values outside of the active channel were assigned based on land cover type (Chow, 1959), as follows:

- Pasture or crops = 0.035
- Brush = 0.06
- Trees = 0.10

The n-values associated with the active channel were assigned based on Rosgen Level 1 stream classifications, as shown on Figure 3-9. Overall there is a negative correlation between the n-values assumed and drainage area.

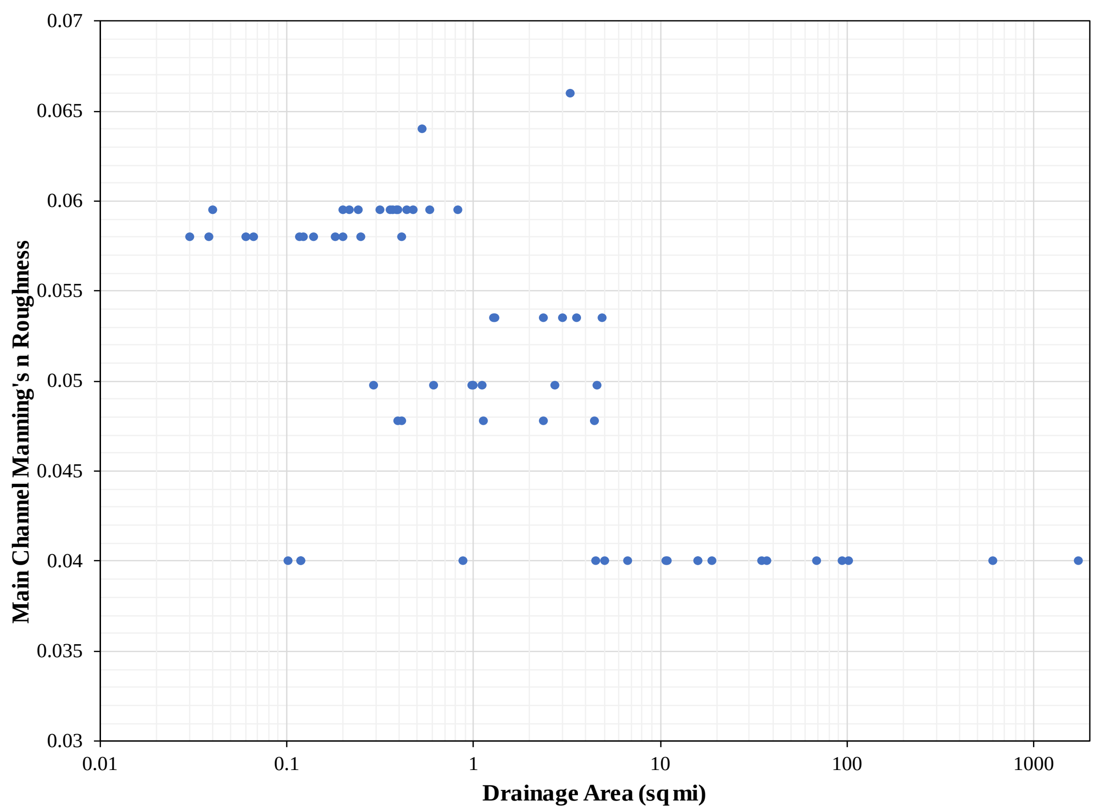


Figure 3-9. Plot of Main Channel Manning's Roughness vs Drainage Area

4. PHASE 1 DESKTOP STUDY

Section 4 summarizes the Phase 1 desktop study, which involves the use of data and parameters that are not based on site-specific data.

4.1 Phase 1 Horizontal Setback Analysis

4.1.1 Background

Geosyntec conducted an HSA to characterize the horizontal limits for lateral channel migration and channel avulsion with potential to affect the pipeline alignment over the anticipated design life of the project (assumed to be at least 30 years). The fluvial processes associated with avulsion can be unpredictable stemming from the channel seeking a topographic advantage (steeper gradient) during flood stage or due to random events such as debris accumulations, debris jamming, or sediment infilling of the main channel. Other fluvial processes, such as channel bend or meander development (response due to historical straightening of many of the streams), lateral bank migration, down-valley meander migration, and meander belt extension are all associated with measured rates of erosion derived from observed changes from aerial image records. It is with these processes in mind that the HSA described below was performed.

4.1.2 Basis of Design

As part of the HSA, Geosyntec evaluated the lateral setback from the subject stream crossings generally following the principals and concepts identified in (1) Chapter 6 of HEC-20 (Federal Highway Administration [FHWA] 2012) for plan view analysis and (2) the State of Washington Department of Ecology's *A Methodology for Delineating Planning-Level Channel Migration Zones* (Olson et al., 2014). Field reconnaissance observations were not available for this Phase 1 desktop analysis. A Phase 2 reconnaissance-level field study could provide a basis for different horizontal setbacks than those presented herein.

The guiding objective for the HSAs is to provide the location and length of pipeline segments at waterbody crossings whose burial depth, defined as the depth from the channel thalweg to top of pipeline, should be consistent with that recommended by the vertical scour assessment described in Section 4.2. The elevation of the pipeline for the extent of the pipeline segment identified should be constant between horizontal setbacks.

4.1.3 Implementation of HSA

For the analysis of fluvial landforms and past and ongoing channel migration, Geosyntec relied on LiDAR-based topographic data (hillshade DEM and 2-ft contours were available) collected by MVP on an approximately 1,070-ft wide path along the project alignment as well as historical aerial imagery sourced from the USGS EarthExplorer database[5] (1946–1986) and supplemented with contemporary historical imagery available in Google Earth Pro (1990–2018). For crossings where vegetation restricted observation of the stream channel in aerial imagery, only LiDAR-based topographic data was used for the HSA.

[5] https://earthexplorer.usgs.gov/

Setback distances for each channel were described as distances from top of, or bottom of, channel bank, measured perpendicular from the channel bank and not along the pipeline alignment. If the channel was geomorphically connected to its floodplain the top of bank position was used for the setback measurement, however if the channel was disconnected (e.g., channel entrenched) from its floodplain the bottom of bank was used for the setback measurement.

When the setback was based on geomorphic features observed on the DEM and aerial imagery, those features were used to define the set-back limits. The following terms were used to describe geomorphic setback locations: ordinary high-water mark (OHWM) line (*F_Stream_Line* GIS file provided by TRC, a consultant to MVP Southgate), active channel belt width, terrace, adjacent floodplain channel, and valley wall (slope transition point between hillslope and valley floor, channel, or floodplain). Valley wall to valley wall burial was typically applied to crossings located in confined valleys (i.e., valley width less than two to three times the stream width). For stream crossings where historic channel migration was observed in aerial imagery, channel bank migration rates (distance of channel bank migration per year) were evaluated to define horizontal setbacks that provide near-term and long-term protection.

The results of the Phase 1 desktop study HSA may require field modification to suit the unique geomorphic and hydraulic attributes of a stream crossing and the field conditions encountered in the temporary and permanent workspace. The proposed recommendations can be updated through acquisition of additional field data to reduce uncertainty during Phase 2 reconnaissance-level field study and then a Phase 3 detailed characterization (i.e., for geomorphically complex crossings) if warranted.

4.1.4 Presentation of Results

The HSA was performed on 63 stream crossings and 1 river floodplain encroachment (Haw River) where the pipeline alignment is parallel within the river’s bank.

As described schematically in Figure 4-1 the burial depth requirements at most of the streams that Geosyntec analyzed are defined by the coordinates (latitude and longitude) of the two sagbend points (Sback_1 and Sback_2) and the burial depth (z_1_2). The coordinates of the sagbends and burial depth are provided in Appendix A in tabular format. Additionally, the PDF version of this report has an MS Excel (.xlsx) file and a Google Earth file (.kmz) attached to the report that can be accessed by clicking on the paper clip on the left margin that appears on Adobe Acrobat.

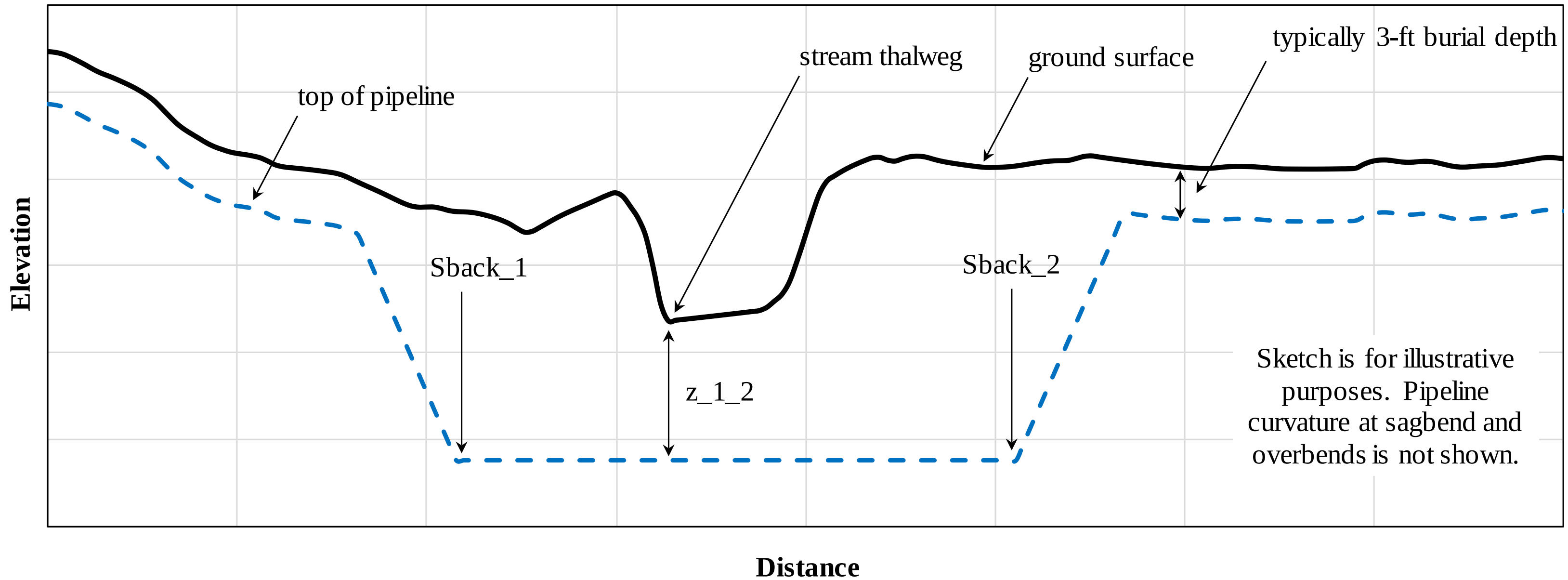


Figure 4-1. Sketch of Pipeline Setback Showing Lateral and Vertical Burial Design Parameters at Streams with One Set of Setbacks

4.2 Vertical Migration Analysis

Geosyntec's Phase 1 vertical migration analysis consisted of evaluating appropriate burial depths based on the depth of anticipated total (vertical) scour at the 63 pipeline stream crossings and 1 river floodplain encroachment (Haw River). Scour calculations required hydraulic analysis for each crossing. The methodology and results of the hydraulic, scour, and burial depth analyses are summarized in the following sections.

4.2.1 Hydraulic Analysis

Hydraulic analysis was performed using a Hydrologic Engineering Center River Analysis System (HEC-RAS) software program to calculate hydraulic parameters (e.g., flow depth, width, velocity, and effective shear stress) for the peak flows derived from the hydrologic analysis, per Section 3.1.3. The flow profiles modeled include peak discharges associated with empirical bankfull conditions and 2-, 5-, 10-, 25-, 50-, 100-, and 200-year return periods. The 64[6] one-dimensional (1-D) HEC-RAS models were populated with channel geometry parameters (i.e., longitudinal slope and cross section), described in Section 3.2, and Manning's roughness, described in Section 3.3.3. The HEC-RAS models are representative of normal flow depth calculations at each stream crossing and contain three cross sections. The middle cross section is representative of the stream crossing whereas the upstream and downstream cross sections have the same geometry as the middle, but with elevations adjusted to represent the longitudinal slope. Normal depth boundary conditions were assigned at both the upstream and downstream cross sections and were set to the longitudinal slope.

Once HEC-RAS models were developed and successfully run, Geosyntec made observation of the flow profile for each stream crossing that results in a flow stage most representative of the active channel conditions. Understanding the approximate return period associated with the active channel is indicative of the level of the channel's entrenchment. A higher return period means that the active channel is more entrenched and has less floodplain connectivity. The distribution of the 64 active channel return periods is shown on Figure 4-2.

[6] HEC-RAS analyses were conducted for the Haw River even though the pipeline does not cross the river

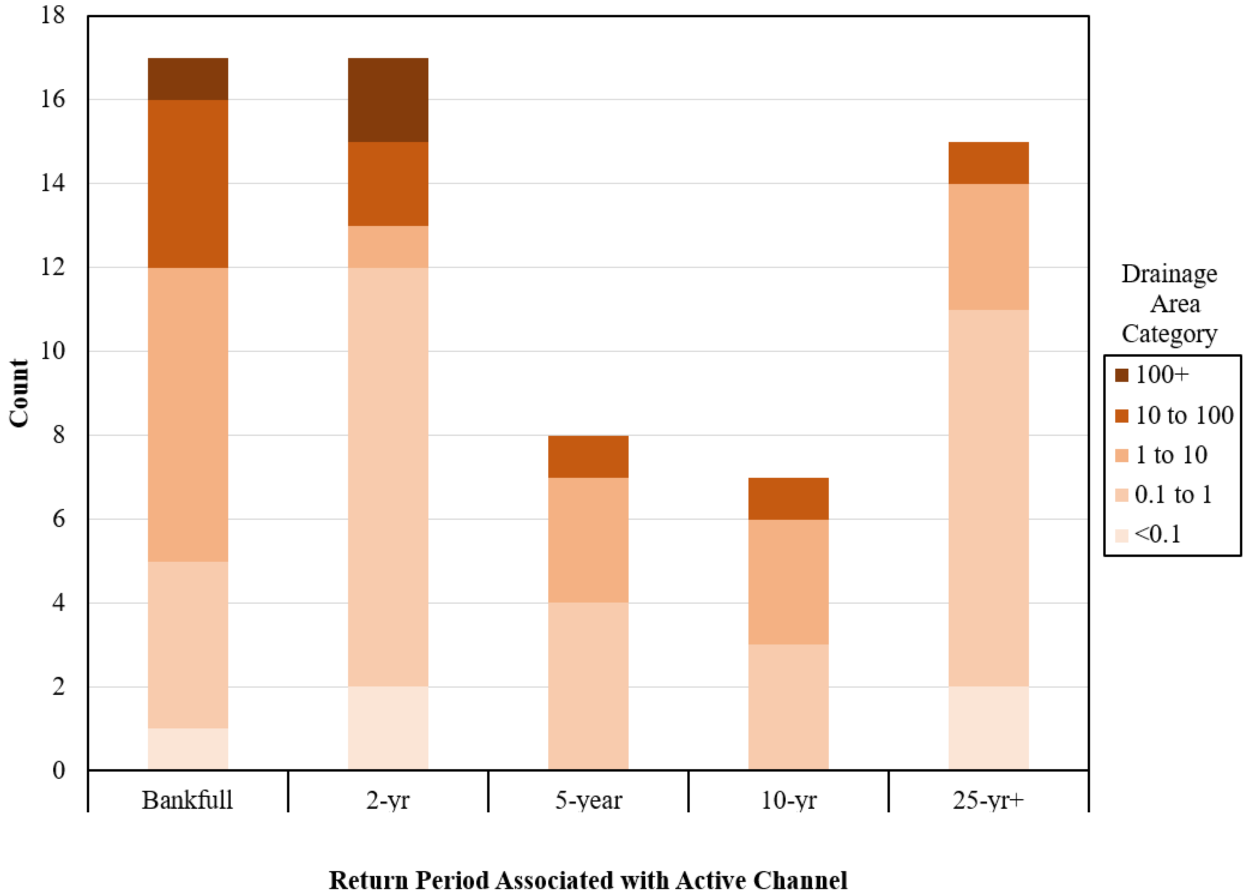


Figure 4-2. Histogram of Active Channel Return Period

4.2.2 Scour Analysis

Total scour (z_{ts}) is the total depth of scour at a given location. It is applied to the thalweg of the channel and is the sum of all scour components that are applicable for the given location. Scour components considered include the following, which are described in the subsequent sections:

- Long-Term Degradation (z_{lt})
- General Scour (z_{gs})
- Local Scour (z_{ls})
- Bend Scour (z_{bs})
- Bed Form Scour (z_{bf})

4.2.2.1 Long-Term Degradation (z_{lt})

Long-Term degradation (z_{lt}) is the progressive lowering of the channel bed due to scour. This permanent or continuing degradation is an indicator that a change in the stream's discharge and sediment load characteristics is taking place. Degradation of the stream bed occurs due to downstream bed elevation changes or excess sediment-transporting capacity relative to the size of bed-material (e.g., resistance to movement) and quantity of bed-material sediment delivered from upstream reaches. Degradation continues until the existing longitudinal slope of the channel decreases to an equilibrium (stable) slope or until an armor layer that mitigates long term degradation develops on the stream bed. Typically, long-term degradation scour is calculated by multiplying the channel distance to the nearest downstream grade control point (e.g., exposed bedrock or manmade drop structure) by the difference in the existing and equilibrium longitudinal slopes. This estimation requires understanding the distance to a grade level control, a process that requires individual assessment at each stream. For this Phase 1 desktop study such data is not readily available. Instead, Geosyntec estimated degradation associated with both observed natural geomorphic processes and urbanization (or hydromodification). Long-term degradation was considered the sum of the two. Calculated long-term degradation ranges between 1.0 and 2.4 ft.

Natural Degradation

In lieu of site-specific data for grade controls, Geosyntec estimated natural degradation by applying observed head cut and knickpoint heights from previous field reconnaissance in the region. These estimates assume that anthropogenic changes to the conditions of the drainage basin upstream and downstream of the crossing, such as installation of dams and changes to the imperviousness of the ground, will be minor. Armoring was not considered. As part of previous field reconnaissance efforts, Geosyntec identified head cuts in various streams in the region with heights ranging from 0.5 to 2 ft. Thus, without knowing more specific information about a given stream crossing, the rules-of-thumb, provided in Table 4-1 were implemented to estimate potential natural degradation.

Table 4-1. Estimated Natural Degradation Depths

Drainage Area (square miles)	Degradation (ft)
< 1	2
1 to 4	1.5
> 4	1

Degradation Caused by Urbanization

Degradation caused by urbanization in the tributary drainage area, also termed hydromodification, was calculated by evaluating the difference between the potential channel enlargement associated with watershed imperviousness, as shown by the trend line in Figure 4-3 (Center for Watershed Protection 2000), and the observed channel enlargement in the vertical direction. The equations used are as follows.

$$z_{hm} = Y_{bf} \cdot (A_{rp} - A_{ro})$$

$$A_{rp} = 0.0012 \cdot Imp^2 + 0.0233 \cdot Imp + 1.005$$

$$A_{ro} = Y_{ac}/Y_{bf}$$

Where:

z_{hm}	=	Degradation associated with urbanization (ft)
Y_{bf}	=	Empirical bankfull depth (ft)
A_{rp}	=	Potential channel enlargement ratio (urban/non-urban) (unitless)
A_{ro}	=	Observed channel enlargement ratio (urban/non-urban) (unitless)
Imp	=	Imperviousness (%)
Y_{ac}	=	Active channel depth (ft)

If the potential channel enlargement (A_{rp}) is less than that observed (A_{ro}), then the long-term degradation associated with urbanization was estimated as zero.

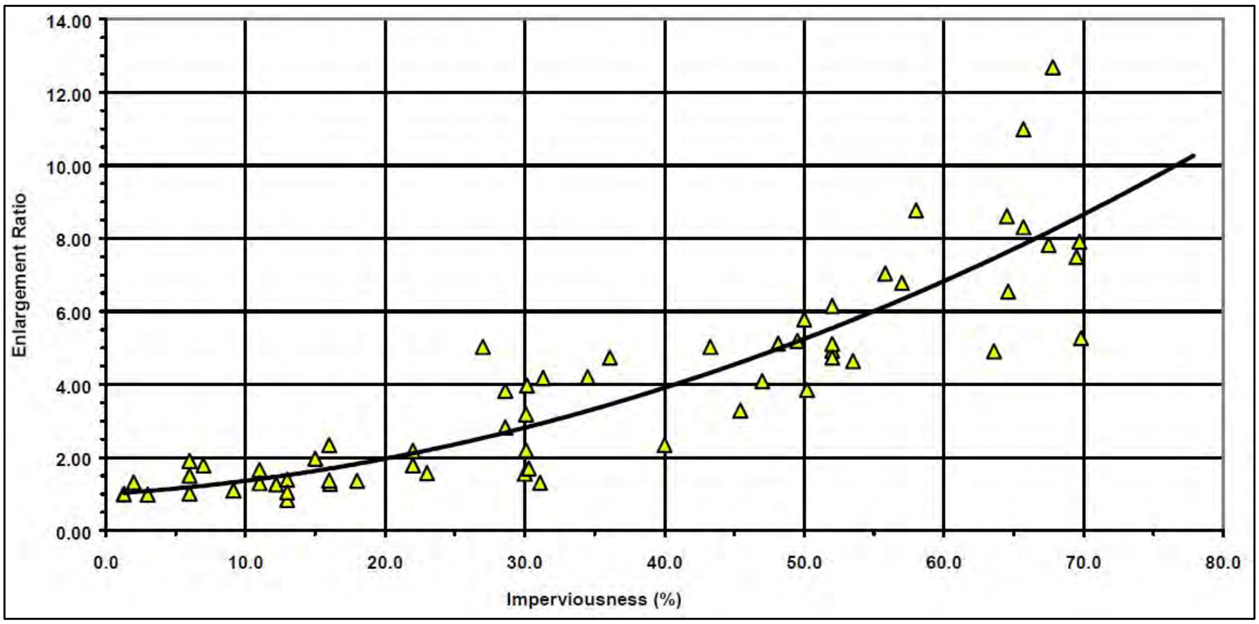


Figure 4-3. Channel Enlargement as a Function of Impervious Cover in Alluvial Streams in Maryland, Vermont, and Texas (MacRae and DeAndrea 1999, Brown and Claytor 2000)

4.2.2.2 General Scour (z_{gs})

General scour is the lowering of the stream bed across the channel over relatively short time periods and is associated with the passing of a single flood. The Lacey Regime Equation (ASCE 2005) was used to calculate general scour for this study, which is expressed as:

$$z_{gs} = Z \cdot 0.47 \cdot (Q/f)^{1/3}$$

Where:

Z = multiplying factor (unitless), here assumed as 0.25 for a straight reach

Q = design discharge (cfs), here assumed as the 100-year peak flow

f = Lacey's silt factor = 1.76 $(D_m)^{1/2}$

D_m = mean grain size of bed material (millimeter [mm]), here assumed as 1 mm

Calculated general scour ranges between 0.4 and 3.9 ft.

4.2.2.3 Local Scour (z_{ls})

Local scour is the scour that results from an obstruction and abrupt change in the direction of flow. It is caused by an acceleration of flow and resulting vortices induced by the obstruction. Two components of local scour were considered in this analysis, as described in the sections below. One component is for large woody debris (LWD), which was applied for every stream crossing. The other for confluences, which only applies to those stream crossings located in vicinity of where two stream channels combine into one. Local scour was considered the sum of these two components. Calculated local scour ranges between 1.0 and 8.9 ft.

Large Woody Debris (z_{lwd})

Large woody debris was considered as part of this analysis due to the prevalence of forested land cover throughout the MVP Southgate pipeline alignment and in vicinity to the stream crossings. Geosyntec's previous experience indicates that LWD is prevalent in this region. An equation for pier scour, based on Hydrologic Engineering Circular No. 18 (FHWA 2012), was used as a basis for estimating scour associated with in-stream LWD. This equation is as follows:

$$z_{lwd} = 2.0 \cdot K_1 \cdot K_2 \cdot K_3 \cdot K_4 \cdot a^{0.65} \cdot y_1^{0.35} \cdot F_r^{0.43}$$

Where:

z_{lwd} = local scour associated with LWD (ft)

K_1 = correction factor for pier nose shape (unitless), here assumed as 1.1

K_2 = correction factor for angle of attack of flow (unitless), here assumed as 1.0

K_3 = correction factor for bed condition (unitless), here assumed as 1.0

K_4 = correction factor for armoring of med material, here assumed as 1.0

a = pier width (ft), here assumed as 1 ft

y_1 = flow depth directly upstream of the pier (ft), here assumed as the channel hydraulic depth associated with the empirical bankfull flow

F_r = Froude Number directly upstream of pier (unitless)

Confluence Scour (z_{con})
Confluence scour was calculated using the following equation (Sutherland 1986):

$$z_{con} = 0.642 \cdot Q_T^{0.395}$$

Where:

z_{con} = local scour associated with steam confluence (ft)

Q_t = total discharge through confluence (cfs)

4.2.2.4 Bend Scour (z_{bs})
Bend scour is associated with meandering channels that can induce transverse or secondary currents. It is the scour associated with the outside of a bend. Bend scour was calculated as follows (Maynord 1996):

$$z_{bs} = Z \cdot (y_{mxb} - y_u)$$

$$y_{mxb} = y_u \cdot \left[1.8 - 0.051 \cdot \left({}^{r_c}\!/_{W_u}\right) + 0.0084 \cdot \left({}^{W_c}\!/_{y_u}\right)\right]$$

Where:

z_{bs} = bend scour depth (ft)

y_{mxb} = maximum water depth in bend (ft)

y_u = average water depth in crossing upstream of bend (ft), here assumed as the hydraulic depth in the main channel for the empirical bankfull peak flow

Z = safety factor (unitless), here assumed as 1.08

r_c = radius of curvature of bend (ft)

W_u = water surface width at upstream end of bend (ft), here assumed as the active channel width

If r_c/W_u < 1.5, then r_c/W_u = 1.5 was assumed.

If W_u/y_u < 20, then W_u/y_u = 20 was assumed.

Calculated bend scour ranges between 0.1 and 7.7 ft.

4.2.2.5 Bedform Scour (z_{bf})

Sand bedded streams develop ripples, dunes, and antidunes at specific levels of shear stress. Dunes and antidunes in sand beds can result in additional scour, since they migrate by a systematic process of erosion and deposition[7], controlled by flow velocities (USDA 2007). The scour produced by the passage of a dune is described as bedform scour and, according to Van Rijn (1984) develops when D_* > 10 and 3 < T_{ts} < 15.

$$D_* = D_{50} \cdot \left(\frac{1.65g}{\nu^2}\right)^{\frac{1}{3}}$$

$$T_{ts} = \frac{\tau_s^* - \tau_c^*}{\tau_c^*}$$

Where:

$$\tau_s^* = \frac{\rho g u^2}{\left[18 log\left(\frac{12R}{3D_{90}}\right)\right]^2}$$

D_*	=	dimensionless sediment size
D_{50}	=	median grain size (ft)
g	=	acceleration of gravity (32.2 feet per square second [ft/s^2])
υ	=	kinematic viscosity of water (1·10^{-5} square feet per second [ft^2/s])
T_{ts}	=	dimensionless transport-stage parameter
D_{90}	=	size larger than 90% of the bed material by weight (ft)
R	=	hydraulic radius (ft)
u	=	mean flow velocity (ft/s)

$$\tau_c^* = 103 \cdot \theta \cdot D_{50}$$

θ = dimensionless Shields stress ranging from 0.02 to 0.10 for sands and larger sediments

$$\theta = \frac{0.24}{D_*} + 0.055 \cdot [1 - exp(-0.02 \cdot D_*)]$$

The dune height may be computed by:

$$\Delta = 0.11 \cdot D_{50}^{0.3} \cdot y^{0.7} \cdot \left(1 - exp(-0.5T_{ts})\right)(25 - T_{ts})$$

$$z_{bf} = \frac{\Delta}{2}$$

[7] Ripples are considered too small to be significant concern for scour evaluation purposes.

Estimates of bed form scour herein used the hydraulic output associated with the empirical bankfull peak flow. Three iterations of D_{50} and D_{90} were calculated, with the greatest resulting depth assumed as the bed form scour. The three iterations are as follows:

- Small: D_{50} = 0.5 mm, D_{90} = 0.75 mm
- Medium: D_{50} = 1.0 mm, D_{90} = 1.5 mm
- Large: D_{50} = 2.0 mm, D_{90} = 3 mm

Calculated bedform scour ranges between 0.0 and 2.0 ft.

4.2.2.6 Total Scour (z_{ts})

Geosyntec calculated total scour for two design scenarios:

- Scenario A: for depth below which exposure is anticipated to be unlikely; and
- Scenario B: for depth below which exposure is anticipated to be limited and acceptable assuming that MVP will implement a monitoring and maintenance program.

The total scour depth for Scenario A adds all components of scour described herein. The total scour depth for Scenario B adds all components except for the local scour associated with large woody debris (z_{lwd}). The distribution of total scour depth results relative to drainage area is provided in Figure 4-4. There is a positive relationship between total scour depth and drainage area. Histograms of calculated total scour depth, with a breakdown by component, are provided for Scenarios A and B in Figure 4-5 and Figure 4-6, respectively. Calculated total scour ranges between 4.1 and 17.9 ft for Scenario A and between 3.0 and 14.6 ft for Scenario B.

Consistent with the recommendation by Baird et al., (2015), Geosyntec did not apply an additional factor of safety to the calculated scour depth as we consider that additional conservatism is not warranted.

These estimates of scour depth are based on the information available at the time of this Phase 1 desktop study. Geosyntec recommends improving the accuracy of these estimates through the implementation of a Phase 2 reconnaissance-level field study and Phase 3 detailed characterization, where warranted.

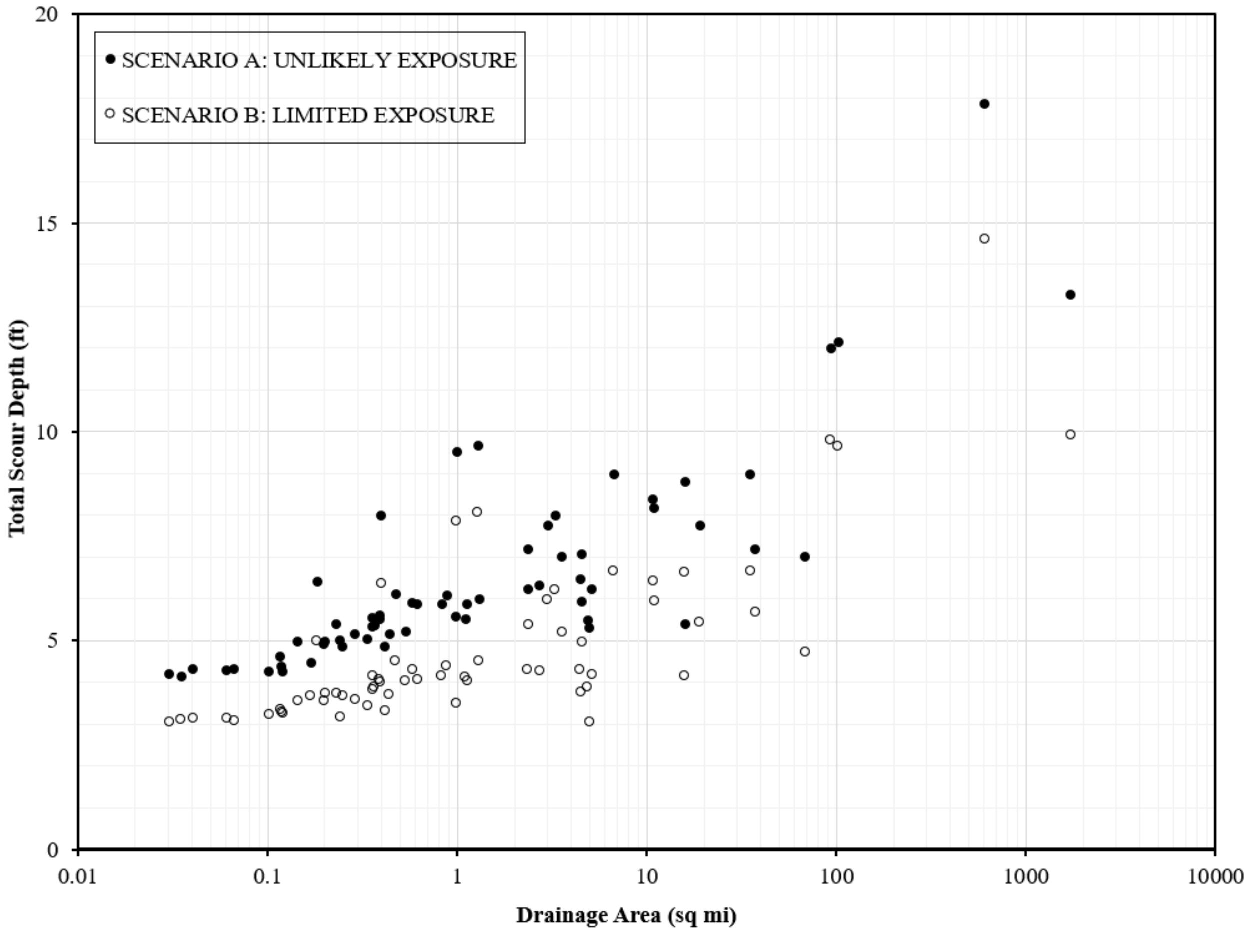


Figure 4-4. Plot of Calculated Total Scour Depth vs. Drainage Area

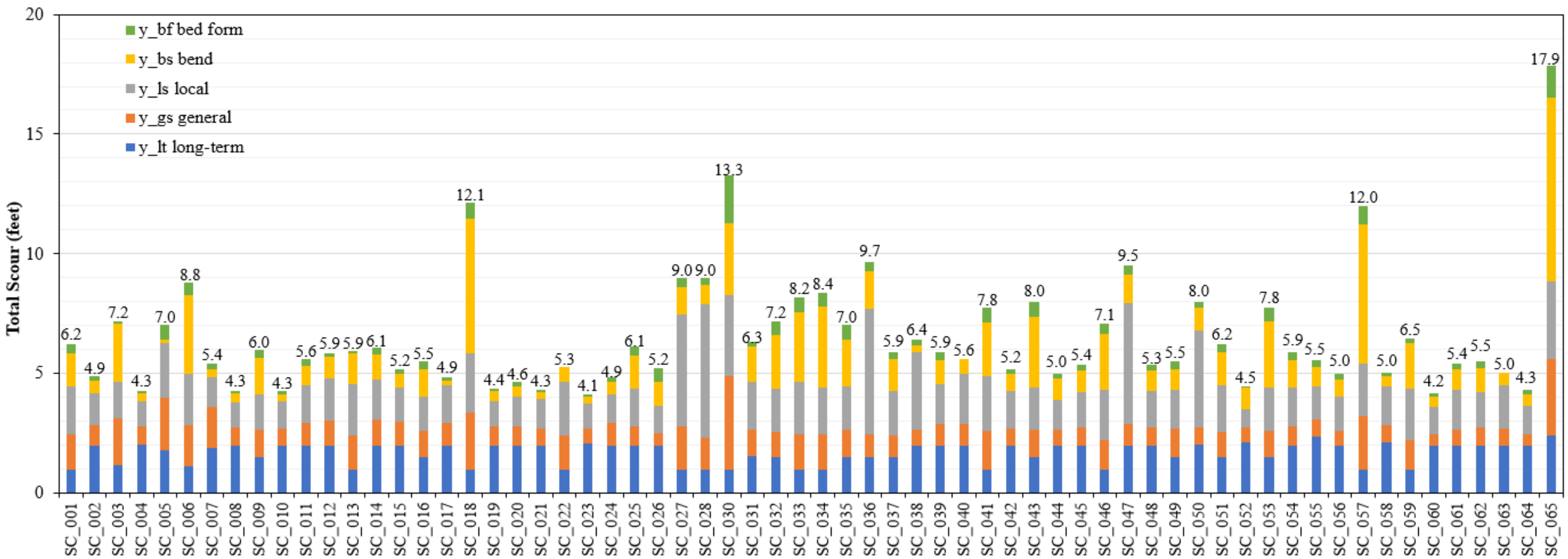


Figure 4-5. Total Scour Depth Results with Component Breakdown for Design Scenario A (Pipeline Exposure Unlikely)

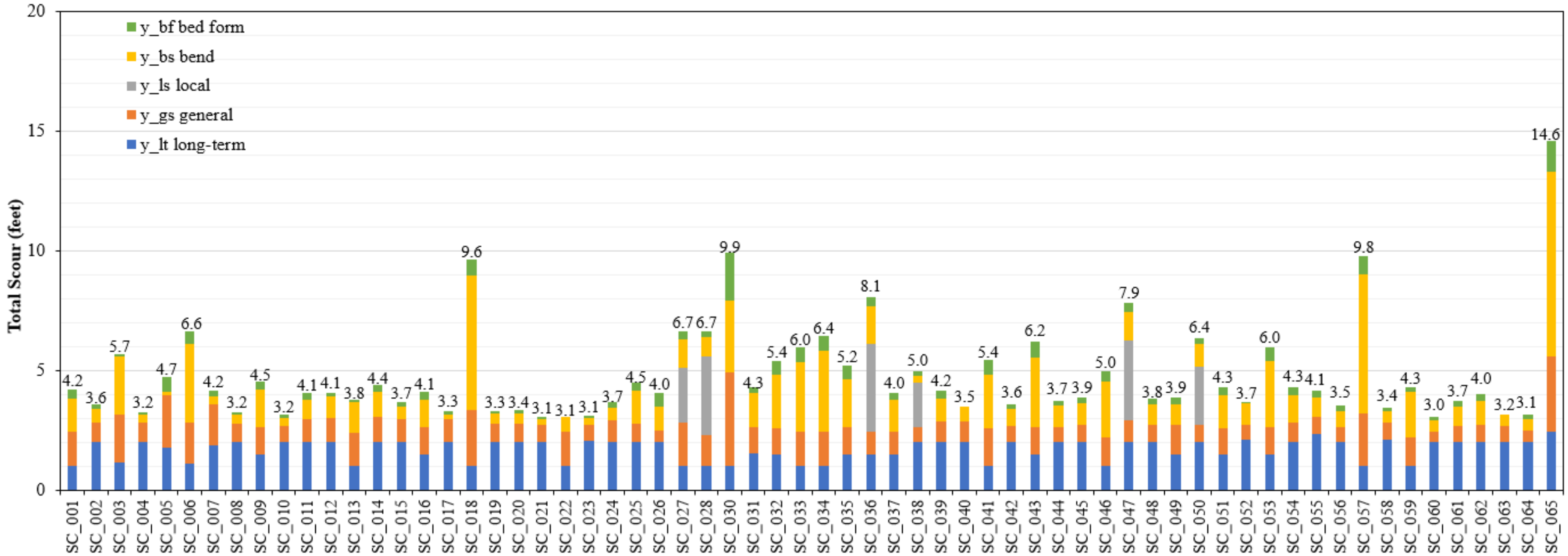


Figure 4-6. Total Scour Depth Results with Component Breakdown for Design Scenario B (Pipeline Exposure Limited)

4.2.3 Burial Depth Recommendations

Geosyntec recommends that the burial depth of the pipeline at stream crossings be rounded up from the total scour estimates to the next half foot increment, with a minimum burial depth of 5 ft. For stream crossings which have consolidated rock shallower than 3 ft, the minimum recommended burial depth at stream crossings is 2 ft into consolidated rock. Appendix A provides burial depth recommendations for the 63 stream crossings (the pipeline does not cross the Haw River). These recommendations are based on the Phase 1 desktop study described herein, and a Phase 2 reconnaissance-level field study (see Section 5), which was used to revise the results for four crossings based on site-specific observations.

Burial depth recommendations for 59 crossings are based on the information available at the time of this Phase 1 desktop study (completed in March 2019 and revised for 13 crossings in October 2019 based on shifts in the 20 September 2019 pipeline alignment), which involves the use of data and parameters that are not based on site-specific data and therefore carry a significant amount of uncertainty. For proposed burial depths that are greater than 5-ft and/or with long burial lengths, Geosyntec recommends refining these burial depths and setbacks through the implementation of a Phase 2 reconnaissance-level field study in which site-specific data can be collected to reduce conservatism.

5. PHASE 2 RECONNAISSANCE-LEVEL FIELD STUDY

Geosyntec completed a Phase 2 reconnaissance-level field survey for four stream/tributary crossings to refine and reduce uncertainty of the Phase 1 burial depth and setback recommendations. During the reconnaissance-level field survey, Geosyntec conducted geologic and geomorphic observations of the stream and floodplain characteristics at each crossing that could impact the vertical and horizontal stability of the stream and influence premature exposure of the pipeline. The crossings included SC_006, SC_036, SC_047, and SC_050. The horizontal setback analysis and vertical migration analysis is summarized in the sections below. Detailed field observations are provided in Appendix B.

5.1 Horizontal Setback Analysis

Geosyntec's Phase 2 horizontal migration analysis consisted of evaluating appropriate lateral setbacks based on the anticipated channel migration at the four pipeline stream crossings visited in the field in August 2019. Horizontal setbacks from the Phase 1 analysis were evaluated and updated, where appropriate, based on site-specific observations made at each crossing location visited.

At SC_006, Geosyntec did not observe evidence of historical secondary flow paths within the floodplain along the left and right bank. Geosyntec did not observe any indicator of lateral migration of the left bank, therefore, the recommended Phase 1 left bank horizontal setback of 15 ft from top of bank was not updated. Geosyntec observed no evidence of lateral migration or potential migration of the upstream meander bend, however, Geosyntec did observe evidence of potential lateral migration of the right bank at the crossing. As such, Geosyntec updated the recommended right bank horizontal setback to 45 ft from the top of right bank, to account for the potential migration of the right bank.

At SC_036, SC_047, and SC_050, Geosyntec did not observe horizontal instability at these crossings, however, each crossing did contain a tributary within 30 ft of the crossing. The setbacks for each of three crossings was adjusted to capture the presence of the associated tributary. Table 5-1 provides the setback recommendations for these three crossings.

A summary of the Phase 2 horizontal setback recommendations is provided in Table 5-1 below and detailed observations are provided in Appendix B.

Table 5-1. Phase 2 Horizontal Setback Recommendations

GEO ID	Left Bank Setback	Right Bank Setback
SC_006	15 ft from TOB	45 ft from TOB
SC_036	15 ft from TOB	15 ft from TOB of adjacent tributary
SC_047	15 ft from TOB of adjacent tributary	15 ft from TOB
SC_050	15 ft from TOB of adjacent tributary	15 ft from TOB

5.2 Vertical Migration Analysis

Geosyntec's Phase 2 vertical migration analysis consisted of evaluating appropriate burial depths based on the depth of estimated total (vertical) scour at the four pipeline stream crossings visited in the field in August 2019. Scour calculations were revised from the Phase 1 calculations based on site-specific observations made at each crossing location visited.

5.2.1 Field Observations

At SC_036, Geosyntec observed bedrock at the stream bed surface. The presence of bedrock at the surface of the stream provides vertical stability for the stream; thus, the recommended burial depth at SC_036 is the minimum of 2 ft burial into consolidated rock (measured from stream bed to the top of the pipe). Key field observations, which affect scour calculations for the three other crossings visited in the field, are provided in Table 5-2 below. A summary of how these field observations influence the calculation of different components of scour is provided in the following section.

Table 5-2. Phase 2 Key Field Observations Related to Vertical Scour

Stream Crossing ID	SC_006	SC_047	SC_050
Bankfull width (ft)	25.5	16.5	10.6
Bankfull depth (ft)	2.47	1.34	1.21
D_{50} (mm)	Sand	35	25
Local Scour (ft)	1.15 (woody debris)	0.5 (woody debris)	1.19 (confluence)
Bend Scour (ft)	0.7 to 1.0	0.5 to 1.0	1.24

5.2.2 Scour Analysis

Total scour (z_{ts}) is the total depth of scour at a given location. It is applied to the thalweg of the channel and is the sum of all scour components that are applicable for the given location. Scour components considered include the following, which are described in the subsequent sections:

- Long-Term Degradation (z_{lt})
- General Scour (z_{gs})
- Local Scour (z_{ls})
- Bend Scour (z_{bs})
- Bed Form Scour (z_{bf})

5.2.2.1 Long-Term Degradation (z_{lt})

Long-term degradation estimates were adjusted slightly for degradation caused by urbanization by updating the active channel depth (Y_{ac}) based on observations of bankfull depth from the Phase 2 field reconnaissance.

5.2.2.2 General Scour (z_{gs})

General scour was adjusted based on observed grain size of the bed material, as measured using Wolman pebble counts. This resulted in a reduction in general scour for SC_047 and SC_050, which had gravel bed material instead of the previously assumed sand bed.

5.2.2.3 Local Scour (z_{ls})

Local scour was adjusted based on scour depths observed in the field associated with confluences and large woody debris. SC_047 and SC_050 are situated at or in the vicinity of confluences, but SC_006 is not. Observed confluence scour was approximately half of that calculated for SC_050. The estimated confluence scour component for SC_047 was assumed to be half of that calculated. For Scenario B estimates, 0.5-feet of confluence scour was added for conservatism. For Scenario A, the local scour was assumed to be 50-percent greater than the Scenario B estimates.

5.2.2.4 Bend Scour (z_{bs})

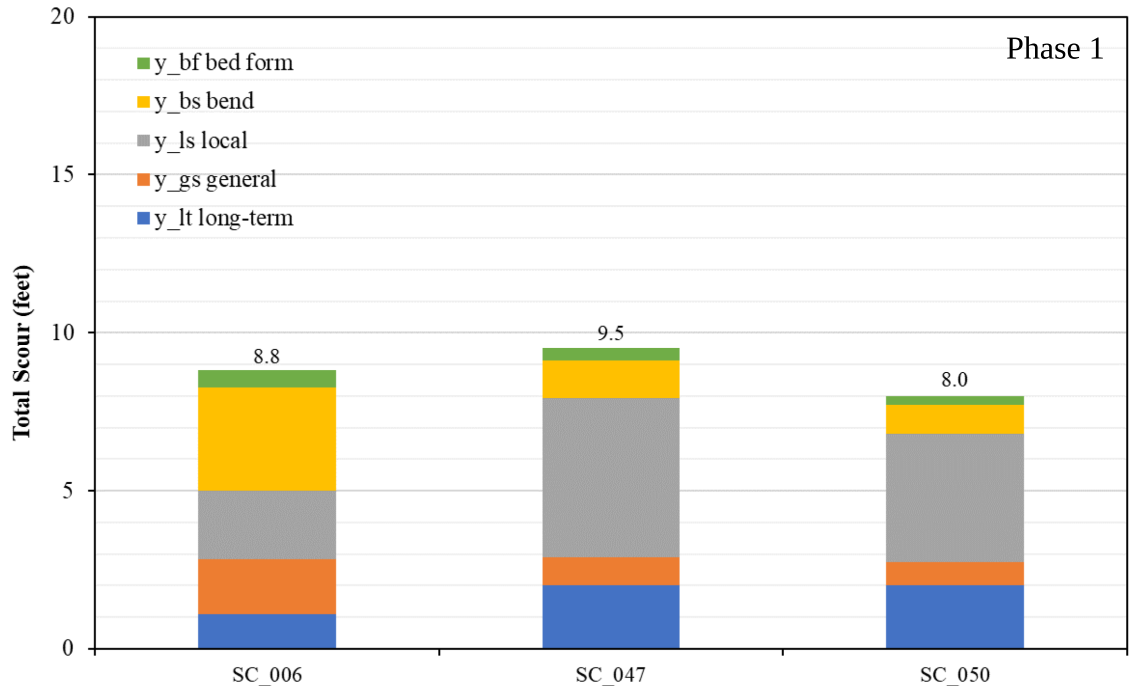
Bend scour was adjusted based on scour depths observed in the field at bends. Scenario B used the upper bound of bed scour depths observed in the field. For Scenario A, the bend scour was assumed to be 50-percent greater than the Scenario B estimates.

5.2.2.5 Bedform Scour (z_{bf})

Bedform scour was adjusted by removing this scour component for SC_047 and SC_050, which exhibit gravel bed material instead of sand.

5.2.2.6 Total Scour (z_{ts})

Comparisons of calculated total scour depth, from Phase 1 to Phase 2, with a breakdown by component, are provided for Scenarios A and B in Figure 5-1 and Figure 5-2, respectively. For all four crossings evaluated, the Phase 2 results are lower than the Phase 1 results.



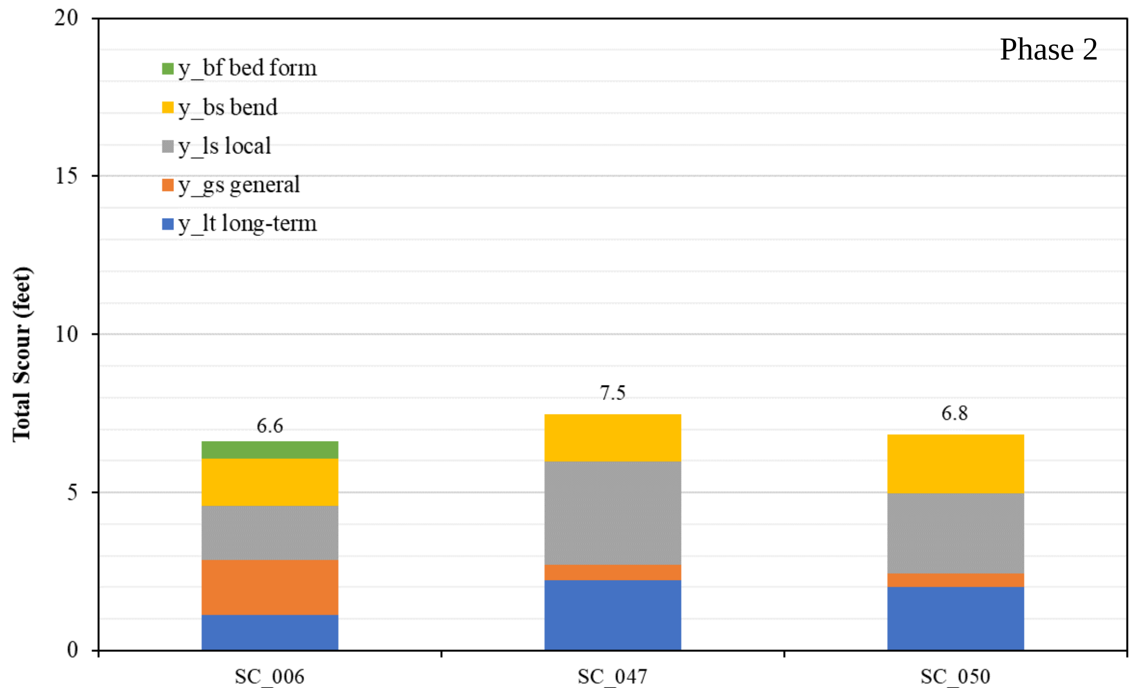


Figure 5-1. Comparison of Total Scour Depth Results for Phase 1 and Phase 2 Studies with Component Breakdown for Design Scenario A (Pipeline Exposure Unlikely)

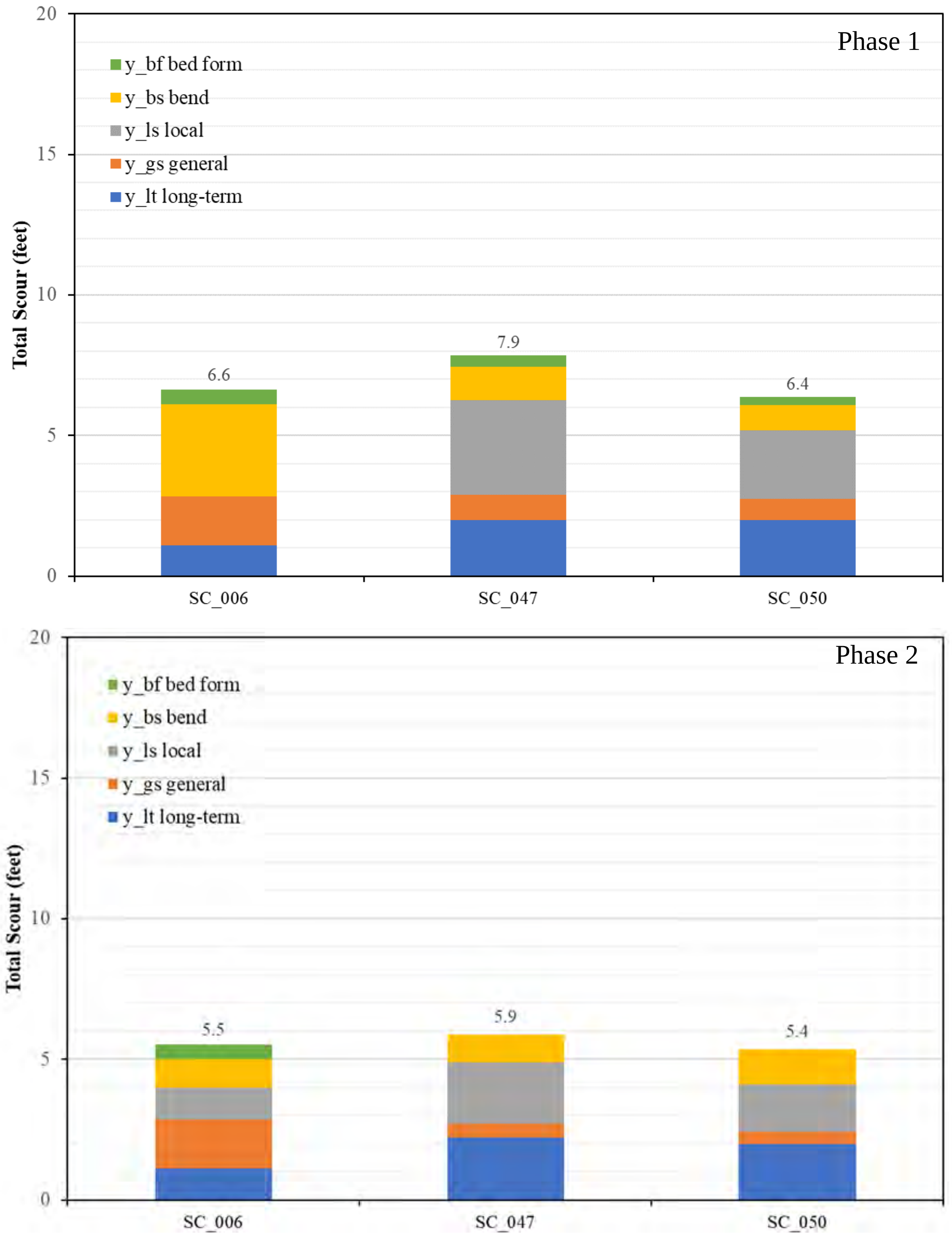


Figure 5-2. Comparison of Total Scour Depth Results for Phase 1 and Phase 2 Studies with Component Breakdown for Design Scenario B (Pipeline Exposure Limited)

5.3 Burial Depth Recommendations

Recommended changes in burial depth at stream crossings based on the Phase 2 Reconnaissance-Level Field Study are provided in Table 5-3. These recommended Phase 2 changes reduce the level of conservatism for design from the Phase 1 recommendations.

Table 5-3. Recommended Changes in Burial Depth (feet) at Stream Crossing Based on Phase 2 Study

Crossing ID	Phase 1 Desktop Study		Phase 2 Field Study	
	Scenario A	Scenario B	Scenario A	Scenario B
SC_006	9.0	7.0	7.0	6.0
SC_036	10.0	8.5	5.0	2-ft below consolidated rock
SC_047	10.0	8.0	7.5	6.0
SC_050	8.5	6.5	7.0	5.5

Note: Scenario A = Pipeline Exposure Unlikely, Scenario B = Pipeline Exposure Limited

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APPENDIX A

Results of Phase 1 Burial Setback and Depth Evaluations

Table A-1. Stream Crossing Physical Data

GEO ID	Approx MP	State	Facility, State, County, Waterbody ID	Waterbody Name	Flow Type	FERC Class	Physio Province	Lat	Long	DA (sq mi)	MVP Crossing Width (ft)	Active Channel Measured Width (ft)	Bankfull Measured Stream Width (ft)	Slope %	Rosgen Stream Type	Mannings n by Stream Type	Qbkf reg (ft^3/s)
SC_001	0.4	VA	S-F18-65	Little Cherrystone Creek	Perennial	Intermediate	Piedmont	36.822919	-79.347523	5.11	21	30	17	0.35	G5	0.040	205.97
SC_002	0.6	VA	S-F18-63	Trib. To Sandy Creek	Intermittent	Intermediate	Piedmont	36.821158	-79.349313	0.20	14	16	9.8	1.82	B4	0.058	9.48
SC_003	1.7	VA	S-D18-18	Cherrystone Creek	Perennial	Intermediate	Piedmont	36.808417	-79.363081	37.22	30	40	27	0.18	E5	0.040	1349.83
SC_004	3.6	VA	S-D18-6	Trib. To Banister River	Intermittent	Minor	Piedmont	36.787964	-79.384411	0.12	10	12	6	0.60	C4	0.040	5.88
SC_005	4.9	VA	S-E18-3	Banister River	Perennial	Intermediate	Piedmont	36.77416	-79.399247	68.55	48	52	42	0.15	E5	0.040	2407.04
SC_006	5.0	VA	S-D18-2	White Oak Creek	Perennial	Intermediate	Piedmont	36.773118	-79.39965	15.86	33	34	25	0.17	E5	0.040	601.78
SC_007	5.1	VA	S-D18-2	White Oak Creek	Perennial	Intermediate	Piedmont	36.771793	-79.400507	15.85	23	26	24	0.13	E5	0.040	601.22
SC_008	9.0	VA	WB-E18-24	Trib. To White Oak Creek	Intermittent	Intermediate	Piedmont	36.729068	-79.445716	0.10	23	24	5	1.28	N/A	0.040	5.04
SC_009	9.9	VA	S-F18-17	White Oak Creek	Perennial	Intermediate	Piedmont	36.720504	-79.455094	1.30	14	18	14	0.26	E5	0.054	56.29
SC_010	11.0	VA	S-F18-20	Trib. To Sandy Creek	Perennial	Intermediate	Piedmont	36.707789	-79.466951	0.06	40	10	4	2.67	B4	0.058	3.09
SC_011	11.4	VA	S-F18-20	Trib. To Sandy Creek	Perennial	Intermediate	Piedmont	36.703915	-79.470512	0.39	12	14	6	1.57	G4	0.060	17.92
SC_012	11.9	VA	S-C18-86	Trib. To Sandy Creek	Perennial	Intermediate	Piedmont	36.698522	-79.476505	0.61	23	26	11	2.02	F4	0.050	27.66
SC_013	12.8	VA	S-D18-21	Sandy Creek	Perennial	Intermediate	Piedmont	36.688824	-79.486175	4.52	15	32	22	1.11	C4	0.040	183.25
SC_014	13.4	VA	S-E18-27	Trib. To Sandy Creek	Perennial	Intermediate	Piedmont	36.680549	-79.490173	0.88	16	16	13	0.61	C4	0.040	38.78
SC_015	14.3	VA	*AS-D18-22 / S-D18-22	Trib. To Sandy Creek	Perennial	Intermediate	Piedmont	36.673422	-79.501674	0.44	12	20	7.5	2.00	G4	0.060	20.02
SC_016	15.7	VA	S-D18-37	Trib. To Silver Creek	Perennial	Intermediate	Piedmont	36.657426	-79.517454	1.10	24	28	14	0.70	F4	0.050	48.20
SC_017	17.3	VA	S-E18-51	Trib. To Sandy River	Perennial	Intermediate	Piedmont	36.639742	-79.534247	0.41	12	14	10	3.05	B4	0.058	19.05
SC_018	17.7	VA	S-E18-44	Sandy River	Perennial	Intermediate	Piedmont	36.635673	-79.538081	102.49	N/A	130	75	0.14	E5	0.040	3523.24
SC_019	20.4	VA	S-E18-52	Trib. To Trayner Branch	Perennial	Intermediate	Piedmont	36.605934	-79.568136	0.12	14	28	5	2.11	C4	0.040	5.80
SC_020	20.6	VA	S-E18-52 TA-PI-052	Trib. To Trayner Branch	Perennial	Minor	Piedmont	36.603271	-79.570415	0.12	10	14	5	1.68	B4	0.058	5.73
SC_021	22.0	VA	S-A18-205	Trib. To Trotters Creek	Intermittent	Intermediate	Piedmont	36.587507	-79.586181	0.07	19	10	6	4.26	B4	0.058	3.37
SC_022	23.2	VA	S-F18-40	Trotters Creek	Perennial	Intermediate	Piedmont	36.574705	-79.600113	4.96	N/A	28	25	1.32	F4	0.040	200.25
SC_023	23.2	VA	S-F18-42	Trib. To Trotters Creek	Ephemeral	Intermediate	Piedmont	36.575049	-79.599603	0.03	N/A	10	5	2.29	B4	0.058	1.82
SC_024	25.1	VA	S-C18-89	Trib. To Dan River	Perennial	Intermediate	Piedmont - Mesozoic	36.55254	-79.621776	0.25	19	22	7.5	1.65	B4	0.058	11.74
SC_025	25.7	NC	S-C18-90	Trib. To Dan River	Perennial	Intermediate	Piedmont	36.545977	-79.628327	0.47	11	18	10.5	0.72	G4	0.060	34.13
SC_026	27.3	NC	*AS-A18-42	Trib. To Cascade Creek	Intermittent	Intermediate	Piedmont	36.528016	-79.646193	0.53	15	44	12	0.33	F5	0.064	4.34
SC_027	27.4	NC	*AS-A18-40 - TA-RO-073A	Cascade Creek	Perennial	Minor	Piedmont	36.526042	-79.648098	35.03	37	68	55	0.24	F4	0.040	1577.10
SC_028	27.5	NC	*AS-NHD-4000	Dry Creek	Perennial	Intermediate	Piedmont	36.525931	-79.648214	6.71	36	36	32	0.46	F5	0.040	362.08
SC_029	27.5	NC	*AS-A18-40	Cascade Creek	Perennial	Intermediate	Piedmont				25						
SC_030	30.1	NC	S-A18-17	Dan River	Perennial	Major	Piedmont	36.497311	-79.676252	1722.42	247	260	235	0.05	C5	0.040	50517.60
SC_031	31.3	NC	S-B18-95	Rock Creek	Perennial	Intermediate	Piedmont	36.483381	-79.686691	2.72	28	38	28	1.08	F4	0.050	161.99
SC_032	32.2	NC	S-A18-147	Machine Creek	Perennial	Intermediate	Piedmont	36.47499	-79.697941	2.37	20	28	20	0.32	E5	0.054	143.26
SC_033	32.6	NC	S-A18-151	Town Creek	Perennial	Intermediate	Piedmont	36.469426	-79.702784	10.96	55	46	22	0.20	F5	0.040	560.74
SC_034	33.0	NC	S-A18-151-2	Town Creek	Perennial	Intermediate	Piedmont	36.465276	-79.703242	10.80	48	56	33	0.13	F5	0.040	553.53
SC_035	34.2	NC	S-C18-38	Trib. To Town Creek	Intermittent	Intermediate	Piedmont	36.449583	-79.69325	3.56	N/A	31	22	0.45	E5	0.054	206.27
SC_036	34.6	NC	S-C18-38-2	Trib. To Town Creek	Intermittent	Intermediate	Piedmont	36.444446	-79.688524	1.28	17	38	15	0.42	E5	0.054	82.93
SC_037	34.8	NC	S-C18-38-3	Trib. To Town Creek	Intermittent	Intermediate	Piedmont	36.442866	-79.686921	1.13	23	22	15	0.80	E4	0.048	74.36
SC_038	36.0	NC	S-C18-35	Trib. To Town Creek	Perennial	Minor	Piedmont	36.433263	-79.670865	0.18	10	18	10	1.46	B4	0.058	14.61
SC_039	37.7	NC	*AS-B18-117-2	Trib. To Wolf Island Creek	Perennial	Minor	Piedmont	36.416276	-79.650829	0.83	10	20	13	0.93	G4	0.060	56.12
SC_040	38.2	NC	S-A18-2	Trib. To Wolf Island Creek	Perennial	Intermediate	Piedmont	36.410639	-79.650784	0.98	20	22	15	3.45	F4	0.050	65.66
SC_041	38.7	NC	*AS-A18-8	Wolf Island Creek	Perennial	Intermediate	Piedmont	36.403929	-79.646805	19.03	42	42	40	0.28	F4	0.040	916.31
SC_042	40.2	NC	S-B18-108	Trib. To Lick Fork	Perennial	Intermediate	Piedmont	36.386968	-79.636394	0.29	27	22	11	1.68	F4	0.050	22.06
SC_043	41.1	NC	S-B18-56	Lick Fork	Perennial	Intermediate	Piedmont	36.377512	-79.625043	3.28	39	38	18	0.31	G5	0.066	191.78
SC_044	41.8	NC	S-B18-41	Trib. To Lick Fork	Perennial	Intermediate	Piedmont	36.36942	-79.620621	0.20	19	20	6	0.45	G4	0.060	15.96
SC_045	43.1	NC	S-B18-92	Trib. To Jones Creek	Perennial	Intermediate	Piedmont	36.354788	-79.611798	0.37	12	28	8	1.37	G4	0.060	27.25
SC_046	43.3	NC	S-A18-176	Jones Creek	Perennial	Intermediate	Piedmont	36.35213	-79.61098	4.55	26	38	19	0.31	F4	0.050	256.34
SC_047	43.7	NC	S-A18-105	Trib. To Jones Creek	Perennial	Intermediate	Piedmont	36.347223	-79.606731	1.00	53	24	19	0.71	F4	0.050	66.31
SC_048	45.7	NC	*AS-B18-71 / S-B18-71	Trib. To Hogans Creek	Perennial	Intermediate	Piedmont	36.321834	-79.593966	0.36	13	26	7	1.54	G4	0.060	26.68
SC_049	47.0	NC	S-C18-76	Hogans Creek	Perennial	Intermediate	Piedmont	36.305696	-79.587958	4.86	19	24	16	0.40	E5	0.054	271.64
SC_050	47.7	NC	*AS-A18-242 / S-A18-242	Trib. To Hogans Creek	Perennial	Intermediate	Piedmont	36.297584	-79.581228	0.40	19	14	8	0.97	E4	0.048	29.17

Table A-1. Stream Crossing Physical Data

GEO ID	Approx MP	State	Facility, State, County, Waterbody ID	Waterbody Name	Flow Type	FERC Class	Physio Province	Lat	Long	DA (sq mi)	MVP Crossing Width (ft)	Active Channel Measured Width (ft)	Bankfull Measured Stream Width (ft)	Slope %	Rosgen Stream Type	Mannings n by Stream Type	Qbkf reg (ft^3/s)
SC_051	50.8	NC	*AS-NHD-305	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.264029	-79.55104	2.36	N/A	30	14	0.87	E4	0.048	142.88
SC_052	56.5	NC	WB-A18-121	Trib. To Haw River	Pond	Intermediate	Piedmont	36.196732	-79.497738	0.17	N/A	68	6	0.31	B4	0.058	13.62
SC_053	58.7	NC	S-C18-11	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.172057	-79.486711	3.01	N/A	30	17	0.21	E5	0.054	177.35
SC_054	60.7	NC	S-C18-30	Trib. To Haw River	Intermittent	Intermediate	Piedmont	36.160775	-79.454945	0.58	N/A	19	9	0.92	G4	0.060	41.11
SC_055	62.4	NC	S-A18-70	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.150109	-79.43017	0.36	N/A	18	7.5	0.97	G4	0.060	26.54
SC_056	63.2	NC	S-B18-12-6	Trib. To Stony Creek	Perennial	Intermediate	Piedmont	36.146055	-79.416986	0.14	N/A	22	6	1.66	B4	0.058	11.87
SC_057	63.6	NC	*AS-B18-16 / S-B18-16	Stony Creek	Perennial	Major	Piedmont	36.146476	-79.411241	93.69	305	234	115	0.09	N/A	0.040	3785.01
SC_058	67.2	NC	*AS-A18-177	Trib. To Boyds Creek	Perennial	Intermediate	Piedmont	36.123982	-79.372947	0.34	N/A	8	6	2.48	E4	0.048	25.30
SC_059	67.6	NC	*AS-A18-233 / S-A18-233	Boyds Creek	Perennial	Intermediate	Piedmont	36.116822	-79.3726	4.45	25	36	22	0.89	E4	0.048	251.46
SC_060	68.8	NC	S-B18-8	Trib. To Haw River	Intermittent	Intermediate	Piedmont	36.100061	-79.370756	0.03	13	20	4.5	1.94	B4	0.058	2.95
SC_061	69.9	NC	*AS-A18-115	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.087699	-79.363539	0.23	N/A	14	6.5	2.06	G4	0.060	17.97
SC_062	70.3	NC	S-B18-133	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.083407	-79.360644	0.39	N/A	24	8	0.86	G4	0.060	28.95
SC_063	70.7	NC	S-C18-81	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.077171	-79.357781	0.24	24	24	6	11.13	G4	0.060	18.72
SC_064	71.5	NC	S-A18-64	Trib. To Haw River	Perennial	Intermediate	Piedmont	36.066521	-79.360353	0.04	26	26	4.5	2.65	G4	0.060	3.82
SC_065	71.6	NC		Haw River	Perennial		Piedmont	36.064601	-79.361382	605.74	150	166	130	0.08	E5	0.040	19930.33

[1] State Water Quality Classification abbreviation definitions from NC and VA found at following:
FERC: Federal Energy Regulatory Commission
ft: feet
GEO: Geosyntec
MP: Milepost
NC: North Carolina
NLCD: National Land Cover Dataset
Qbkf: Empirical Bankfull Flow (based on regional hydraulic geometry relationship)
sq mi: square mile
VA: Virginia
Wbkf: Empirical Bankfull Width (based on regional hydraulic geometry relationship)
Ybkf: Empirical Bankfull Depth (based on regional hydraulic geometry relationship)
CSA: Cross sectional area

Table A-2. Hydrotechnical Data

GEO ID	Approx MP	State	Facility, State, County, Water Body ID	Water Body Name	Phase of Study	Scenario A Burial Depth (ft)	Scenario B Burial Depth (ft)	Burial Distance (ft)	Setback 1 (Left Bank)		Setback 2 (Right Bank)		HSA Notes
									Lat	Long	Lat	Long	
SC_001	0.4	VA	S-F18-65	Little Cherrystone Creek	1	6.5	5.0	145	36.823057	-79.347361	36.822761	-79.347691	~30 ft of upstream lateral migration observed in aerials between 1994 and 2007 (~ 2.3ft /yr); Bank has not migrated much since 2007 and was straightened between 2016 and 2017; Setbacks placed ~42 ft from TOBs measured perpindicular; which is just outside stable belt width.
SC_002	0.6	VA	S-F18-63	Trib. To Sandy Creek	1	5.0	5.0	63	36.821232	-79.349236	36.821100	-79.349375	Crossing located downstream of agricultural impoundment; minimal lateral instabilities observed; standard 15 ft setbacks from OHWM line.
SC_003	1.7	VA	S-D18-18	Cherrystone Creek	1	7.5	6.0	139	36.808602	-79.362882	36.808323	-79.363205	Upstream belt width ~80-90 ft; minimal lateral migration observed in historic aerials; LB setback 45 ft from LB TOB, outside upstream meander belt width; right bank setback 30 ft from TOB (minimal migration hazards along right bank); setbacks cover upstream meander belt width.
SC_004	3.6	VA	S-D18-6	Trib. To Banister River	1	5.0	5.0	41	36.788019	-79.384398	36.787909	-79.384424	Crossing in backwater of impoundment in a depositional zone; no lateral migration hazard expected; standard 15-ft setbacks from OHWM.
SC_005	4.9	VA	S-E18-3	Banister River	1	7.5	5.0	145	36.774341	-79.399146	36.773978	-79.399348	Minor lateral migration observed in historic aerial imagery; channel has been straightened repeatedly to prevent meandering; 40 (`one channel width) ft setbacks from toe of bank to accommodate lateral migration; one channel width evaluated to be the lateral hazard extent. Cannot identify belt width from aerials.
SC_006	**5**	**VA**	**S-D18-2**	**White Oak Creek**	**2**	**7.0**	**6.0**	**130**	**36.773289**	**-79.399624**	**36.772937**	**-79.399686**	**Lateral migration observed in historic aerial imagery (~15 ft in 22 yrs); Lateral migration observed in LiDAR signature; Potential for meander formation at right bank post construction; Phase 2 Field evaluation reduce RB setback to ~45 ft from TOB and keep LB setback at ~35 ft from TOB.**
SC_007	5.1	VA	S-D18-2	White Oak Creek	1	5.5	5.0	52	36.771774	-79.400593	36.771813	-79.400421	Minimal lateral migration observed in historic aerials. 15-ft standard setbacks from OHWM line.
SC_008	9	VA	WB-E18-24	Trib. To White Oak Creek	1	5.0	5.0	33	36.729117	-79.445669	36.729044	-79.445738	Crossing in backwater of impoundment in a depositional zone; no lateral migration hazard expected; setbacks at edge of impoundment on LB and RB.
SC_009	9.9	VA	S-F18-17	White Oak Creek	1	6.0	5.0	66	36.720594	-79.454990	36.720460	-79.455144	LB setback set beyond observed meander migration history; RB setback ~15 ft from TOB.
SC_010	11	VA	S-F18-20	Trib. To Sandy Creek	1	5.0	5.0	187	36.707520	-79.467014	36.708024	-79.466896	Pipeline crosses stream obliquely/parallel (runs down channel centerline); Suggest reroute; No lateral instabilities observed, channel laterally confined by valley wall; Standard 15-ft setbacks from OHWM.
SC_011	11.4	VA	S-F18-20	Trib. To Sandy Creek	1	6.0	5.0	62	36.703949	-79.470436	36.703866	-79.470620	Difficult to see stream in aerials; Stream is moderatly entrenched; no historic lateral migration observed in LiDAR signature; 15-ft setbacks from TOB on LB and RB.
SC_012	11.9	VA	S-C18-86	Trib. To Sandy Creek	1	6.0	5.0	51	36.698587	-79.476440	36.698478	-79.476549	Setbacks placed ~17 ft from TOB on LB and RB beyond the meander belt width to accommodate the meander migration potential.
SC_013	12.8	VA	S-D18-21	Sandy Creek	1	6.0	5.0	75	36.688898	-79.486102	36.688738	-79.486260	Right setback set at ~70 ft from TOB on left bank to accommodate the meander belt wdith observed upstream and downstream; LB setback at TOB; total burial distance ~75 ft.
SC_014	13.4	VA	S-E18-27	Trib. To Sandy Creek	1	6.5	5.0	84	36.680661	-79.490069	36.680475	-79.490241	Minimal lateral migration hazard; standard 15-ft setbacks from TOB on LB and RB
SC_015	14.3	VA	*AS-D18-22 / S-D18-22	Trib. To Sandy Creek	1	5.5	5.0	38	36.673479	-79.501616	36.673398	-79.501699	Vegetation restricts view of channel at crossing in aerials; no lateral instabilities or migration observed in aerials within ROW immediately upstream; topographically confined along rightbank; Standard 15-ft setbacks from OHWM/TOB.
SC_016	15.7	VA	S-D18-37	Trib. To Silver Creek	1	6.0	5.0	106	36.657348	-79.517521	36.657588	-79.517316	Setbacks at 15 ft beyond TOB outside meander migration potential/active belt width.
SC_017	17.3	VA	S-E18-51	Trib. To Sandy River	1	5.0	5.0	22	36.639757	-79.534213	36.639728	-79.534278	Stream in a confined valley; setbacks placed at toe of valley wall (approximately elevation 582)
SC_018	17.7	VA	S-E18-44	Sandy River	1	12.5	10.0	166	36.635856	-79.537941	36.635468	-79.538237	Limited channel migration observed at the crossing in aerials between 1967 and 2018; downstream meander has migrated ~25 ft downstream over 56 years; channel at the crossing shows no signs of instability or migration at LB or RB in 56 years; RB topographically confined; LB is a depositional area; given drainage area size, 30-ft setbacks from bank toe on LB and RB
SC_019	20.4	VA	S-E18-52	Trib. To Trayner Branch	1	5.0	5.0	48	36.605979	-79.568098	36.605871	-79.568190	Crossing located 30 ft downstream of culvert; RB laterally confined by valley wall; LB and RB standard 15-ft setback from OHWM line.
SC_020	20.6	VA	S-E18-52 TA-PI-052	Trib. To Trayner Branch	1	5.0	5.0	44	36.603319	-79.570374	36.603221	-79.570458	Crossing located 25 ft downstream of culvert/road crossing; no lateral instabilities observed in aerials or LiDAR signature; standard 15 ft setbacks from OHWM line
SC_021	22	VA	S-A18-205	Trib. To Trotters Creek	1	5.0	5.0	79	36.587431	-79.586271	36.587589	-79.586084	Headwater stream in confined valley; pipeline crosses stream obliquely; standard 15-ft setbacks measured perpendicular from OHWM.
SC_022	23.2	VA	S-F18-40	Trotters Creek	1	5.5	5.0	54	36.574738	-79.600056	36.574651	-79.600207	Crossing locatated within confined valley; limited lateral migration potential; Setbacks 15 ft on LB and RB from toe of bank.
SC_023	23.2	VA	S-F18-42	Trib. To Trotters Creek	1	5.0	5.0	35	36.575084	-79.599561	36.575016	-79.599644	Crossing located within confined valley; No lateral instabilities noted; oblique pipeline crossing; Standard 15-ft setbacks.
SC_024	25.1	VA	S-C18-89	Trib. To Dan River	1	5.0	5.0	41	36.552580	-79.621736	36.552492	-79.621823	Crossing ~35 ft downstream of culvert; Cannot observe channel at crossing aerials; Historic aerials indicate no lateral instability/migration within existing ROW; Standard 15ft setbacks from OHWM.
SC_025	25.7	NC	S-C18-90	Trib. To Dan River	1	6.5	5.0	59	36.546033	-79.628271	36.545908	-79.628396	Vegetation restricts view of channel at crossing in aerials; No historic migration or alteral instabilities observed in channel in ROW upstream of crossing in; drainage depression present adjacent to LB; Standard 15-ft setbacks from TOB.
SC_026	27.3	NC	*AS-A18-42	Trib. To Cascade Creek	1	5.5	5.0	121	36.528201	-79.646014	36.527939	-79.646267	Vegetation restricts view of channel at crossing in aerials; meander bend present immediately upstream of crossing on RB; Standard 15-ft setbacks from TOB (`15 ft from TOB), beyond upstream belt width.
SC_027	27.4	NC	*AS-A18-40 - TA-RO-073A	Cascade Creek	1	9.0	7.0	367	36.526486	-79.647631	36.525716	-79.648441	Pipeline crosses channel obliquely and at confluence with adajcent stream (SC_028)' suggest reroute; ~ 40 ft of upstream meander migration toward left bank observed in aerials since 1999 (20 years or 2 ft/year); LB setack at 126 from LB TOB which places it outside the upstream meander belt width potential. LB setback at 50 ft from adjacent channel RB TOB and 76 ft from RB TOB.

Table A-2. Hydrotechnical Data

GEO ID	Approx MP	State	Facility, State, County, Water Body ID	Water Body Name	Phase of Study	Scenario A Burial Depth (ft)	Scenario B Burial Depth (ft)	Burial Distance (ft)	Setback 1 (Left Bank)		Setback 2 (Right Bank)		HSA Notes
									Lat	Long	Lat	Long	
SC_028	27.5	NC	*AS-NHD-4000	Dry Creek	1	9.0	7.0	367	36.526486	-79.647631	36.525716	-79.648441	Setbacks same as setbacks for SC_027; suggest reroute as crossing is oblique to flow and located at a confluence.
SC_029					1			0					Crossing same SC_027 (Cascade Creek) and was combined to one crossing.
SC_030	30.1	NC	S-A18-17	Dan River	1	13.5	10.0	299	36.497624	-79.675907	36.497010	-79.676582	~20 feet of migration observed in historic aerial imagery between 1963 and 2018 (55 years at .36 ft/year); Setbacks set for 100 yr migration protection at 40ft from toe of bank on LB and RB.
SC_031	31.3	NC	S-B18-95	Rock Creek	1	6.5	5.0	43	36.483323	-79.686754	36.483413	-79.686657	Valley confined; lateral migration hazard low; Setbacks placed at toe of valley wall on LB and RB
SC_032	32.2	NC	S-A18-147	Machine Creek	1	7.5	5.5	149	36.474875	-79.698047	36.475203	-79.697746	RB setback at 15 ft from TOB; LB setback 20 ft from TOB beyond active belt width (~70 ft).
SC_033	32.6	NC	S-A18-151	Town Creek	1	8.5	6.0	171	36.469220	-79.702994	36.469582	-79.702626	Minimal lateral migration observed in historic aerials between 2007 and 2017; 15-ft standard setbacks from OHWM on LB; 30-ft setback from TOB on RB outside of upstream active meander belt width.
SC_034	33	NC	S-A18-151-2	Town Creek	1	8.5	6.5	199	36.465400	-79.703285	36.464874	-79.703101	Difficult to observe channel at crossing in historic aerials; Significant lateral migration observed upstream of crossing between 1934 and 2017; 48 ft of downstream migration of upstream meander between 1994 and 2017 (2 ft/year); Meander cutoff is likely within next 10 years; LB confined by hillslope/valley wall; LB setback at toe of hillslope; RB setback ~130 ft from LB TOB outside upstream meander belt width.
SC_035	34.2	NC	S-C18-38	Trib. To Town Creek	1	7.5	5.5	84	36.449480	-79.693257	36.449709	-79.693242	LB confined at valley wall; LB setback set at toe of terrace and right bank setback ~25 ft from TOB to accommodate upstream belt width.
SC_036	**34.6**	**NC**	**S-C18-38-2**	**Trib. To Town Creek**	**2**	**5.0**	**2-ft below consolidated rock**	**169**	**36.444527**	**-79.688602**	**36.444167**	**-79.688238**	**Pipeline crosses obliquely and at confluence with small drainage; suggest re-route to reduce perscribed burial distance; Phase 2 field survey keep LB setback at 15 ft from TOB; RB setback 15 ft from TOB of adjacent channel due to alignment of pipeline with side channel.**
SC_037	34.8	NC	S-C18-38-3	Trib. To Town Creek	1	6.0	5.0	78	36.442796	-79.686850	36.442961	-79.687018	LB set at 15 ft from TOB outside of meander migration potential and belt width; RB setback at 22 ft from TOB outside upstream meander migration potential and belt width.
SC_038	36	NC	S-C18-35	Trib. To Town Creek	1	6.5	5.0	41	36.433219	-79.670826	36.433312	-79.670907	Crossing located ~85 ft downstream of dam; LB alterally confined; no lateral instabilities noted; standard 15-ft setbacks from OHWM line.
SC_039	37.7	NC	*AS-B18-117-2	Trib. To Wolf Island Creek	1	6.0	5.0	51	36.416229	-79.650766	36.416323	-79.650892	Minimal lateral migration hazard; 15-ft standard setbacks from TOB on LB and RB.
SC_040	38.2	NC	S-A18-2	Trib. To Wolf Island Creek	1	6.0	5.0	55	36.410702	-79.650754	36.410562	-79.650822	Crossing at end of confined valley; minimal lateral migration hazard; Setbacks at 15 ft from OHWM line.
SC_041	38.7	NC	*AS-A18-8	Wolf Island Creek	1	8.0	5.5	190	36.404103	-79.646978	36.403697	-79.646574	2 ft of lateral migration observed between 2007 and 2017 (~1.3 to 1.5 ft per year). LB setback at 40 ft from TOB and RB setback ~70 ft from TOB. Setbacks outside of normal reach meander belt width of ~130 ft.
SC_042	40.2	NC	S-B18-108	Trib. To Lick Fork	1	5.5	5.0	44	36.387013	-79.636419	36.386904	-79.636359	Difficult to observe channel in aerials; no lateral instabilities or migration observed in LiDAR signature; Standard 15-ft setback from OHWM line.
SC_043	41.1	NC	S-B18-56	Lick Fork	1	8.0	6.5	94	36.377640	-79.625120	36.377407	-79.624980	Down valley migration of upstream meander observed in historic aerial imagery; LB setback placed ~25 ft from TOB; RB meander set at top of floodplain terrace.
SC_044	41.8	NC	S-B18-41	Trib. To Lick Fork	1	5.0	5.0	72	36.369522	-79.620672	36.369338	-79.620580	Minimal instabilities noted from aerials and no historic migration signature observed in LiDAR; channel entrenched; Standard 15-ft setbacks from OHWM.
SC_045	43.1	NC	S-B18-92	Trib. To Jones Creek	1	5.5	5.0	61	36.354858	-79.611865	36.354727	-79.611738	Vegetation restricts view of channel at crossing in aerials; Channel incised; 15-ft standard setback from TOB on LB and RB.
SC_046	43.3	NC	S-A18-176	Jones Creek	1	7.5	5.0	81	36.352240	-79.611007	36.352021	-79.610952	Belt width measured at 75 ft; Setbacks set at 25 ft from toe of bank beyond active belt width.
SC_047	**43.7**	**NC**	**S-A18-105**	**Trib. To Jones Creek**	**2**	**7.5**	**6.0**	**175**	**36.347409**	**-79.606860**	**36.346991**	**-79.606567**	**Crossing located at confluence and crosses two streams obliquely; suggest re-route to minimize number of crossings; Phase 2 field survey keep LB setback 15ft from top of adjacent channel bank; RB setback at 15 ft from top of terrace.**
SC_048	45.7	NC	*AS-B18-71 / S-B18-71	Trib. To Hogans Creek	1	5.5	5.0	60	36.321908	-79.594013	36.321761	-79.593923	Minimal lateral instability and no historic migration signatures observed in LiDAR; Standard 15-ft setbacks from OHWM.
SC_049	47	NC	S-C18-76	Hogans Creek	1	5.5	5.0	68	36.305778	-79.588010	36.305611	-79.587904	Stream belt width is ~66 ft; Belt width setbacks due to instabilities observed. Left and right setbacks set beyond active meander belt widths.
SC_050	**47.7**	**NC**	***AS-A18-242 / S-A18-242**	**Trib. To Hogans Creek**	**2**	**7.0**	**5.5**	**66**	**36.297657**	**-79.581343**	**36.297550**	**-79.581160**	**Difficult to see stream in historic aerials; crossing is located near confluence of two streams, suggest re-route to minimize number of crossings; Phase 2 field survey keep RB setback 15ft from TOB; LB setback 15ft from adjacent stream LB TOB.**
SC_051	50.8	NC	*AS-NHD-305	Trib. To Haw River	1	6.5	5.0	333	36.263364	-79.550554	36.264151	-79.551130	RB topographically confined; Lateral migration hazard low; 15-ft setbacks from TOB for LB and RB.
SC_052	56.5	NC	WB-A18-121	Trib. To Haw River	1	5.0	5.0	107	36.196842	-79.497615	36.196623	-79.497860	Minimal lateral migration potential noted; difficult to view channel in aerials; stream just upstream of impoundment; standard 15-ft setback from TOB on RB and LB.
SC_053	58.7	NC	S-C18-11	Trib. To Haw River	1	8.0	6.0	59	36.172015	-79.486610	36.172090	-79.486787	LB setback at 15 ft from TOB; RB setback at ~20 ft from TOB, outside lateral migration potential.
SC_054	60.7	NC	S-C18-30	Trib. To Haw River	1	6.0	5.0	53	36.160815	-79.454860	36.160742	-79.455016	Meander belt width ~35 ft; setbacks placed at 15 ft from TOB on LB and RB beyond the active belt width and meander migration zone.
SC_055	62.4	NC	S-A18-70	Trib. To Haw River	1	6.0	5.0	49	36.150123	-79.430093	36.150094	-79.430255	Difficult to view crossing in aerials; limited lateral instability and no historic migration observed in LiDAR signature; standard 15-ft setbacks from OHWM line.
SC_056	63.2	NC	S-B18-12-6	Trib. To Stony Creek	1	5.0	5.0	61	36.146106	-79.416978	36.145940	-79.417005	Crossing is oblique and runs down channel centelrine, suggest reroute; no lateral instabilities noted; channel moderately entrenched; standard 15-ft setbacks from OHWM.
SC_057	63.6	NC	*AS-B18-16 / S-B18-16	Stony Creek	1	12.5	10.0	295	36.146480	-79.410750	36.146491	-79.411751	Crossing located in backwater area of Stony Creek Reservoir in depositional area with limited potential for lateral migration; Setbacks set at edge of water.
SC_058	67.2	NC	*AS-A18-177	Trib. To Boyds Creek	1	5.5	5.0	79	36.124103	-79.372912	36.123893	-79.372972	Vegetation restricts view of channel in historic aerials; No historic migration evident in LiDAR signature; narrow floodplain in confined valley; Standard 15-ft setbacks from TOB for LB and RB.

Table A-2. Hydrotechnical Data

GEO ID	Approx MP	State	Facility, State, County, Water Body ID	Water Body Name	Phase of Study	Scenario A Burial Depth (ft)	Scenario B Burial Depth (ft)	Burial Distance (ft)	Setback 1 (Left Bank)		Setback 2 (Right Bank)		
									Lat	Long	Lat	Long	HSA Notes
SC_059	67.6	NC	*AS-A18-233 / S-A18-233	Boyds Creek	1	6.5	5.0	80	36.116672	-79.372587	36.116892	-79.372610	Minimal lateral migration observed in the historic aerials; Meander belt width measured at ~70 ft upstream; RB confined by valley wall; RB setback set at toe of terrace; LB setback ~15 ft from top of terrace to accommodate belt width.
SC_060	68.8	NC	S-B18-8	Trib. To Haw River	1	5.0	5.0	51	36.099995	-79.370754	36.100136	-79.370757	No lateral instabilities noted; bank erosion area present on inner meander bank immediately downstream of crossing. May want to extend LB setback beyond this area; 15-ft standard setbacks.
SC_061	69.9	NC	*AS-A18-115	Trib. To Haw River	1	5.5	5.0	43	36.087704	-79.363470	36.087694	-79.363614	Difficult to observe channel in aerials; no lateral instabilities apparent in LiDAR signature; Standard 15-ft setbacks TOB (ELEV 506).
SC_062	70.3	NC	S-B18-133	Trib. To Haw River	1	6.0	5.0	58	36.083350	-79.360573	36.083465	-79.360710	Difficult to view stream in historic aerials; No lateral instabilities observed in LiDAR signature; Drainage feature present along RB at crossing; RB setback 15 ft from TOB of adjacent drainage feature, LB setback 15 ft from TOB; suggest re-route due to crossing location at confluence.
SC_063	70.7	NC	S-C18-81	Trib. To Haw River	1	5.5	5.0	56	36.077084	-79.357744	36.077229	-79.357806	Historic aerials show minimal lateral migration and no historic migration observed in LiDAR; standard 15ft setbacks from OHWM line.
SC_064	71.5	NC	S-A18-64	Trib. To Haw River	1	5.0	5.0	64	36.066422	-79.360379	36.066595	-79.360333	No lateral instabilities noted; standard 15-ft setback OHWM line on RB and ~18 ft from OHWM on LB.
SC_065	71.6	NC	<Null>	Haw River	1	18.0	15.0	0	<Null>	<Null>	<Null>	<Null>	No crossing here, pipeline runs parallel to channel; closest distance of pipeline to toe of left bank is 70 ft; moderate lateral migration towards the left bank observed in aerials between 1967 and 2018, approximately 30 ft over 51 years; recommend offsetting the pipeline back an additional 50 ft (120 ft total) from toe of LB to provide buffer for observed bank migration rate for 100 years.

ft: feet
GEO: Geosyntec
HSA: horizontal setback analysis
LB: left bank
LiDAR: light detection and ranging
MP: Milepost
NC: North Carolina
OHWM: ordinary high water mark
RB: right bank
TOB: top of bank
VA: Virgina

Geosyntec consultants

Geosyntec Consultants of NC, P.C.

APPENDIX B

Phase 2 Reconnaissance-Level Field Data

Stream Name	White Oak Creek	GEO_ID	SC_006
Survey Date	06-August-2019	MP	5.0
Start Time	0815	Drainage Area (sq. mi)	15.86

- Bankfull (Bkf) width = 25.5 ft; Bkf depth = 2.47-ft; Max Bkf depth – 3.03
- Crossing located, ~15-25-ft upstream of an overhanging tree/root wad along right bank, with lateral protrusion pool (LPP) present on downstream side
    - LPP: max Bkf depth = 4.18-ft deep; length = 6.4-ft
    - LPP was max pool depth observed within reach
    - Overhanging tree is providing some stabilization to right bank at crossing and preventing meander formation towards right bank
- Left bank (LB) height = 2.98-ft (Bkf height); Right Bank (RB) height = 3.5-ft
- Banks appear to be well vegetated with overstory trees and herbaceous vegetation;
- Minimal bank erosion observed at locations upstream and downstream of crossing
    - Banks appear to be relatively stable due to presence and density of roots and competence of clay material comprising banks
    - Banks are moderately sloped between 60° to 80°
- Mid channel bar present at crossing
- Overhanging trees present along both banks throughout the reach along with woody debris within channel
- Bed comprises silt and sand; point bar material comprises coarse sand and fine gravel, banks comprises silt and clay.
- Riparian buffer ~82-ft wide (3 river widths) along left bank until the existing ROW; > 5 river widths along right bank to valley wall.
- Flat terrain within left and right floodplains;
- Flood-prone area width > 300-ft;
    - Entrenchment ratio (flood-prone area width/max bkf depth) > 12
- Meander belt width = 60 to 65-ft
- Bannister River (MP 4.9) located ~330-ft from left bank

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings

Project Number: TXG0072

Site Name: MP 5.0 - White Oak Creek, VA

Site Location: Lat: 36.773125°, Lon: -79.399653°

Photograph: 1

Direction: Downstream

Note: View of proposed crossing (Crossing location approximately at tape across channel). Note overhanging tree along right bank immediately downstream of crossing

Date: 08/06/2019

Photograph: 2

Direction: Upstream

Note: View of debris within channel at upper end of surveyed reach. Immediately upstream of lateral bar photographed in Photograph 4

Date: 08/06/2019

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings	**Project Number:** TXG0072
Site Name: MP 5.0 - White Oak Creek, VA	**Site Location:** Lat: 36.773125°, Lon: -79.399653°

Photograph: 3

Direction: Downstream

Note: Note vegetation along left bank and overhanging tree along right bank. Presence of lateral protrusion pool downstream of tree. Point bar observed further downstream towards the right bank

Date: 08/06/2019

Photograph: 4

Direction: Upstream

Note: View of lateral bar upstream of crossing location. Note vegetation along right bank and debris within channel photographed in Photograph 1

Date: 08/06/2019

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings | **Project Number:** TXG0072

Site Name: MP 5.0 - White Oak Creek, VA | **Site Location:** Lat: 36.773125°, Lon: -79.399653°

Photograph: 5

Direction: Toward right bank

Note: Right bank at crossing. Bank height of 3.5 ft. Bank material consists of clay with some sandy silt. Note steepness of bank lack of vegetation

Date: 08/06/2019

Photograph: 6

Direction: Toward left bank

Note: Left bank at crossing. 2.98 ft. Bank material consists of clay with some sandy silt. Note vegetation along bank and presence of woody debris

Date: 08/06/2019

Geosyntec Consultants
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings

Project Number: TXG0072

Site Name: MP 5.0 - White Oak Creek, VA

Site Location: Lat: 36.773125°, Lon: -79.399653°

Photograph: 7

Direction: Upstream

Note: Lateral protrusion pool downstream of crossing overhanging tree photographed in Photograph 1 and 3. Max bankfull depth of 3.24-ft. Note exposed roots on downstream side of tree

Date: 08/06/2019

Photograph: 8

Direction: Lateral bar near left bank

Note: Coarse sand and fine gravel bar upstream of crossing (Photograph 4).

Date: 08/06/2019

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings

Project Number: TXG0072

Site Name: MP 5.0 - White Oak Creek, VA

Site Location: Lat: 36.773125°, Lon: -79.399653°

Photograph: 9

Direction: Point bar Near right bank

Note: Coarse sand and fine gravel point bar downstream of crossing (Photograph 3).

Date: 08/06/2019

Direction: Downstream

Note: Benchmark survey point 1, right bank, upstream of crossing.

Date: 08/06/2019

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Crossings	**Project Number:** TXG0072
Site Name: MP 5.0 - White Oak Creek, VA	**Site Location:** Lat: 36.773125°, Lon: -79.399653°

Photograph: 10

Direction: Downstream

Note: Benchmark survey point 2, left bank, downstream of crossing.

Date: 08/06/2019

Stream Name	Tributary to Town Creek	GEO_ID	SC_036
Survey Date	06-August-2019	MP	34.6
Start Time	1315	Drainage Area (sq. mi)	1.28

- Bankfull (Bkf) width = 16.5 ft; Bkf depth = 2.12 ft; Max Bkf depth – 2.95
- Crossing located, ~15-25-ft upstream of confluence and ~10 ft downstream of fallen tree within center of channel
  - Bar development at confluence along outer bank
- Channel is incised with bank heights between 7 to 10 ft
- Bedrock outcrops observed near crossing upstream and downstream
- Minimal scour observed as result of exposed roots and presence of bedrocks limiting bank migration
- D_{50} of bed material = 7.50mm
- Left bank height at crossing ~2.1 ft
- Right bank height at crossing ~6.1 ft
- Scour observed
  - D_{max} of pool = 3.95 ft
  - D_{max} of riffle observed = 2.78
- Current alignment crosses adjacent tributary, which is deeply incised
- Riparian buffer > 5 channel widths along left and right bank
- Flood-prone area width = 33.3 ft; channel entrenched

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Proposed pipeline crossings	**Project Number:** TXG0072
Site Name: MP 34.6 - Tributary to Town Creek, NC	**Site Location:** Lat: 36.444453°, Lon: -79.688527°

Photograph: 1

Direction: Upstream.

Note: View of proposed pipeline crossing from right bank at downstream bend (Crossing is approximately at person's location).

Date: 08/06/2019

Photograph: 2

Direction: Downstream.

Note: View downstream from bend. Note bedrock feature within channel

Date: 08/06/2019

GEOSYNTEC CONSULTANTS
Site Photographic Records

Project: Phase 2, MVP Southgate Stream Proposed pipeline crossings	**Project Number:** TXG0072
Site Name: MP 34.6 - Tributary to Town Creek, NC	**Site Location:** Lat: 36.444453°, Lon: -79.688527°

Photograph: 3

Direction: From upstream (left) to downstream (right).

Note: General view from right bank at downstream bend. Observed from upstream reach to downstream reach. Adjacent tributary joins channel at bottom left of photograph.

Date: 08/06/2019