Global Solutions Yielding Sustainable Results

MOUNTAIN VALLEY PIPELINE (MVP) PROJECT
INDIVIDUAL PERMIT APPLICATION – VIRGINIA AND WEST VIRGINIA
STREAM CROSSING COST EVALUATION

CHANGE Environmental (a.k.a., CHANGE, LLC) has prepared this Stream Crossing Cost Evaluation for Appalachian Mountain Advocates (Client). CHANGE performed a review of the February 2021 Mountain Valley Pipeline, LLC (MVP) Project USACE Individual Permit Application (Application) for a general understanding of the project, as well as the November 18, 2020 Supplemental Environmental Report (SER). We have prepared this critical assessment of MVP's cost estimates for the stream crossing options, with particular emphasis on the cost estimates for horizontal drilling and resulting proposed methods for the stream crossings associated with the pipeline installation.

I. Critical Cost Assessment

MVP is constructing a steel, 42-inch diameter high pressure natural gas pipeline that would stretch approximately 304 miles in length if completed. In the November 18, 2020 SER, MVP proposed 41 conventional bores to cross 69 waterbodies and wetlands within the first 77 miles of the pipeline that FERC originally authorized as open cut. Subsequently, in February 2021, MVP requested in their Individual Permit Application permission to bore under a series of 182 waterbodies across the entire 304-foot length of the pipeline that resulted in the switching back of many of the crossings in the first 77 miles to open cut from the November 2020 proposal for conventional bores.

Many factors impact the preferred installation method for each stream crossing. The following features would need to be assessed in support of a complete and thorough least environmentally damaging practicable alternative (LEDPA) determination:

- Alignment of connection points for installed pipe
- Length of crossing
- Depth of pit for conventional bore
- Depth of stream
- Slope of bank (maximum and average)
- Subsurface conditions (karst, rock, soil gradation)
- Maximum winch length
- Surrounding features capable of supporting operations
- Significance of stream to be crossed (scenic, protected, trout)
- Endangered species within crossing
- Public or private water wells within 300 feet of crossing
- Cultural resources
- Viewshed

- Air quality
- Overall Construction Cost

Section 4.1.2, Section 10 Waters, focuses on five water bodies that have been determined to be or were assumed to be by MVP, traditionally navigable waters under Section 10 of the Rivers and Harbors Act (33 U.S.C. § 403). In four of the five cases, MVP has petitioned the USACE to change the stream crossing methodology from the open-cut method to a conventional boring method. In one instance, the ROW was reduced to minimize impacts in lieu of proposing a changed installation technology.

With the information provided, it is impossible to assess the validity of the presented costs. All the costs presented in Table 15 of the Application are lump sum, without sufficient detail provided in breakout sections to allow for the roll-up of cost assemblies. This prevents critical assessment of the overall costs to allow for independent verification of the costs presented.

Based on the information included in the March 1, 2021 version of Table 15 of MVP's Application, the following cost summary was prepared:

Method	**Number of Crossings Assessments**	**Projected Price**
Dry Ditch Open-Cut	303	$33,560,218
Conventional Bore	125	$58,457,293
Direct Pipe	1	$10,059,375
Total:	**429**	**$102,076,886**

The switching of 125 crossings from "dry-ditch open-cut" to "conventional bore" method will incur a projected additional $43. 6 million USD in estimated project costs. The original cost of the 125 stream crossings listed in the table as Conventional Bore if installed via the Dry Ditch Open-Cut method was $14.9 million USD in estimated project costs.

Method	**Number of Crossings Assessments**	**Projected Price**
Dry Ditch to Con. Bore	303	$305,027,960
Conventional Bore	125	$58,457,293
Direct Pipe	1	$10,059,375
Total:	**429**	**$373,544,628**

The 125 currently proposed Conventional Bore Drills have an average cost per linear foot of $4,773 and average bore depth of 21 feet. This is comparable to other conventional bore projects occurring in a relatively similar time period. Two crossings are listed as Guided Conventional Bore (C-022 and G-013), but the costs were not dissimilar to Conventional Bore, so these were not assessed uniquely and are included in the Conventional Bore summary.

	Conventional Bore	Dry-Ditch Open Cut
Average Pit Depth (feet)	21	10
Average Length (feet)	98	99
Average Cost per Liner Foot	$4,773	$1,117

CHANGE compared fifteen of the proposed conventional bores from Appendix A from MVP's November 18, 2020 SER that exceeded $1M USD. All but three of the 41 stream crossings from Appendix A have been switched back to Dry-Ditch Open-Cut in the Corps Application. Specifically, A-008, B-012, and B-015A remain as conventional bores. The following table compares the fifteen costliest bores that have now been switched back to open cuts to try and determine if the costs presented are inflated.

Crossing #	Crossing Length (feet)	Bore Depth (feet)	Estimated Price ($)	Price Per Linear Ft. ($)	Price Per Bore Depth ($)	Max. Steep Slope %	Avg. Slope %	Max Winch Height (ft.)
A-005	203	48	$3,194,292	$15,735	$66,548	59	44	1432
A-009	40	49	$2,786,247	$69,656	$56,862	57	47	350
A-010/011	243	49	$3,362,357	$13,837	$68,620	58	47	711
A-012	96	43	$2,617,901	$27,270	$60,881	79	59	375
A-015	190	37	$1,215,184	$6,396	$32,843	48	32	412
A-016	286	36	$1,469,361	$5,138	$40,816	58	36	453
A-019A	37	41	$2,341,369	$63,280	$57,107	64	49	148
B-001	238	39	$1,387,946	$5,832	$35,588	73	33	0
B-005	117	48	$2,950,226	$25,216	$61,463	75	57	496
B-010	74	52	$3,046,374	$41,167	$58,584	100	59	341
B-015B	193	35	$1,014,042	$5,254	$28,973	17	6	0
C-003	47	50	$2,860,658	$60,865	$57,213	79	52	609
C-004	62	49	$2,848,682	$45,946	$58,136	70	57	886
C-005	130	48	$2,987,120	$22,978	$62,232	36	22	431
C-007	146	67	$4,068,891	$27,869	$60,730	87	66	571
Avg:	**140**	**46**	**$2,543,377**	**$29,096**	**$53,773**	**64**	**44**	**481**

On average, these fifteen crossings are projected to cost five times the average price per linear foot, and twice the average price per bore depth. This focused assessment of the fifteen most expensive conventional bores from the first 77 miles demonstrates the need to provide transparency in the cost assessment process by providing breakout costs that can be rolled up into each crossing estimate. Currently, there is no transparency in the assembly of the costs.

Based on the March 1, 2021 update to Table 15 of the Application, and comparing MVP's Evaluation Factors, it could be inferred that the fifteen crossings selected for assessment were more expensive because all costing factors were higher. This escalation in cost must be substantiated, however, by the information presented in the permit application. The current level of detail in Table 15 does not support the truthing of the presented costs. Additionally, an analysis of site location logistical costs could not be determined from these factors and represents another unknown that lacks transparency in the current level of detail provided for the costs.

CHANGE also compared Dry-Ditch Open-Cut with Conventional Boring from Appendix A from MVP's November 2020 SER.

	Conventional Bore	**Dry-Ditch Open Cut**
Average Pit Depth (feet)	21	10
Average Length (feet)	98	99
Average Liner Foot Cost	$4,773	$1,117
Average Max Steep Slope (%)	28	41
Average Slope (%)	16	27
Average Max Winch Height (feet)	22	243

As previously stated, the proposed costs are not transparently developed to readily allow for independent verification and limits the ability of a reviewer to validate the costs presented are reasonable.

Based on the available information, it is difficult to understand the metrics used to select the stream crossing methodology. Two stream crossing have less than $100,000 in difference in cost between Conventional Bore and Dry- Ditch Open-Cut costs. If an evaluation of the how the assessment factors were applied was performed on these two stream crossings (C-001 and C-013B), without using cost as a differentiating metric, transparency in the decision-making process could be achieved and would provide the truest measure of the assessment process since cost is not a significant factor. Requesting a detailed assessment of these stream crossings could inform the process.

Also of note, is the fact that stream crossing F-020 indicates that conventional bore is not an option due to the degree of curvature that needs to be achieved in the pipe alignment, so no costs are presented for Conventional Bore. The Costs shown for Dry-Ditch Open-Cut are -$700. This would reflect an error in the cost summary for this crossing.

The overall price for the installation of the pipeline has been estimated at $6 Billion USD. If all of the stream crossings were installed by conventional auger, the total installation price for the 429 stream crossings included in the application would be approximately $375M USD. The increased cost for the changing the currently proposed open cut crossing to conventional auger would be just over $270M USD. As a point of reference, $270M represents approximately 4.5% of the total overall cost. It is unclear what the accuracy of the presented costs are. If the costs represent an order-of-magnitude engineering cost estimate, then the expected error range for the costs are –30 to +50 percent of the actual project cost. An increase of $270M is not outside of the possible margin of error.

Section 5.1.1.2, Pipeline Crossing Constraints in the February 2021 Application lists several of the factors assessed, but only in general terms. CHANGE focused on the Crossing Method Decision Logic column of Table 15, and the metrics discussed focus primarily on technical and logistics issues with respect to the two technologies. Typically, when assessment of preferred methodologies is performed, a ranking system is used which scores each of the factors evaluated to allow for an understanding of the importance of each factor being considered in relationship to the other factors. This also provides transparency in the process, as many of the factors can be competing. The summary assessment provided in Table 15 in the Crossing Method Decision Logic column does not discuss how the various competing factors were ranked to arrive at the proposed stream crossing methodology. The “risk management” based assessment that the permit application discusses does not appear to have been used in the crossing selection process. This process should balance the competing interests of cost and protectiveness against the impacts and potential impacts should unanticipated conditions be encountered, and unforeseen circumstances result in environmental degradation. The Application as presented does not demonstrate that the Affected Environment and Environmental Review Factors discussion in Section 4 of the application, and the Mitigating factors discussion in Section 5, affected the proposed stream crossing selection. This failure of explanation represents a lack of assessment of environmental impacts and technical issues as presented and any approval without this level of detail could be interpreted as an arbitrary and capricious technology selection process. The complexities of each of the stream crossings dictates the need for a case-by-case assessment which balances the cost, logistics and the environmental factors discussed in the application. This assessment step needs to be included in Table 15 in such a way as to present a meaningful summary of all factors considered that supports the selected crossing technology. The addition of this detail in the assessment provides the necessary transparency to demonstrate how the protectiveness, logistics and physical constraints of each stream crossing, and cost were balanced and considered.

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