

Alternatives Analysis Table
Riverine Resources
Northampton County

Watercourse ID and Crossing Number ¹	Watercourse Name	Milepost ²	Latitude	Longitude	Primary Pipeline Crossing Method ³	Secondary Pipeline Crossing Method ³	Tertiary Pipeline Crossing Method ³	Geology Constraints	Topography Constraints	Insufficient Workspace to Stage Trenchless	Practicality	Other (See Justification)	Implementing Trenchless Technology	Routing to Minimize	Crossing at Narrowest Location	Co-Locating	Reducing LOD	Minimizing Construction Duration	Adhering to Construction Timing Windows	Implementing BMPs	Justification
080917_WA_1002_P_MI - 1	UNT to Indian Creek	52.7R3	40.800358	-75.474329	N/A	N/A	N/A				X	X			X	X	X	X	X	X	Workspace reduced to 50' in stream and floodway. Stream can be crossed in less than 24 hours.
080917_WA_1002_P_MI - 2	UNT to Indian Creek	52.7R3	40.800152	-75.474330	DPX	FX	CD				X	X			X	X	X	X	X	X	Workspace reduced to 50' in stream and floodway. Stream can be crossed in less than 24 hours.
110217_WA_1003_P_MI	UNT to Indian Creek	52.9R3	40.797543	-75.475202	DPX	FX	CD				X				X	X	X	X	X	X	Workspace reduced to 50' in stream and floodway. Stream can be crossed in less than 24 hours.
080917_WA_1001_I_MI	UNT to Indian Creek	53.2R3	40.793855	-75.476191	DPX	FX	DX-NF				X	X			X		X	X	X	X	Workspace reduced to 75' through stream. Timing to cross justifies open cut; stream width at crossing is approximately 2' and can be crossed in less than 24 hours.
050217_MB_1002_I_MI	UNT to Indian Creek	53.3R3	40.792107	-75.476103	DPX	FX	DX-NF				X	X			X		X	X	X	X	Workspace reduced to 75' through stream. Timing to cross justifies open cut; stream width at crossing is approximately 5' and can be crossed in less than 24 hours.
050217_MB_1001_P_IN	UNT to Indian Creek	53.4R3	40.790992	-75.475861	DPX	FX	CD				X	X			X		X	X	X	X	Workspace reduced to 75' through stream. Timing to cross justifies open cut.
102815_WA_1001_E_MI	UNT to Hokendauqua Creek	55.7	40.783732	-75.459065	DPX	FX	DX-NF				X	X			X		X	X	X	X	Workspace reduced to 75' through stream. Timing to cross justifies open cut.
051215_JC_1002_P_IN	Hokendauqua Creek	55.9	40.781304	-75.457677	DPX	FX	CD	X			X	X					X	X	X	X	Steep slope on the east side of the crossing (29%) is impractical for trenchless methods (HDD, Direct Pipe and Microtunnel). Elevation differences would require bore pits to be over 5 feet deep (unsafe). Workspace reduced to 75' through stream and floodway.
051215_JC_1001_E_MI	UNT to Hokendauqua Creek	55.9	40.780606	-75.457279	DPX	FX	DX-NF				X	X			X		X	X	X	X	Workspace reduced to 75' through stream. Timing to cross justifies open cut; stream width at crossing is approximately 5' and can be crossed in less than 24 hours. PI to the immediate south along alignment would make staging trenchless crossing impractical.
051215_JC_1003_I_MI	UNT to Hokendauqua Creek	56	40.779940	-75.457029	BX	BX	BX				X	X	X		X		X			X	Trenchlessly crossed as part of Rte. 946 bore. Adjacent workspace required to facilitate bored crossing.
062218_WA_1000_P_MI	UNT to Hokendauqua Creek	56	40.779356	-75.456814	DPX	FX	CD			X	X	X			X			X	X	X	Existing route presents challenges to trenchless methods. Adjacent workspace required to facilitate bored crossing.
050417_GM_1002_P_MI	UNT to Hokendauqua Creek	56.7	40.772084	-75.448600	DPX	FX	CD	X			X	X			X			X	X	X	Slope south of the crossing (23%) would present challenges to trenchless methods (HDD, Direct Pipe & Microtunnel). Existing route presents challenges to trenchless methods. Workspace reduced to 75' in stream and floodway.
050417_GM_1003_P_IN	UNT to Hokendauqua Creek	56.7	40.771677	-75.448290	DPX	FX	CD	X			X	X			X		X	X	X	X	Slope south of the crossing (23%) would present challenges to trenchless methods (HDD, Direct Pipe & Microtunnel). Existing route presents challenges to trenchless methods. Workspace reduced to 75' in stream and floodway.
071917_MB_1001_I_MI	UNT to Monocacy Creek	58R2	40.760247	-75.429116	DPX	FX	DX-NF				X	X			X		X	X	X	X	Stream can be crossed in less than 24 hours.
052218_WA_1001_E_MI	UNT to Monocacy Creek	58.1R2	40.759968	-75.427902	DPX	FX	DX-NF				X	X			X		X	X	X	X	Stream can be crossed in less than 24 hours.
052218_WA_1002_P_MI	UNT to Monocacy Creek	58.5	40.755227	-75.423054	DPX	FX	CD	X			X	X			X		X	X	X	X	Steep slope north and south of the crossing (+15%) is impractical for trenchless methods (HDD, Direct Pipe, Microtunnel). Stream can be crossed in less than 48 hours. Workspace reduced to 75' in stream

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052218_WA_1003_P_MI	UNT to Monocacy Creek	58.5	40.755118	-75.422932	DPX	FX	CD		X		X	X			X		X	X	X	X	Steep slope north and south of the crossing (+15%) is impractical for trenchless methods (HDD, Direct Pipe, Microtunnel). Stream can be crossed in less than 48 hours. Workspace reduced to 75' in stream
090314_DB_1011_E_MI	UNT to Monocacy Creek	59	40.749646	-75.416448	DPX	FX	DX-NF				X	X			X		X	X	X	X	Stream can be crossed in less than 24 hours.
090414_DB_1012_I_MI	UNT to Monocacy Creek	59.2	40.747407	-75.413558	DPX	FX	DX-NF		X		X	X			X		X	X	X	X	Steep topography on either side of crossing makes trenchless alternatives impractical. Stream can be crossed in less than 24 hours.
090414_DB_1013_I_MI	UNT to Monocacy Creek	59.2	40.747235	-75.413335	DPX	FX	DX-NF		X		X	X			X		X	X	X	X	Steep topography on either side of crossing makes trenchless alternatives impractical. Stream can be crossed in less than 24 hours.
051215_JC_1005_P_IN	Monocacy Creek	60.3	40.737018	-75.399488	BX	DPX	FX				X				X		X	X	X	X	Steep slope on the east side of the crossing (22%) present challenges to trenchless methods (HDD, Direct Pipe & Microtunnel). Limited workspace due to CTR-987 and steep slope on east side of crossing challenge auger boring methods. Timing to cross justifies open cut. Workspace reduced to 75' in stream and floodway.
090314_DB_1005_E_MI	UNT to Monocacy Creek	60.6	40.736004	-75.393631	BX	BX	BX				X	X	X		X					X	Trenchlessly crossed as part of Rte. 512 bore. Adjacent workspace required to facilitate bored crossing.
090314_DB_1007_E_MI	UNT to Monocacy Creek	60.7	40.735815	-75.392502	DPX	FX	DX-NF				X	X			X		X	X	X	X	Stream can be crossed in less than 24 hours. Workspace reduced to 75' in stream .
090314_DB_1006_I_MI	UNT to Monocacy Creek	60.7	40.735773	-75.392255	DPX	FX	DX-NF				X	X			X		X	X	X	X	Stream can be crossed in less than 24 hours. Workspace reduced to 75' in stream .
111214_JC_1004_P_IM	East Branch Monocacy Creek	61.5R3	40.734494	-75.377316	DPX	FX	CD				X				X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 3'. Workspace reduced to 75' in stream and floodway. Existing route not conducive to trenchless methods.
102715_WA_1002_P_MI	UNT to East Monocacy Creek	62.4R3	40.730341	-75.364596	DPX	FX	CD				X				X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 3'. Workspace reduced to 75' in stream and floodway.
051415_JC_1001_I_MI	UNT to East Branch Monocacy Creek	62.8R3	40.726153	-75.356883	BX	BX	BX				X	X	X							X	Trenchlessly crossed as part of railroad bore. Adjacent workspace required to facilitate bored crossing. Workspace reduced to 75' in stream and floodway.
051415_JC_1002_P_IN	UNT to East Branch Monocacy Creek	63.5	40.724871	-75.342878	DPX	FX	CD				X				X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 3'. Workspace reduced to 75' in stream and floodway.
010615_JC_1000_E_MI	UNT to Lehigh River	70.6R3	40.649869	-75.283240	DPX	FX	DX-NF		X		X	X			X		X	X		X	Timing to cross justifies open cut. Workspace reduced to 75' in stream . Steep topography on east and west of crossing would make trenchless methods impractical.
010615_JC_1001_E_MI	UNT to Lehigh River	70.7R3	40.649000	-75.283198	N/A	N/A	N/A				X	X			X		X			X	Crossing stream perpendicularly to minimize crossing window. Adjacent ATWS required for Lehigh River HDD crossing.
061416_GM_1001_P_IN	Lehigh Coal and Navigation Canal	70.9	40.643062	-75.280289	HDD	HDD	HDD				X	X	X							X	Trenchlessly crossed as part of Lehigh River HDD.
031918_WA_1004_P_MA	Lehigh River	71	40.641519	-75.280107	HDD	HDD	HDD				X	X	X							X	Trenchlessly crossed as part of Lehigh River HDD.
012116_GM_1001_E_IN	UNT to Lehigh River	71.4	40.636128	-75.279471	HDD	HDD	HDD				X	X	X							X	Trenchlessly crossed as part of Lehigh River HDD.
010615_JC_1002_E_MI	UNT to Bull Run	71.7	40.631975	-75.277520	HDD	HDD	HDD				X	X	X							X	Trenchlessly crossed as part of Lehigh River HDD.
040318_WA_1000_P_MI	UNT to Bull Run	72.1	40.628502	-75.272379	DPX	FX	CD				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.

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092614_GO_1001_P_MI	UNT to Bull Run	72.1	40.628373	-75.272134	DPX	FX	CD				X	X			X		X		X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
040318_WA_1001_I_MI	UNT to Bull Run	72.4	40.625788	-75.267975	N/A	N/A	N/A				X	X			X		X	X	X	X	Crossing stream perpendicularly to minimize crossing window. Workspace reduced to 75' in stream and floodway.
031918_WA_1003_I_MI	UNT to Bull Run	72.4	40.625754	-75.267798	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
031918_WA_1000_P_MI	UNT to Bull Run	72.5	40.625349	-75.266954	DPX	FX	CD				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
051415_JC_1006_E_MI	UNT to Bull Run	72.5	40.625087	-75.266321	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
012016_GM_1001_I_MI	UNT to Bull Run	72.6	40.623907	-75.264118	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream .
102715_WA_1001_P_MI - 1	UNT to Bull Run	72.6	40.623853	-75.264152	DPX	FX	CD				X				X		X	X	X	X	Alignment was shifted north to minimize impacts. Timing to cross justifies open cut. Workspace reduced to 75' in stream and floodway.
102715_WA_1001_P_MI - 2	UNT to Bull Run	72.7	40.622647	-75.262633	DPX	FX	CD				X				X		X	X	X	X	Alignment was shifted north to minimize impacts. Timing to cross justifies open cut. Workspace reduced to 75' in stream and floodway.
012016_GM_1003_I_MI	UNT to Bull Run	72.7	40.623831	-75.263938	N/A	N/A	N/A				X	X			X		X	X	X	X	Workspace reduced to 75' in stream and floodway.
012016_GM_1002_I_MI	UNT to Bull Run	72.7	40.623713	-75.263907	N/A	N/A	N/A				X	X			X		X	X	X	X	Workspace reduced to 75' in stream and floodway.
102715_WA_1001_I_MI	UNT to Bull Run	72.7	40.623170	-75.263291	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
102715_WA_1002_I_MI	UNT to Bull Run	72.7	40.623072	-75.263168	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream .
042815_JC_1005_I_MI	UNT to Bull Run	72.8	40.621954	-75.261760	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
042815_JC_1001_E_MI	UNT to Bull Run	73	40.620310	-75.259908	DPX	FX	DX-NF			X	X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream . Pis in immediate vicinity of crossing make staging trenchless crossing equipment impractical.
042117_GM_1003_P_MI	UNT to Frya Run	73.6R2	40.619979	-75.249033	DPX	FX	CD				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream.
042117_GM_1001_P_MI	UNT to Frya Run	73.6R2	40.619979	-75.248304	DPX	FX	CD				X						X	X	X	X	Workspace reduced to 75' in stream and floodway. Stream can be crossed in less than 24 hours.
042418_WA_1005_P_MI	UNT to Frya Run	73.6R2	40.619979	-75.248248	DPX	FX	CD				X				X		X	X	X	X	Workspace reduced to 75' in stream and floodway. Stream can be crossed in less than 24 hours.
042418_WA_1004_P_MI	UNT to Frya Run	73.7R2	40.619977	-75.246728	DPX	FX	CD				X				X		X	X	X	X	Workspace reduced to 75' in stream and floodway. Stream can be crossed in less than 24 hours.
042418_WA_1003_P_MI	UNT to Frya Run	73.7R2	40.620095	-75.246668	N/A	N/A	N/A				X	X			X		X	X	X	X	Workspace reduced to 75' in stream and floodway.
042418_WA_1002_I_MI - 2	UNT to Frya Run	73.7R2	40.619977	-75.246412	DPX	FX	DX-NF				X				X		X	X	X	X	Workspace reduced to 75' in stream and floodway. Intermittent stream can be crossed in less than 24 hours.
042418_WA_1002_I_MI - 1	UNT to Frya Run	73.7R2	40.619897	-75.246774	N/A	N/A	N/A				X				X		X	X	X	X	Workspace reduced to 75' in stream and floodway. Intermittent stream can be crossed in less than 24 hours.
091814_MK_1009_P_IM	Frya Run	74.6	40.608674	-75.233521	DPX	FX	CD				X				X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 3'. Workspace reduced to 75' in stream and floodway.
062415_BT_1001_P_MI	UNT to Frya Run	74.9	40.606894	-75.229171	DPX	FX	CD				X				X		X	X	X	X	Temporary equipment bridge on existing road / Cross on existing culvert.

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062415_BT_1002_I_MI	UNT to Frya Run	74.9	40.606889	-75.229400	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 5'. Workspace reduced to 75' in stream and floodway.
122016_LZ_1001_P_MI	UNT to Frya Run	75.1	40.605250	-75.226333	DPX	FX	CD				X				X		X	X	X	X	Workspace reduced to 75' in stream and floodway. Stream can be crossed in less than 24 hours with its width being less than 5'.
111314_JC_1003_E_MI	UNT to Cooks Creek	75.7	40.601787	-75.219056	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut due to the width being less than 5'. Workspace reduced to 75' in stream and floodway.
111314_JC_1002_I_MI	UNT to Cooks Creek	75.7	40.601783	-75.219050	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut due to the width being 6'. Workspace reduced to 75' in stream and floodway.
111314_JC_1001_I_MI	UNT to Cooks Creek	75.7	40.601426	-75.218445	DPX	FX	DX-NF				X	X			X		X	X	X	X	Timing to cross justifies open cut. Workspace reduced to 75' in stream and floodway.
062218_WA_1002_P_IN	Bull Run	0.3	40.629789	-75.281329	DPX	FX	CD			X	X	X					X	X	X	X	Steep terrain on either side of stream crossing (~18%) present challenges to trenchless crossing methods. Workspace reduced to 75' through stream.

Notes:

1. In instances where a watercourse is crossed by the proposed pipeline or workspace multiple times, crossing numbers (e.g. "-1", "-2") have been added to the Watercourse ID.

Watercourse ID Key: P = perennial, I = intermittent, E = ephemeral, MA = major, IN = intermediate, MI = minor, C = canal, D = ditch

2. All route deviations implemented after the FERC Certificate Application are denoted with an "R" and indicate a MP equation. MPs with an "R1" indicate route deviations implemented and provided to FERC prior to the issuance of the DEIS. MPs with an "R2" indicate route deviations implemented as part of the September 2016 Route Update. MPs with an "R3" indicate route deviations implemented post-FERC Certificate issuance. All MPs without an "R" indicate that the route has not changed since the Certificate Application.

3. Crossing Type Key for Watercourse Channels:

- BX = Conventional Bore Crossing
- CD = Cofferdam Crossing
- DPX = Dam-and-Pump Crossing
- DX-NF = Dry Crossing If No Flow
- FX = Flume Crossing
- HDD = HDD Crossing
- N/A = Not Applicable