RLC ENGINEERING

FINAL REPORT

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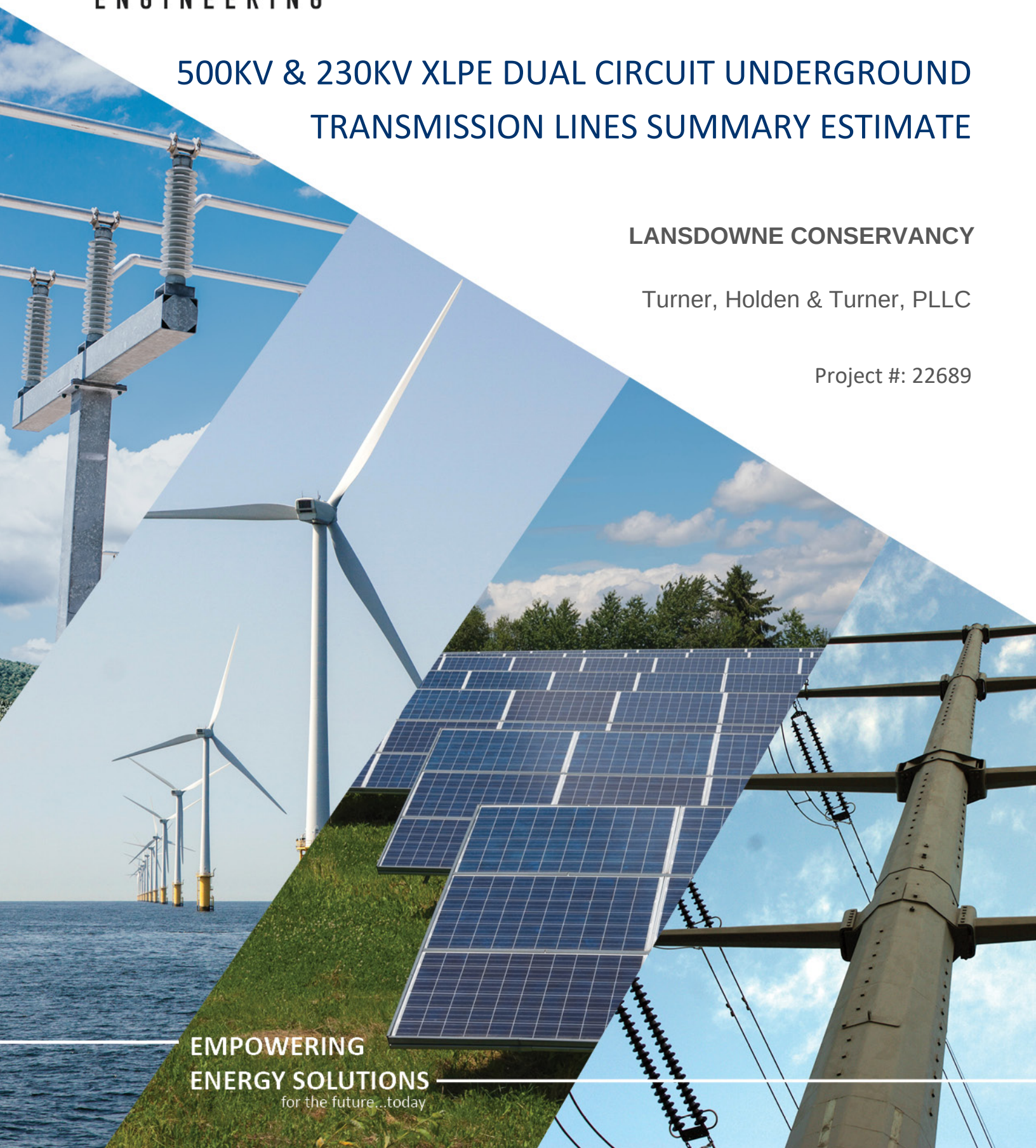
500KV & 230KV XLPE DUAL CIRCUIT UNDERGROUND TRANSMISSION LINES SUMMARY ESTIMATE

LANSDOWNE CONSERVANCY

Turner, Holden & Turner, PLLC

Project #: 22689



EXECUTIVE SUMMARY

RLC Engineering, LLC (RLC) has prepared this report to develop a high level feasibility and conceptual grade cost estimate for the proposed 500kV and 230kV Dual Circuit XLPE Underground Transmission Line Installation (Project) located in Loudoun County, VA. The Project is a 10,400' (1.96-mile) long underground installation of two (2) transmission lines in a common duct bank. The underground transmission lines will be a section of a larger 500kV/230kV overhead transmission line, which will run 10 miles from the proposed Aspen Substation location to the proposed Golden Substation. The transmission lines will be installed by and constructed to Dominion Energy specifications and approvals. Project cost estimates for the overhead portion of this transmission line and required substation construction have been provided by Dominion Energy. The Lansdowne Conservancy and RLC Engineering met with Dominion on February 15, 2024 to discuss this underground solution proposal. This report represents a revised underground solution to incorporate the comments made by Dominion in that meeting.

The proposed underground routing of the Project has been established and provided to RLC by the client, see Figure 1 below. Based on the limited amount of project information available, RLC has made a number of assumptions in order to compile the required information to provide this feasibility analysis and cost estimate for the underground transmission line installation, these assumptions are listed in this report below. The proposed layout and assumptions cover many of the concerns with constructing the line underground vs overhead. Further details will need to be addressed during detail design.

RLC Engineering has provided a high-level cost estimate for the underground transmission line portion of the project and combined it with the cost estimates for the Aspen to Golden overhead transmission line project provided by Dominion. The cost estimate summary shown in table 1 below shows a total project cost for a hybrid overhead and underground dual circuit transmission line. RLC displaced approximately 1.96 miles of overhead DCT Lines with the underground solution. This hybrid variant on the project represents a $275M difference in the original OH cost estimate provided by Dominion.

Table 1 Cost Estimate Summary

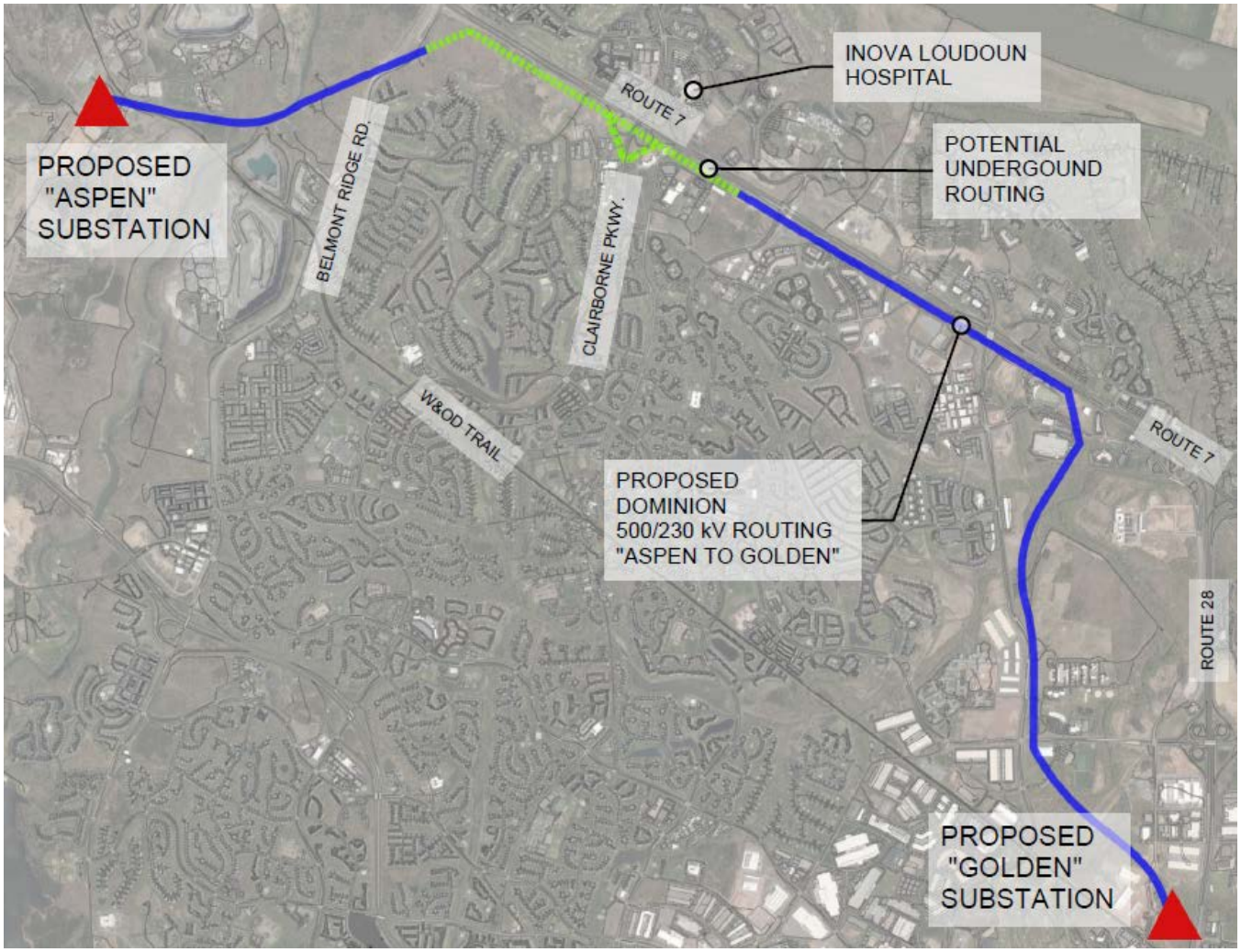
Cost (million)	Description
$582	Dominion estimate for line terminals
$218	Dominion estimate for 10 mile OH DCT line ($21.8/mile)
$800	Dominion estimate for Aspen-to-Golden Project (Overhead Construction)
-$43	Reduction of 2 miles of OH DCT line ($21.8M x 2miles)
$318	Addition for 2 miles UG construction
$1,075	Hybrid estimate for Aspen-to-Golden (OH and UG Construction) (34% increase from proposed)

1. UNDERGROUND TRANSMISSION LINE PROJECT DESCRIPTION

1.1. General Underground Transmission line Information

The potential underground routing consists of the installation of a 10,400’ section of new underground transmission lines along Route 7 in Loudoun County, VA (See Figure 1). The 500kV and 230kV dual circuit underground transmission lines will be a section of a larger 500kV/230kV overhead transmission line, which will run from the proposed Aspen Substation location to the proposed Golden Substation and will require a total of two (2) overhead-to-underground transition yards consisting of a 200 ft by 200 ft, one acre lots; one (1) at each proposed start and finish location (see Figure 3). Each of the transition yards will require two (2) take-off structures; one (1) for the 500kV conductors, and one (1) for the 230kV conductors. Because of the limited distance for the underground lines, substations will not be required for the transition yards. Both transmission lines will be run in one (1) common trench and concrete encased duct bank, with a series of splice vaults to accommodate the proposed routing and conductor splicing. The location of the transition yards and vaults, and distance between them, was estimated using the map provided and Google Earth imagery as well as estimated cable lengths. No right of way (ROW) reviews, environmental permitting or inspections were completed on this project routing, which could impact the final locations of the structures and vaults.

Figure 1 - Proposed transmission line routing



1.2. Underground Transmission Line Scope of Work

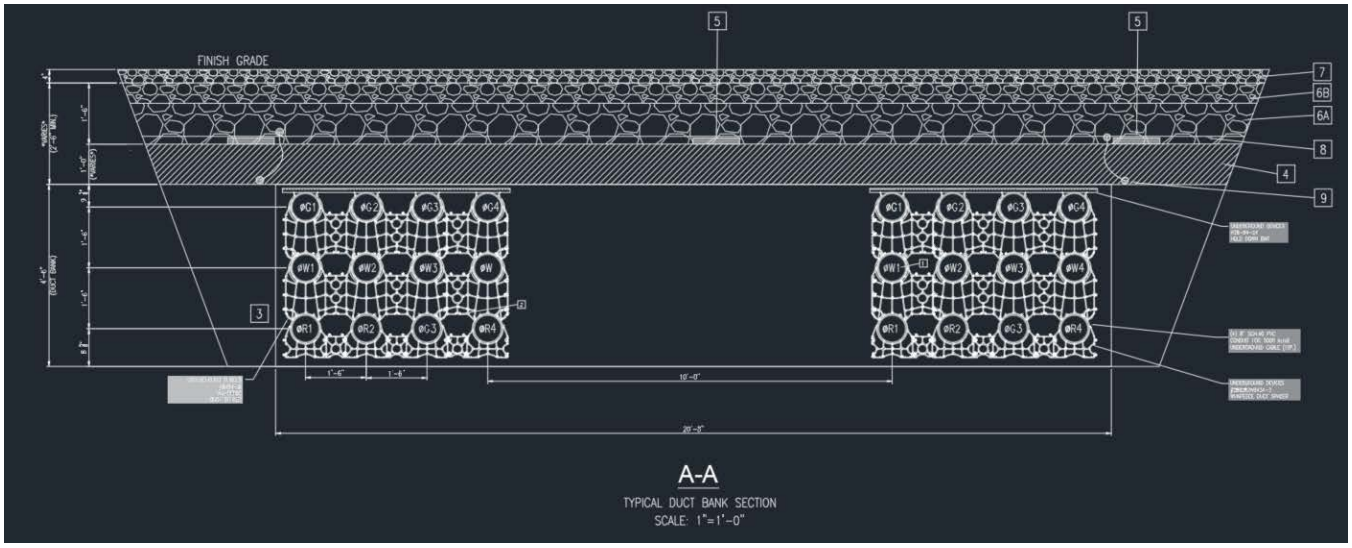
The following is a list of major equipment that was included in the cost estimate for the proposed underground portion of project: (see Figure 3 for a proposed sketch of the transition yards and transmission duct bank routing)

- **Two (2) – 200'x200' transition yards (one at either end of the underground transmission lines routing)**
    - Two (2) 500kV take-off structures (A-Frame)
        - (12) Concrete Foundations
        - Structure Steel
        - (36) Insulators
        - (12) 500kV Underground Cable Terminations (4 per phase)
    - Two (2) 230kV take-off structures (H-Frame)
        - (4) Concrete Foundations
        - Structure Steel
        - (36) Insulators
        - (12) 230kV Underground Cable Terminations (4 per phase)
    - 1,600' perimeter, 8' high chain-link security fencing, with access gates
    - 80,000 sq/ft transition yard site work and finish materials
    - 400' of access road
    - Site Lighting
    - Ground Grid
    - Storm Water Drainage
- **500kV Underground Transmission Line**
    - 124,800' of 5000kcmil XLPE conductors (4 per phase – 12 total)
    - 10,400' #500kcmil grounding conductor
    - (36) – 10'x30'x10' splice vaults located along proposed routing
        - 10'x30'x10' concrete vaults
        - Cable supports, splicing, grounding
        - Excavation and grading work
- **230kV Underground Transmission Line**
    - 124,800' of 5000kcmil XLPE conductors (4 per phase – 12 total)
    - 10,400' of #500kcmil grounding conductor
    - (36) - 10'x30'x10' splice vaults located along proposed routing
        - 10'x30'10' concrete vaults
        - Cable supports, splicing, grounding
        - Excavation and grading work

- **Common Duct Bank (6x3 concrete encased duct bank, 10'W x8' deep)**
    - 124,800' of 8'' PVC conduit (for 500kV line: 10,400' x 12)
    - 124,800' of 8'' PVC conduit (for 230kV line: 10,400' x 12)

- 20,800’ of 6’’ PVC conduit (for grounding)
- 10,400’ of 4’’ PVC conduit (for communications)

Figure 2 - Example Concrete Duct Bank Arrangement



1.3. Assumptions and Clarifications

RLC made the following assumptions and clarifications while developing this analysis and cost estimate:

- Conductor sizing/quantity will vary depending on loading and soil conditions, the exact quantities will need to be established during the conductor design.
- Dominion’s cost estimates were the source of Overhead transmission costs included in this estimate
- Dominion’s cost estimates for the source of remote end substation updates/modifications are included in this analysis. The remote end substations are the 500/230 kV Aspen and Golden Substations.
- No protection and control equipment installed at transition yards
- The transition yard size is based on existing single 230kV transition yard constructed by Dominion that is 200’x85’. RLC assumes a 200’x200’ yard will accommodate two circuits.
- Location of underground routing is based on “Report Map Insert 2023.12.08” map set.
- Assumed all ROW and real estate rights are existing, and allow for transmission lines installation.
- Assumed all Regulatory approvals can be obtained.
- Proposing to use 100’ ROW for 500kV & 230kV UG cabling with 150’ ROW at splice vault locations.
- Assumed temporary road closures can be obtained to install duct bank across roads.
- Cable manufacturer can produce a 500kV XLPE cable to meet specifications.
- Concrete vaults for conductor splicing will be installed in a staggered manor to reduce overall width of ROW required for the transmission line routing.
- Disposal of contaminate soils not included for any excavations

- Limited Environmental permitting is included in the estimate
- Locations for splice vaults based on review of google earth, final locations would need to be coordinated with cable manufactures as well as existing site conditions.
- A high-level investigation reveals some existing utilities. Future inspection will be required. Relocation of existing utilities has not been included in this estimate.
- Assumed external engineering with internal (Dominion) reviews
- Assumed external construction with both internal and external construction reps
- Assumed to encounter 30% rock
- Assumed (3) splice locations for each of the 500kV and 230kV underground transmission lines
- Assumed 8% escalation per year. This is to cover increases in cost of labor, equipment and material due to continuing price changes over time.

1.4. Underground Transmission line Cost Estimating

The costs identified in this study, for the underground portion of the hybrid routing, are estimated costs for the design, procurement, construction, and commissioning of a 500kV and 230kV dual circuit underground transmission line. This is a conceptual grade estimate that will be refined as the projects progresses through the design process. This margin is based on the limited design information available for the project. The quantities and costs included in the estimate were established based on standard electric underground transmission design criteria and installation practices for XLPE conductors. This estimate includes risks and escalation associated with the procurement of a custom 500kV XLPE conductor as well as the required splicing vaults and termination structures. The final conductor design could have major impacts to the project design and routing of the underground transmission line. The cost for the 500kV and 230kV conductors in this estimate were obtained from a distributor and cable manufacturer based on basic design information.

RLC Engineering has provided a high-level cost estimate and combined it with the cost estimates for the Aspen to Golden Project provided by Dominion. RLC displaced approximately 1.95 miles of overhead DCT Lines with the underground solution. This hybrid variant on the project represents a $275M difference in the original overhead cost estimate provided by Dominion. A cost estimate for the Aspen – Golden hybrid solution shown in Table 1 above.

1.5. Schedule

RLC assumed and created project milestone dates to be used in the development of estimate, see below for schedule:

- Engineering: 10/01/2024 - 12/31/2025 (electrical/civil)
- Permitting/Approvals: 03/01/2024 – 10/01/2026 (environment/Utility/FERC/State/Local, etc.)
- Cable Procurement: 06/01/25 – 12/31/2026 (assume 18month lead time)
- Construction: 10/01/2026 – 06/01/2028

2. UNDERGROUND TRANMISSION LINE ROUTING SKETCH

Figure 3 - Proposed New Dual Circuit Routing (Google Earth)