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May 10, 2019

TRANSMITTED VIA E-MAIL

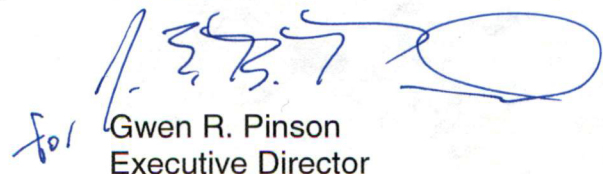
Thomas FitzGerald
P.O. Box 1070
Frankfort, Kentucky 40602-1070

Re: Open Records Request, received April 13, 2019, requesting to inspect confidential files in Case No. 2016-00371, *Electronic Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates and Certificates of Public Convenience and Necessity*

Dear Mr. FitzGerald;

This letter is written in response to your request pursuant to the Kentucky Open Records Act, KRS 61.870 et seq. and 807 KAR 5:001, Section 13 et seq., to inspect certain records filed by Louisville Gas and Electric Company (LG&E) in the above referenced case and granted confidential treatment by the Commission. In accordance with 807 KAR 5:001, Section 13(10)(d), LG&E was notified of your request and by letter dated May 7, 2019, has stated that the documents you requested no longer need to be protected as confidential. Those documents consist of the attachments to LG&E's Response to Commission Staff's Third Request for Information, Item 24. Accordingly, those documents are now being posted to the publically available post-case file for Case No. 2016-00371. If you have any questions please contact J.E.B. Pinney, Acting General Counsel, at (502) 782-2587.

Sincerely,


for Gwen R. Pinson
Executive Director

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Proposed Routes D and J Origin Location with Calvary Transmission Line
(KY-245 Bardstown)



Proposed Routes E, F, and I Origin Location with Calvary Transmission Line
(KY-509 Cocks Creek)

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Proposed Route G Origin Location with Calvary Transmission Line



Proposed Route H Origin Location with Calvary Transmission Line

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Route Terminations



Proposed Route A Termination Location with High-Pressure Distribution Main



Proposed Routes B & C Termination Location with High-Pressure Distribution Main

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Proposed Routes D, E, & F Termination Location with High-Pressure Distribution Main



Proposed Routes G & H Termination Location with High-Pressure Distribution Main

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Proposed Route I Termination Location with High-Pressure Distribution Main



Proposed Route J Termination Location with High-Pressure Distribution Main

Route Corridor

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Proposed Routes A & H Typical Highway Corridor



Proposed Routes E, F, and I Typical Roadway Corridor

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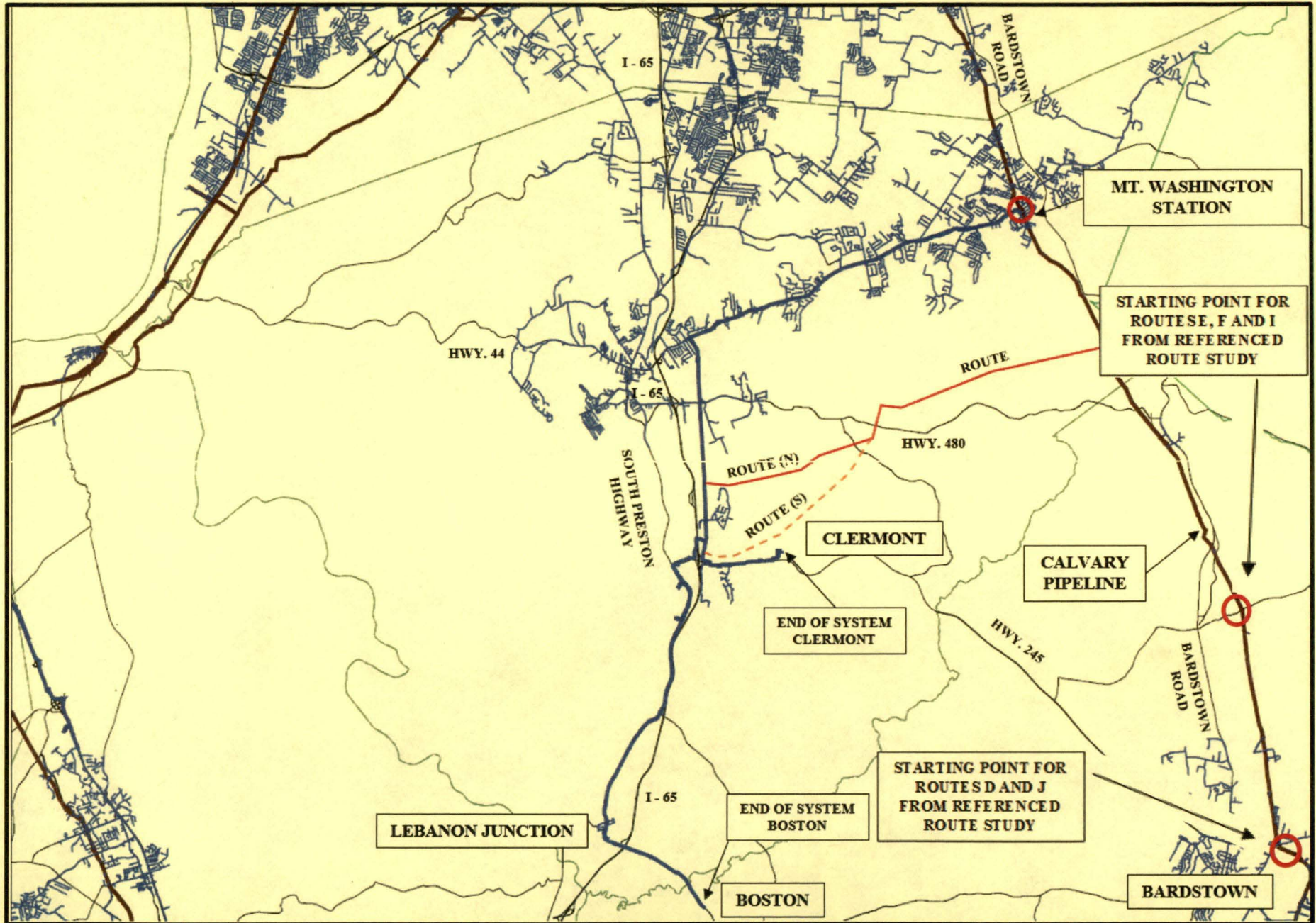


Proposed Route G Typical Bluegrass Parkway Corridor



Proposed Route H Typical Bluegrass Parkway Corridor

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Existing Bullitt County Gas Supply with Proposed Reinforcement Route – All Facilities

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Opinion of Probable Cost

Mt. Washington Lateral Feasibility Study

Nelson County, Kentucky



Prepared by



EnSiteUSA Project Number

6520

Issued Friday, September 2, 2016

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Feasibility Study
Opinion of Probable Cost



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Feasibility Study
Opinion of Probable Cost



1 PROJECT DESCRIPTION

Louisville Gas & Electric Company (LG&E) has hired EnSiteUSA to determine the feasibility of a new lateral pipeline south of Louisville, KY. One key component of this feasibility study is the development of an Opinion of Probable Cost (OPC) for design services. Design services are to include project management, permitting legal expenses, environmental planning and permitting, land acquisition, survey, aerial photography, mapping and drafting, and engineering services. Condemnation, materials, construction installation, and construction services are not included in this evaluation.

The proposed lateral route is located in Bullitt County, Kentucky to the east of Shepherdsville, Kentucky. The proposed route is 10.34 miles of 12-inch, Grade B steel pipeline with a wall thickness of 0.375-inches. The route crosses Cox Creek and at least additional three streams. The route abuts an existing electrical right-of-way (ROW) the length of the route.

Although two routes on the southern side of KY-480/Cedar Grove Road were proposed by LG&E for review, only the northern route was evaluated in this OPC. The northern route was selected as the primary route following a feature review. This features leading to its selection include shorter overall length, shorter floodplain crossing length, and fewer buildings within in 100-feet of the right-of-way.

An electronic version of the route shown in Section 4 (.kmz file) and OPC Table shown in Section 5 (.xlsx file) will be supplied with this document.

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Feasibility Study
Opinion of Probable Cost



2 OPINION OF PROBABLE COST

The OPC Table is an amalgamation of activities that incurred cost during the design phases on previous projects completed by EnSiteUSA and Terracon. The design phase would start at kick-off following the completion of Land securing access permission. The design phase included in this estimate would reach completion following the end of the bidding process. Activities were included based on our understanding of the project goals at this preliminary stage. This understanding is clarified in the assumptions listed in Section 3.

The following sections clarify the sections on the OPC Table. The costs for each activity are derived from previous proposal estimates and project cost reports. The EnSiteUSA and Terracon team reviewed projects similar to those that aligned with the assumptions established for the Mt. Washington Lateral.

1.1 PROJECT MANAGEMENT AND CONTROLS

This section was completed by EnSiteUSA - Engineering. It includes costs for the time required by EnSiteUSA to coordinate department and subcontractor design work, facilitate design integration, manage scheduling and budget updates, and provide progress reports to the client.

1.2 3RD PARTY REGULATORY LEGAL EXPENSES

This section was completed by Terracon. The regulatory legal expenses section is to include any costs associated with regulatory permitting legal expenses.

1.3 ENVIRONMENTAL PLANNING AND PERMITTING

This section was completed by Terracon. The environmental planning and permitting section is to include any costs associated environmental and archaeological review of the route.

1.4 LAND

This section was completed by EnSiteUSA - Land. The land section is to include any costs associated with field office requirements, permit preparation, right-of-way acquisition, and condemnation.

1.5 SURVEY

This section was completed by EnSiteUSA - Survey. The survey section is to include any costs associated with preliminary and utility surveys as well as survey support for geotechnical and environmental field activities.

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Feasibility Study
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1.6 AERIAL PHOTOGRAPHY

This section was completed by EnSiteUSA - Survey.

1.7 MAPPING AND DRAFTING

This section was completed by EnSiteUSA - Drafting. The drafting section is to include costs to produce alignment and permit application drawings, non-certified easement exhibits, and interconnect plans and sections.

1.8 ENGINEERING

This section was completed by EnSiteUSA – Engineering. The engineering section is to include any costs associated with pipeline design, alignment development, interconnect facility design, HDD and conventional crossing design, AC mitigation, and material specifications.

Terracon completed costs associated with geotechnical services to include field investigation, laboratory services, and geotechnical reports.

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Feasibility Study
Opinion of Probable Cost



3 GENERAL ASSUMPTIONS

The following information and assumptions were used in developing the OPC estimates are to be within +/- 10% of the project cost.

- Land, survey, environmental, engineering, and drafting services will take place in 2017.
- Design services shall require no longer than 26 weeks from kick-off to completion.
- ROW is 30-feet wide and will primarily be adjacent to an existing powerline.
- Gas in shall be transmission-quality natural gas, no production or storage gas.
- Land access permissions shall be in place prior to starting design services based on preliminary route.
- A one-hour weekly project meeting will be required for all design team members actively engaged with the project.
- This project will not require FERC approval.
- Cox Creek will require a geotechnical investigation and HDD design.
- Design firm shall have a contractual relationship with LG&E and any other entity involved in the project is a subcontractor to the design firm.
- Two interconnect facilities shall be required: one at the origin and termination of the lateral pipeline. The interconnect facilities shall require same engineering, design, and equipment. Variations anticipated include: perimeter property lines considering setback, major equipment layout and plumbing.
- Each facility shall contain the following major equipment: bi-directional pig launcher-receiver, meter and meter run, regulation or flow control, RTU building, backup generator, and OPP if MAOP varies between pipelines. Meter and meter run shall not be required to meet custody-transfer requirements.
- Programming of RTU shall be completed by LG&E.
- Cathodic Protection was not included in this OPC due to previous experience on projects when LG&E reviewed this internally.
- LG&E shall provide drawings used on previous projects for major equipment, typical drawings for pipelines, design specifications, and construction specification at design kick-off.

Additional assumptions for specific activities are included in the OPC Table.

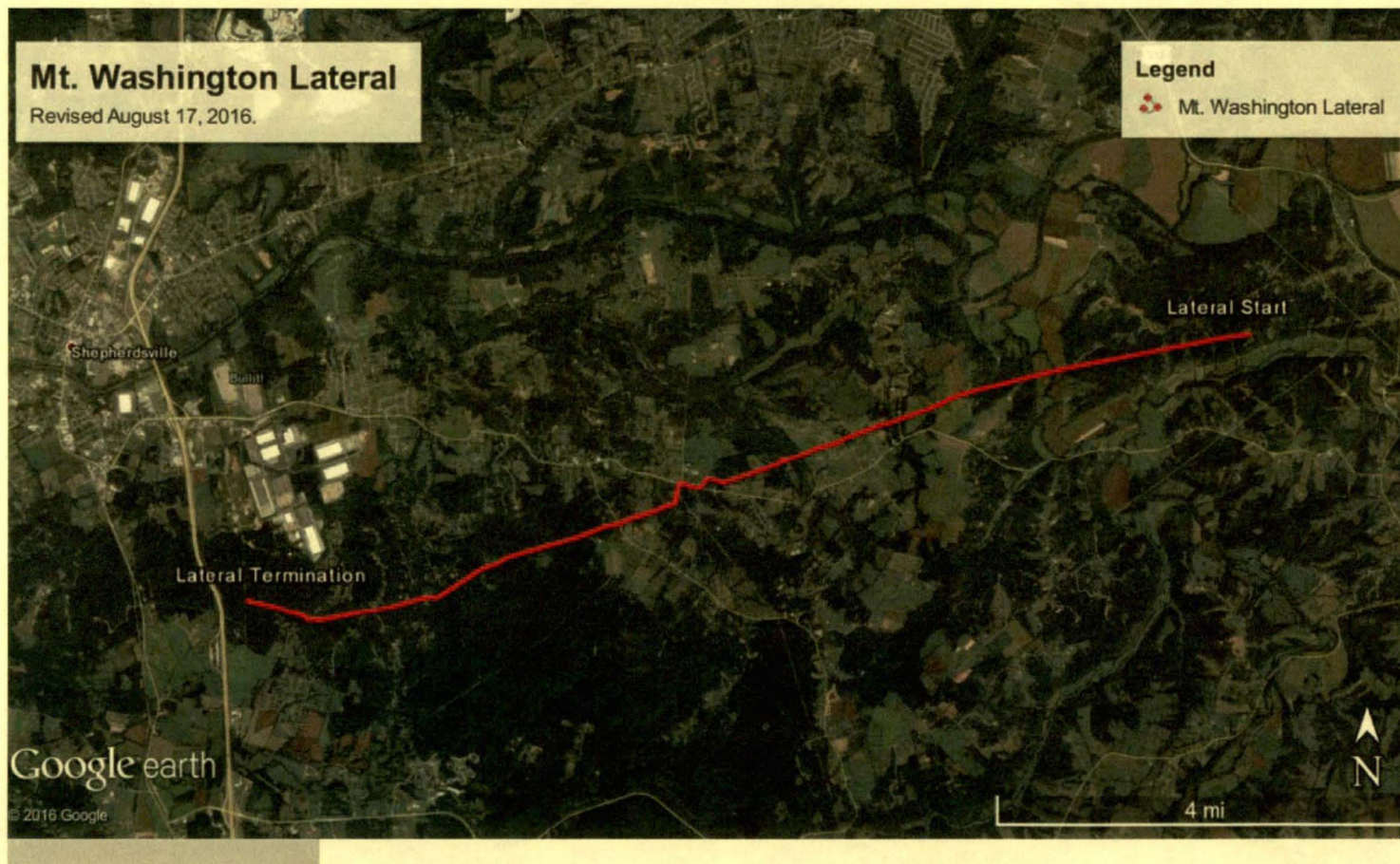
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Request for Quotation
Opinion of Probable Cost



4 ROUTE LOCATION



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5 OPC TABLE

| Line Item | Unit of Measure | Quantity | Unit Cost | Item Cost | Assumptions |
|--|-----------------|----------|-----------|------------|--|
| I. Project Management and Controls | | | | \$ 79,180 | |
| Project Director | mo. | 6 | \$ 725 | \$ 4,350 | 1 Project Director at 5 hours a month |
| Pipeline Project Manager | week | 26 | \$ 2,600 | \$ 67,600 | 1 Project Manager at 20 hours a week |
| Pipeline Project Controls | week | 26 | \$ 255 | \$ 6,630 | 1 Administrative Assistant at 5 hours a week |
| MPC/FTP File Sharing Set-Up and Maintenance Fee | mo. | 6 | \$ 100 | \$ 600 | Provide Sharefile site for file storage from Design Kick-Off through IFB Package Completion |
| II. 3rd Party Regulatory Legal Expenses | | | | \$ 16,875 | |
| Regulatory Permitting Work | hours | 45 | \$ 375 | \$ 16,875 | Per hour of attorney document review. (FERC application is not expected.) (Additional Federal involvement is not known until the desktop survey is completed). Tribal Consultation is not included. |
| III. Environmental Planning and Permitting | | | | \$ 263,430 | |
| Field Resource Surveys | | | | | |
| Wetland/Waterbody Delineation | lot | 1 | \$ 12,250 | \$ 12,250 | 10.23 Miles to be survey at one deployment. |
| Phase I T&E Species Survey | lot | 1 | \$ 5,300 | \$ 5,300 | T&E field survey to be completed at same time as WOUS |
| Yards & Access Roads | lot | 1 | \$ 12,500 | \$ 12,500 | 2-5 ac yards & 1 mile of Access Roads |
| Wetland/Waterbody/T&E Species Reports | lot | 1 | \$ 5,250 | \$ 5,250 | |
| T&E Specific Surveys - Informal Consultation, surveys and report | lot | 1 | \$ 2,000 | \$ 2,000 | Not including USACE Section 9 or Section 10 consultation, if warranted |
| Bat Survey | lot | 1 | \$ 12,500 | \$ 12,500 | Expected, but only performed if required by USFWS. Initial review and consultation to discover what may be needed. Does not include netting study. |
| Noise Baseline Surveys | ea. | 1 | \$ 12,000 | \$ 12,000 | Research existing noise reports, ID Noise Sensitive Areas, Conduct Noise Spot Measurements at 3 locations. Does not include modeling or public hearing. Assumes that there are no compressor or noisy equipment. |
| Cultural Resource Desktop Review | lot | 1 | \$ 2,245 | \$ 2,245 | |
| Phase I Archaeological Survey of Four River/Stream Crossings Only | lot | 1 | \$ 15,020 | \$ 15,020 | If USACE and KHC-SHPO agree |
| Phase I Archaeological Survey of the Entire Corridor | lot | 1 | \$ 18,730 | \$ 18,730 | Additional cost for Phase I Archaeological Survey. Expected, but only performed if required for the entire corridor |
| Phase I Archaeological Survey of Lay Down Yards | lot | 1 | \$ 3,780 | \$ 3,780 | Two five-acre yards |
| Phase I Archaeological Survey of Access Roads | lot | 1 | \$ 3,155 | \$ 3,155 | Two roads totaling 1.0 mile |
| Architectural/Historic Resources Survey of All Areas | lot | 1 | \$ 7,000 | \$ 7,000 | Expected, but only performed if required by KHC-SHPO |
| Project Permitting | | | | | |
| Wetlands & Stream Joint Application | lot | 1 | \$ 8,700 | \$ 8,700 | Assumes a USACE Nationwide Permit thresholds will not be exceeded. If permanently impacting greater than 1/2-acre IP/WQC will be required resulting in additional scope and cost. |
| E&S Plan & SWPPP | lot | 1 | \$ 6,500 | \$ 6,500 | |
| T&E Approvals & Mitigation Plans | lot | 1 | \$ 2,500 | \$ 2,500 | Excluding specific species surveys plans |
| Hydrostatic test water withdrawal & discharge | lot | 1 | \$ 12,000 | \$ 12,000 | |
| SPCCC Plans | lot | 1 | \$ 9,500 | \$ 9,500 | If needed |
| Local permits, plan approvals | lot | 1 | \$ 6,500 | \$ 6,500 | Cost is an estimation until a complete field survey can be completed. |
| Local permits, timber clearing | lot | 1 | \$ 5,500 | \$ 5,500 | Cost is an estimation until a complete field survey can be completed. |
| Other Permits/Approval (Floodplain, Ag Lands, Aqueduct, Conservation Lar | lot | 1 | \$ 4,500 | \$ 4,500 | Cost is an estimation until a complete field survey can be completed. |
| Public Meetings | | | | | |
| Public Involvement Meetings | ea. | 2 | \$ 2,200 | \$ 4,400 | |
| Agency Coordination Meetings | ea. | 5 | \$ 1,250 | \$ 6,250 | Not including USACE Section 9 or Section 10 consultation, if warranted |

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Section 9 – Appendix B: Evaluation Matrix

| Features and Considerations | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Route Length (miles) | 13.30 | 14.20 | 12.80 | 15.48 | 13.96 | 13.04 | 17.77 | 16.95 | 16.76 | 21.28 |
| Opinion of Probable Cost (Thousand \$\$) | \$ 36,822 | \$ 39,403 | \$ 37,249 | \$ 42,105 | \$ 37,728 | \$ 34,683 | \$ 50,405 | \$ 53,523 | \$ 48,632 | \$ 62,351 |
| Waterbody Crossings | | | | | | | | | | |
| Number of River Crossings | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 0 |
| Number of Stream Crossings | 4 | 7 | 7 | 6 | 5 | 6 | 2 | 9 | 10 | 8 |
| Wetlands Crossed | | | | | | | | | | |
| Freshwater Emergent (acres) ¹ | 0.16 | 0.22 | 0.22 | 0.12 | 0.13 | 0.24 | 0.21 | 0.25 | 0.12 | 0.14 |
| Freshwater Forested/Shrub (acres) ¹ | 0.00 | 0.72 | 64.36 | 0.00 | 0.11 | 0.11 | 0.00 | 0.00 | 0.11 | 0.00 |
| Woody Wetlands (acres) ¹ | 0 | 0 | 0 | 0 | 0 | 0 | 1.21 | 1.21 | 0 | 0 |
| Length of Route Thru Floodplain Ordinance Review Areas (miles) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Use | | | | | | | | | | |
| New ROW Required (miles) | 0 | 0 | 10 | 0 | 1 | 6 | 0 | 10 | 15 | 11 |
| Number of Properties Crossed | 77 | 129 | 96 | 139 | 104 | 60 | 51 | 82 | 118 | 155 |
| Number of Properties Crossed (per mile) | 6 | 9 | 8 | 9 | 7 | 5 | 3 | 5 | 7 | 7 |
| Deciduous Forest (acres) | 0 | 1 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Socioeconomic Impact | | | | | | | | | | |
| Buildings Within 100 feet of the ROW (count) | 30 | 91 | 19 | 40 | 55 | 32 | 18 | 13 | 25 | 48 |
| Buildings Within 100 feet of the ROW (per mile) | 2 | 6 | 1 | 3 | 4 | 2 | 1 | 1 | 1 | 2 |
| Buildings Within 50 feet of the ROW (count) | 28 | 18 | 10 | 4 | 5 | 4 | 13 | 12 | 2 | 11 |
| Buildings Within 50 feet of the ROW (per mile) | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Buildings Within 25 feet of the ROW (count) | 6 | 0 | 3 | 1 | 0 | 0 | 7 | 5 | 1 | 2 |
| Buildings Within 25 feet of the ROW (per mile) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| T&E Species | | | | | | | | | | |
|--|---|----|----|----|----|----|---|---|----|----|
| Animals | 2 | 2 | 2 | 11 | 11 | 11 | 7 | 7 | 11 | 11 |
| Plants | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| Road & Railroad Crossings | | | | | | | | | | |
| Number of U.S. Road Crossings | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 1 | 2 |
| Number of State Road Crossings | 5 | 0 | 10 | 4 | 1 | 1 | 2 | 2 | 4 | 10 |
| Number of County Road Crossings | 3 | 5 | 2 | 21 | 17 | 6 | 2 | 3 | 2 | 7 |
| Number of City Road Crossings | 2 | 14 | 2 | 0 | 0 | 0 | 1 | 1 | 5 | 9 |
| Number of Railroad Crossings | 2 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 0 | 3 |
| Cultural Resources | | | | | | | | | | |
| Number of Cemeteries ² | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Number of Schools ² | 1 | 0 | 0 | 3 | 4 | 3 | 1 | 1 | 0 | 1 |
| Number of Places of Worship ² | 4 | 2 | 1 | 4 | 5 | 4 | 2 | 1 | 0 | 1 |
| Number of Parks ² | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 |
| National Register Buildings ² | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Notes:

¹Nation Wetland Inventory data source

²Within 660 feet of proposed route

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Section 9 – Appendix C: Hydraulic Analysis

Based on a minimum delivery pressure of 205 psig and a desired minimum flow rate of 650 mscfh, EnSiteUSA recommends the following pipe sizes and Grade B pipe for the Mt. Washington High-Pressure Distribution System Extension.

- An 8.625-inch OD pipeline will work for the Mt. Washington pipeline extension for Route A, Route B, and Route C; however, an 8.625-inch diameter is not recommended, because the minimum required supply pressure is estimated to be 326 psig, and an overall pressure drop for the longest proposed route is estimated to be 125 psig. These conditions do not provide much flexibility for a higher termination pressure, should LG&E desire it.
- Based on a max velocity requirement of 70 feet per second (fps), EnSiteUSA recommends a 10.750-inch OD pipe for the Mt. Washington pipeline for Routes A through F. The velocity in the pipe is estimated to be 22 fps. The total pressure drop from the start to the termination point for the longest proposed route is estimated to be between 30 and 40 psig. The required supply pressure to achieve 205 psig at the termination point must be no less than 245 psig.
- If the pressure drop is undesirable, LG&E may consider the use of a 12.750-inch OD pipe for these routes. The velocity in this pipe is estimated to be 15 fps. The total pressure drop from start to termination point is estimated to be between 13 and 17 psig. The supply pressure must be no less than 222 psig to maintain 205 psig at the termination point.
- Based on a max velocity requirement of 70 feet per second (fps), EnSiteUSA recommends a 12.750-inch OD pipe for the Mt. Washington pipeline for Routes G through I. The velocity in the pipe is estimated to be 15 fps. The total pressure drop from the start to the termination point for the longest proposed route is estimated to be between 17 and 22 psig. The required supply pressure to achieve 205 psig at the termination point must be no less than 227 psig.
- A 16.750-inch OD pipe has also been evaluated for consideration.

The results of diameter analysis for each proposed route are shown in Table 9.2 below.

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| LG&E FEASIBILITY STUDY HYDRAULIC ANALYSIS | | | | | | | | | | | | | | | |
|---|------------------|----------------|-----------------------------|------------|---------------|----------------------|-----------|----------------------------|----------------------|-----------------------------|----------------------------------|---------------|--------------|--------------------|-----------|
| Route | Line Description | Length (miles) | Nominal Pipe Diameter (in.) | Pipe Grade | Design Factor | Wall Thickness (in.) | Temp (°F) | Max. Available MAOP (psig) | Required MAOP (psig) | Required/Available MAOP (%) | Min. Req. Supply Pressure (psig) | Flow (mmscfd) | Flow (mscft) | Max Velocity (fps) | AP (psig) |
| A | Mt Washington | 13.30 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 290 | 15.6 | 650 | 34 | 84.8 |
| B | Mt Washington | 14.20 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 295 | 15.6 | 650 | 34 | 89.7 |
| C | Mt Washington | 12.80 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 287 | 15.6 | 650 | 34 | 82.1 |
| D | Mt Washington | 15.48 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 301 | 15.6 | 650 | 34 | 96.5 |
| E | Mt Washington | 13.96 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 293 | 15.6 | 650 | 34 | 88.4 |
| F | Mt Washington | 13.04 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 288 | 15.6 | 650 | 34 | 83.4 |
| G | Mt Washington | 17.77 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 313 | 15.6 | 650 | 34 | 108.2 |
| H | Mt Washington | 16.95 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 309 | 15.6 | 650 | 34 | 104.1 |
| I | Mt Washington | 16.76 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 308 | 15.6 | 650 | 34 | 103.1 |
| J | Mt Washington | 21.28 | 8 | B | 0.5 | 0.322 | 60 | 1307 | 720 | 55.1% | 326 | 15.6 | 650 | 34 | 125.4 |
| A | Mt Washington | 13.30 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 237 | 15.6 | 650 | 22 | 31.9 |
| B | Mt Washington | 14.20 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 239 | 15.6 | 650 | 22 | 33.9 |
| C | Mt Washington | 12.80 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 236 | 15.6 | 650 | 22 | 30.8 |
| D | Mt Washington | 15.48 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 242 | 15.6 | 650 | 22 | 36.7 |
| E | Mt Washington | 13.96 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 238 | 15.6 | 650 | 22 | 33.4 |
| F | Mt Washington | 13.04 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 236 | 15.6 | 650 | 22 | 31.3 |
| G | Mt Washington | 17.77 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 247 | 15.6 | 650 | 22 | 41.7 |
| H | Mt Washington | 16.95 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 245 | 15.6 | 650 | 22 | 39.9 |
| I | Mt Washington | 16.76 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 245 | 15.6 | 650 | 22 | 39.5 |

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| | | | | | | | | | | | | | | | |
|---|----------------|-------|----|---|-----|-------|----|------|-----|-------|-----|------|-----|----|------|
| J | Mt. Washington | 21.28 | 10 | B | 0.5 | 0.365 | 60 | 1188 | 720 | 60.6% | 252 | 15.6 | 650 | 22 | 49.2 |
| A | Mt. Washington | 13.30 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 219 | 15.6 | 650 | 15 | 14.0 |
| B | Mt. Washington | 14.20 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 220 | 15.6 | 650 | 15 | 14.9 |
| C | Mt. Washington | 12.80 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 218 | 15.6 | 650 | 15 | 13.5 |
| D | Mt. Washington | 15.48 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 221 | 15.6 | 650 | 15 | 16.2 |
| E | Mt. Washington | 13.96 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 220 | 15.6 | 650 | 15 | 14.7 |
| F | Mt. Washington | 13.04 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 219 | 15.6 | 650 | 15 | 13.7 |
| G | Mt. Washington | 17.77 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 224 | 15.6 | 650 | 15 | 18.5 |
| H | Mt. Washington | 16.95 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 223 | 15.6 | 650 | 15 | 17.7 |
| I | Mt. Washington | 16.76 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 222 | 15.6 | 650 | 15 | 17.5 |
| J | Mt. Washington | 21.28 | 12 | B | 0.5 | 0.375 | 60 | 1029 | 720 | 69.9% | 226 | 15.6 | 650 | 15 | 22.0 |
| A | Mt. Washington | 13.30 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 210 | 15.6 | 650 | 9 | 4.5 |
| B | Mt. Washington | 14.20 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 210 | 15.6 | 650 | 9 | 4.8 |
| C | Mt. Washington | 12.80 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 209 | 15.6 | 650 | 9 | 4.4 |
| D | Mt. Washington | 15.48 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 210 | 15.6 | 650 | 9 | 5.3 |
| E | Mt. Washington | 13.96 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 210 | 15.6 | 650 | 9 | 4.8 |
| F | Mt. Washington | 13.04 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 209 | 15.6 | 650 | 9 | 4.4 |
| G | Mt. Washington | 17.77 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 211 | 15.6 | 650 | 9 | 6.0 |
| H | Mt. Washington | 16.95 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 211 | 15.6 | 650 | 9 | 5.8 |
| J | Mt. Washington | 16.76 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 211 | 15.6 | 650 | 9 | 5.7 |
| J | Mt. Washington | 21.28 | 16 | B | 0.5 | 0.375 | 60 | 820 | 720 | 87.8% | 211 | 15.6 | 650 | 9 | 7.2 |

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County: Bullitt, KY

| Group | Name | Population | Status | Lead Office | Recovery Plan Name | Recovery Plan Action Status | Recovery Plan Stage |
|------------------|--|------------|------------|---|---|---|----------------------------------|
| Flowering Plants | Kentucky glade cress (<i>Leavenworthia exigua laciniata</i>) | | Threatened | Assistant Regional Director-Ecological Services | - | - | - |
| Mammals | Indiana bat (<i>Myotis sodalis</i>) | Entire | Endangered | Bloomington Ecological Services Field Office | Indiana Bat (<i>Myotis sodalis</i>) Draft Recovery Plan: First Revision | Implementation Progress | Draft Revision 1 |
| | Gray bat (<i>Myotis grisescens</i>) | Entire | Endangered | Columbia Ecological Services Field Office | Gray Bat | Implementation Progress | Final |
| | Northern Long-Eared Bat (<i>Myotis septentrionalis</i>) | | Threatened | Twin Cities Ecological Services Field Office | - | - | - |

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County: Nelson, KY

| Group | Name | Population | Status | Lead Office | Recovery Plan Name | Recovery Plan Action Status | Recovery Plan Stage |
|------------------|---|------------|------------|--|--|-----------------------------|---------------------|
| Clams | Fanshell (<i>Cyprogenia stegaria</i>) | | Endangered | Kentucky Ecological Services Field Office | Fanshell (Mussel) | Implementation Progress | Final |
| Flowering Plants | Running buffalo clover (<i>Trifolium stoloniferum</i>) | | Endangered | Columbus Ohio Field Office | Revised Final Recovery Plan for the Running Buffalo Clover (<i>Trifolium stoloniferum</i>) | Implementation Progress | Final Revision 1 |
| Mammals | Indiana bat (<i>Myotis sodalis</i>) | Entire | Endangered | Bloomington Ecological Services Field Office | Indiana Bat (<i>Myotis sodalis</i>) Draft Recovery Plan: First Revision | Implementation Progress | Draft Revision 1 |
| | Gray bat (<i>Myotis grisescens</i>) | Entire | Endangered | Columbia Ecological Services Field Office | Gray Bat | Implementation Progress | Final |
| | Northern Long-Eared Bat (<i>Myotis septentrionalis</i>) | | Threatened | Twin Cities Ecological Services Field Office | - | - | - |

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Species By County Report

The following report contains Species that are known to or are believed to occur in this county. Species with range unrefined past the state level are now excluded from this report. If you are looking for the Section 7 range (for Section 7 Consultations), please visit the IPaC application.

County: Hardin, KY

| Group | Name | Population | Status | Lead Office | Recovery Plan Name | Recovery Plan Action Status | Recovery Plan Stage |
|------------------|--|------------|------------|--|---|-----------------------------|---------------------|
| Flowering Plants | Egger's sunflower (<i>Helianthus eggeri</i>) | | Recovery | Tennessee Ecological Services Field Office | - | - | - |
| Insects | Rattlesnake-master borer moth (<i>Papaipema eryngii</i>) | | Candidate | Rock Island Ecological Services Field Office | - | - | - |
| Mammals | Indiana bat (<i>Myotis sodalis</i>) | Entire | Endangered | Bloomington Ecological Services Field Office | Indiana Bat (<i>Myotis sodalis</i>) Draft Recovery Plan: First Revision | Implementation Progress | Draft Revision 1 |
| | Gray bat (<i>Myotis grisescens</i>) | Entire | Endangered | Columbia Ecological Services Field Office | Gray Bat | Implementation Progress | Final |
| | Northern Long-Eared Bat (<i>Myotis septentrionalis</i>) | | Threatened | Twin Cities Ecological Services Field Office | - | - | - |

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CONFIDENTIAL INFORMATION**Section 9 – Appendix E – Soil Variability and Construction Cost Matrix**

Soil and rock data were assessed using the Soil Survey for Nelson County, Kentucky; the Soil Survey for Hardin and Larue counties, Kentucky; and the Soil Survey for Bullitt and Spencer counties, Kentucky produced by the United States Department of Agriculture (USDA) in cooperation with Kentucky Agricultural Experiment Station. Per data included in these reports, three categories for limitations of the soils for non-farm and recreational uses were identified: severe, moderate, and slight. EnSiteUSA developed the matrix below based on the limitations noted in the soil survey for county and access roads construction limitation.

A range of cost estimates for rock removal in addition to the base lay construction cost was provided by contractors. These ranges were skewed toward encountering limited quantities of rock during construction. Due to the high presence of rock along these routes, a matrix was developed to better estimate the construction cost for rock trenching that reflected the construction conditions rather than to use one number to estimate all trenching.

| Construction Limitations and Rock Trench Pricing | | | | | |
|--|----------|--------------|----------|---------|---------------|
| | | Rock Depth** | | | |
| | | Shallow | Moderate | Deep | Below Install |
| | | 0'-3' | 3'-6' | 6'-9' | >9' |
| Construction Limitations* | Severe | \$100.00 | \$65.00 | \$5.00 | n/a |
| | Moderate | \$70.00 | \$45.50 | \$10.50 | n/a |
| | Slight | \$25.00 | \$16.25 | \$3.75 | n/a |

*Construction Limitations designated per USDA Soil Surveys

**Rock depth per USDA Soil Surveys and visual review.

(Pricing based on 2015 estimates from contractors.)

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Section 9 – Appendix D: Pictures Along Proposed Routes

Route Origins



Proposed Route A Origin Location with Magnolia Transmission Line



Proposed Routes B and C Origin Location with Magnolia Transmission Line

LOUISVILLE GAS AND ELECTRIC COMPANY

CASE NO. 2016-00371

**Response to Commission Staff's Third Request for Information
Dated February 7, 2017**

Question No. 24

Responding Witness: Lonnie E. Bellar

- Q-24. Refer to LG&E's response to Staff's Second Request, Item 64.d. Explain how LG&E determined the pipeline route, and describe the status of LG&E's negotiations and acquisitions of private easements. Include the number of private easements necessary for the project, the number of private easements obtained to date, and whether LG&E anticipates any changes to the project scope, timeline, or estimated cost as a result of its current status for obtaining private easements.
- A-24. LG&E selected the proposed route taking into consideration information from a route selection study and input from Bullitt County economic and development officials in regards to projected residential/commercial development and locations, and information from a large customer about projections for increased gas usage.

As LG&E has been monitoring this system, it authorized a local gas engineering and design firm to perform a route selection study for a natural gas pipeline to supply gas to LG&E's Mt. Washington high-pressure distribution system with a final report from the study issued in July of 2015. LG&E provided the locations of preferred source points of natural gas and the termination points of the new pipeline. Within the study areas, route corridors were identified using available GIS data. Multiple field surveys were performed by vehicle, and several initial proposed routes were selected for further evaluation. The selected proposed route was not included as part of this route study. A copy of the route study report is attached. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

Subsequent to the route study and having additional information from local officials and other sources, the proposed route was selected. The Company had a local gas engineering and design firm to perform a feasibility study for routes in this corridor and the proposed route was selected due to length and route features. The feasibility study is attached. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection. This route allowed the proposed pipeline to connect to the existing high pressure distribution pipeline at a location that will provide reliability to the system as a second gas source and capacity to serve expected growth. The key

difference from the parameters used in the routing study was the starting point for the proposed pipeline. A revision was made as the Company continued to evaluate options and ultimately found that the proposed starting point selected would provide the desired benefits of improving the reliability of the existing system and would provide capacity at the desired location while minimizing the overall length of the pipeline. Additionally, the proposed route is intended to follow existing electrical line corridors for a considerable portion of route. The attached document displays the starting locations for routes from the route study previously mentioned (report date July 2015) that started at Cox's Creek and the LG&E Bardstown Operations Center and location in relation to the selected starting point. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

A summary of other routes studied in the report and comparison to the selected proposed route include:

- 1) Starting the pipeline in Bardstown near the Maywood subdivision and tie-in (connect) to the end of the system in Boston. The major benefit of this route would be to provide a true second feed for the entire system were considered. However, these routes were rejected because they provide much less benefit to the Hwy 480 corridor where the majority of commercial and light industrial growth is and is expected to occur (without replacing additional pipe between Boston and Hwy 480) and these routes are also 4 to 5 miles longer than the proposed route.
- 2) Starting the pipeline in Bardstown near the Bardstown Operations Center or near Cox's Creek and tie-in near the Clermont or Hwy 480 area. The route from the Bardstown regulator facility would provide a feed along the Hwy 245 corridor, but is an additional 7 miles longer than the proposed route. The route from Cox's Creek does not provide significant additional benefit and is 3 - 4 miles longer than the proposed route.
- 3) Starting the pipeline near Elizabethtown from LG&E's Magnolia gas transmission pipelines and tie-in to the Mt. Washington system near Lebanon Junction. This does provide the benefit of a gas supply from a different gas transmission pipeline system. However, this route is slightly longer and the route is very rocky, likely increasing the cost of construction. In addition, this route would not benefit the Hwy 480 area as much as the proposed route without replacing additional pipeline between Lebanon Junction and Hwy 480.

The pipeline engineering and design is in its beginning stages. The proposed pipeline route is intended to parallel an existing electric corridor for a considerable portion of the route. The engineering and design work along with the easement acquisition processes is just starting and no negotiations have taken place with the landowners. Initially, LG&E will send letters to the property owners along the preliminary route to obtain permission to survey land parcels.

For the proposed route, LG&E estimates approximately 80 easements will need to be acquired. LG&E anticipates that the number of permanent easements will likely change as the route is finalized. As typical for a pipeline project, the timeline and project cost could be impacted by changes that occur during the easement acquisition process, however at this time the Company does not have information that indicates the overall project scope of installing a new pipeline to improve the reliability and provide capacity for growth of the existing system objectives will change.

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July 29, 2015

Attn: Mr. Stephen Beatty
Louisville Gas & Electric Company
10300 Ballardville Road
Louisville, KY 40241

Re: LG&E and KU Services Company Route Selection Study

Dear Mr. Beatty,

Please find attached the Route Selection Study for potential routes to supply natural gas for the Mt. Washington High-Pressure Distribution System. This is the expanded study and includes routes in Bullitt, Hardin, and Nelson counties.

It was a pleasure to perform this study for LG&E, and we hope to be able to continue our partnership on the next phases of this project.

Please let us know if we may be of further service.

Sincerely,
EnSiteUSA, Inc.

A handwritten signature in black ink that reads "Grace Northcutt".

Grace Northcutt, P.E.
Project Manager

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Route Selection Study

Submitted to

Louisville Gas & Electric Co.



for

Potential Routes for Natural Gas Supply to
Mt. Washington High-Pressure Distribution System

Submitted by



Revised July 29, 2015

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Section 1 – Introduction

Louisville Gas & Electric (LG&E) authorized EnSiteUSA, Inc. (EnSiteUSA) to perform a route selection study for a natural gas pipeline to supply the Mount Washington High-Pressure Distribution System in Bullitt, Hardin, and Nelson counties, Kentucky.

The primary purpose of this study was to evaluate potential pipeline routes and to rate the routes based on established factors to determine the most favorable route to provide a natural gas distribution system supply connection. The study would also determine whether there are any obvious natural or man-made obstructions to the project, and to prepare a preliminary facility cost estimate. The study addressed other project particulars that would affect the cost and implementation, including establishing potential gas supply sources and preliminary design parameters.

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Section 2 – Executive Summary

LG&E authorized EnSiteUSA to perform a route selection study for a natural gas pipeline to supply gas to the Mt. Washington High-Pressure Distribution System (HPDS) in Bullitt, Hardin, and Nelson counties, Kentucky. Design parameters for pipe sizing were provided by LG&E. Delivery pressure to the HPDS, which runs through Boston, Lebanon Junction, and Clermont, is to be 205 pounds per square inch gauge (psig), minimum. For natural gas with a high heating value (HHV) of 1,027 British thermal units per cubic foot (BTU/ft³), the required flow rate is 650 million standard cubic feet per hour (mscfh).

LG&E provided the locations of preferred source points of natural gas and the termination points of the new line. Based on these locations, two study areas were defined. The first study area is to the west of the HPDS. The study area encompassed areas in Hardin and Bullitt counties, with routes connecting points south of Radcliff, Kentucky; and Lebanon Junction, Kentucky. EnSiteUSA was directed to use the highway corridors of State Road 313 and State Road 434 toward Lebanon Junction in Bullitt County, Kentucky. The second study area is to the east of the HPDS. The study area encompassed area in Nelson and Bullitt counties with four general corridors (all in Kentucky): one connecting Bardstown to Boston along the Bluegrass Parkway, one connecting Bardstown to Clermont along KY-245, one from Coxs Creek to Clermont along multiple highways, and one from Coxs Creek to Shepherdsville utilizing KY-509 and multiple utility corridors.

Within the study areas, route corridors were identified using available GIS data. Three field surveys were performed by vehicle, and 10 proposed routes were selected for further evaluation. For the purposes of this study, they are designated as routes A through J. The routes use six unique origination points, and six unique measurement station locations were evaluated for termination of the proposed routes.

Of the 10 proposed routes considered, all were contained within Bullitt, Hardin, and Nelson counties, Kentucky. Due to prohibitive costs and regulatory review, a route through neither Fort Knox nor Bernheim Arboretum and Research Forest was considered a viable option.

An 8.625-inch outside diameter (OD) pipe has sufficient capacity for three of the proposed routes (Routes A, B, and C). A 10.750-inch OD pipe has sufficient capacity for five of the proposed routes (Routes D, E, F, G, and H). A 12.750-inch OD pipe has sufficient capacity for two of the proposed routes (Routes I and J). For each route, a larger-diameter pipeline may be required to provide the required pressure and flow rate if the required pressure is not available at the take-off point.

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Eminent domain rights may have a major bearing on right-of-way acquisition. LG&E legal counsel should make a determination on eminent domain rights before proceeding.

LG&E legal counsel and property rights personnel should examine issues regarding occupying (co-locating) previously acquired LG&E right-of-way. Also, determinations need to be made regarding occupying third-party rights-of-way for other utilities and railroad crossings.

The opinion of probable cost (OPC) for the 10 route options is discussed in Section 6, and the summary table is provided below.

| Category | Route A - 10" | Route B - 10" | Route C - 10" | Route D - 10" |
|------------------------------|----------------------|----------------------|----------------------|----------------------|
| Right-of-Way and Sites | \$ 93,000 | \$ 284,000 | \$ 1,294,000 | \$ 118,000 |
| Material | \$ 2,913,000 | \$ 3,103,000 | \$ 2,814,000 | \$ 3,354,000 |
| Installation | \$ 23,812,000 | \$ 25,362,000 | \$ 22,938,000 | \$ 27,531,000 |
| Outside Services | \$ 1,346,000 | \$ 1,401,000 | \$ 1,448,000 | \$ 1,226,000 |
| Measurement Stations and Tap | \$ 159,000 | \$ 159,000 | \$ 159,000 | \$ 159,000 |
| Omissions and Contingencies | \$ 8,498,000 | \$ 9,093,000 | \$ 8,596,000 | \$ 9,717,000 |
| Total Amount | \$ 36,822,000 | \$ 39,403,000 | \$ 37,249,000 | \$ 42,105,000 |
| Category | Route E - 10" | Route F - 10" | Route G - 12" | Route H - 12" |
| Right-of-Way and Sites | \$ 176,000 | \$ 747,000 | \$ 40,000 | \$ 1,224,000 |
| Material | \$ 2,973,000 | \$ 2,791,000 | \$ 5,430,000 | \$ 5,378,000 |
| Installation | \$ 24,605,000 | \$ 22,008,000 | \$ 31,368,000 | \$ 32,261,000 |
| Outside Services | \$ 1,108,000 | \$ 973,000 | \$ 1,543,000 | \$ 1,147,000 |
| Measurement Stations and Tap | \$ 159,000 | \$ 159,000 | \$ 393,000 | \$ 393,000 |
| Omissions and Contingencies | \$ 8,707,000 | \$ 8,004,000 | \$ 11,633,000 | \$ 12,121,000 |
| Total Amount | \$ 37,728,000 | \$ 34,683,000 | \$ 50,405,000 | \$ 52,523,000 |
| Category | Route I - 12" | Route I - 16" | Route J - 12" | Route J - 16" |
| Right-of-Way and Sites | \$ 1,869,000 | \$ 1,869,000 | \$ 1,361,000 | \$ 1,361,000 |
| Material | \$ 5,274,000 | \$ 6,110,000 | \$ 6,625,000 | \$ 7,655,000 |
| Installation | \$ 28,845,000 | \$ 31,424,000 | \$ 38,528,000 | \$ 42,178,000 |
| Outside Services | \$ 1,028,000 | \$ 1,028,000 | \$ 1,028,000 | \$ 1,147,000 |
| Measurement Stations and Tap | \$ 393,000 | \$ 160,000 | \$ 393,000 | \$ 160,000 |
| Omissions and Contingencies | \$ 11,223,000 | \$ 12,178,000 | \$ 14,417,000 | \$ 15,751,000 |
| Total Amount | \$ 48,632,000 | \$ 52,769,000 | \$ 62,351,000 | \$ 68,252,000 |

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Project duration for any of the given routes ranges from 24 to 38 months. Variables considered during the schedule include permit acquisitions, certification acquisition, length of route, estimated rock in right-of-way, and estimated daily construction progress.

The analyses performed on the system design, right-of-way, site acquisition considerations, estimated cost data, and project schedule point to Route F as the preferred route to supply natural gas to the Mt. Washington HPDS. Route D was ranked a very close alternative and should be considered pending negotiations with right-of-way owners.

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Section 3 – System Design

3.1 Definition of the Study Area

The origination and termination points of the new pipeline were set by LG&E and described in the proposal documents. Based on these locations, two study areas were defined.

The first study area is to the west of the HPDS. The study area encompasses area in Hardin and Bullitt counties. Two origination points were designated on the Magnolia Transmission Line south of Radcliff, Kentucky, and were used as the western boundary of the study area. The western boundary was the HPDS in Lebanon Junction, Kentucky. Fort Knox is to the north of the connection points; therefore, to minimize permitting and design restrictions, this served as the northern boundary of the study area. Due to an increase in length of the route and corresponding costs, routes south of Highway 434 were not considered.



Figure 3.1: Study Area I

The second study area is to the east of the HPDS. The study area encompassed area in Nelson and Bullitt counties, with three general routes. One corridor connects a gas line on the east of Bardstown, Kentucky, to the HPDS in Clermont, Kentucky, using the right-of-way of KY-245. A second corridor connects a gas line to the east of Coxs Creek, Kentucky, to the HPDS in Clermont, Kentucky, using both highway right-of-way and existing transmission corridor. A third corridor connects a gas line on the east of Bardstown, Kentucky, to the HPDS in Boston, Kentucky, using the right-of-way of the Bluegrass Parkway, the right-of-way of state highways, and existing transmission corridors. These various corridors form a study area with a southern boundary of the Bluegrass Parkway

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between the interchange with KY-150 and KY-52. The northern boundaries are Shepherdsville, Kentucky, and KY-480. The eastern boundary is LG&E's Calvary Transmission pipeline connecting Bardstown, Kentucky; and Coxs Creek, Kentucky. The western boundary is the HPDS.

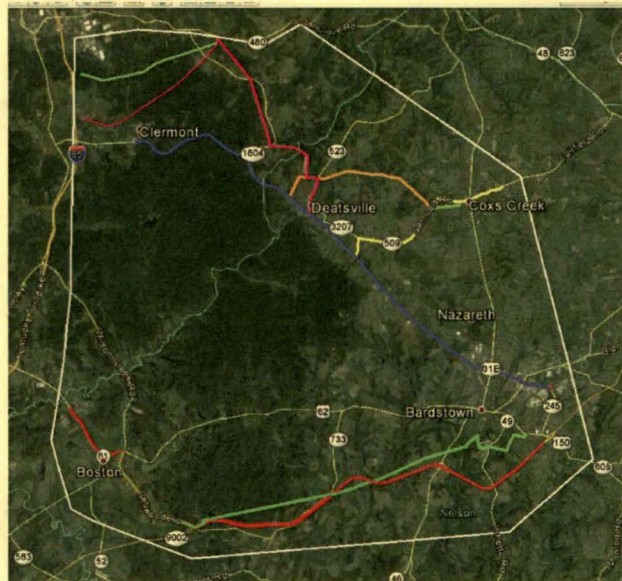


Figure 3.2: Study Area II

LG&E requested the routes use highway or transmission corridors whenever feasible. Highway right-of-way corridors were used primarily on five routes: route A, B, D, E, and G. Five routes were proposed primarily using existing transmission corridors. These routes include C, F, H, I, and J.

3.2 Route Reconnaissance and Preliminary Route Selection

After the study areas were defined, route corridors were identified using GIS information. The potential routes were field checked for feasibility. After evaluation of the field data, 10 potential routes were identified for further evaluation. For the purposes of this study, they are designated as routes A through J.

Route A

Proposed Route A is illustrated in Section 9. Route A is approximately 13.30 miles in length. It begins at the Magnolia Transmission Line in Radcliff, Hardin County, Kentucky. The

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pipeline will terminate at a proposed LG&E delivery measurement and regulating station near the High-Pressure Distribution Main on S. Preston Highway in Lebanon Junction, Bullitt County, Kentucky. The proposed route runs through Hardin and Bullitt counties, Kentucky.

From the Magnolia Transmission Line, the proposed route goes west until intersecting Highway 313. The proposed route follows the Highway 313 right-of-way for 9.86 miles, crossing Highway 251, Mill Creek, Wooldridge Ferry Road, Cedar Creek, Clear Creek, and Mud Creek. At the end of the intersection of Highway 313 and the Highway 434 right-of-way, the route turns north and follows the Highway 434 right-of-way for 3.35 miles and crosses Rolling Fork. The route ends at the intersection of Highway 434 and Highway 61.

A desktop review of threatened and endangered species found a combined total of two plants and two animals listed for Hardin and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route B

Proposed Route B is illustrated in Section 9. Route B is approximately 14.20 miles in length. It begins at the Magnolia Transmission Line in Radcliff, Hardin County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station near the High-Pressure Distribution Main on South Preston Highway in Lebanon Junction, Bullitt County, Kentucky. The proposed route runs through Hardin and Bullitt counties, Kentucky.

From the Magnolia Transmission line, the proposed route runs west for 0.40 mile until intersecting Amy Avenue. The proposed route follows Amy Avenue in a western direction for 0.36 miles. The proposed route then crosses Highway 31W at the end of Amy Avenue and turns north. The proposed route runs in the Highway 31W right-of-way for 0.23 miles until the intersection of Highway 31W and Highway 434. The proposed route turns west and follows the Highway 434 right-of-way for 12.2 miles, crossing Highway 251, Wooldridge Ferry Road, Highway 1115, and Highway 313. During this segment, the route crosses Mill Creek, Cedar Creek, Patty's Branch, Clear Creek, Mud Creek, and Rolling Fork. The proposed route then turns from the highway right-of-way in a western direction through a field for 0.72 miles. At the edge of the highway, the proposed route follows Knoxville Avenue in a northwestern direction for 0.28 mile before crossing South Poplar Street and intersecting South Preston Highway.

A desktop review of threatened and endangered species found a combined total of two plants and two animals listed for Hardin and Bullitt counties, Kentucky, per the U.S. Fish

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and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route C

Proposed Route C is illustrated in Section 9. Route C is approximately 12.80 miles in length. It begins at the Magnolia Transmission Line in Radcliff, Hardin County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station near the High-Pressure Distribution Main on South Preston Highway in Lebanon Junction, Bullitt County, Kentucky. The proposed route runs through Hardin and Bullitt counties, Kentucky.

From the Magnolia Transmission Line, the proposed route runs west for 1.68 miles, crossing South Wilson Road and Highway 31W. The proposed route intersects Highway 434 and follows this right-of-way west for 1.80 miles. The proposed route then turns north and follows an existing pipeline right-of-way for 8.05 miles, crossing Highway 251, Wooldridge Ferry Road, Highway 313, and Highway 434. After crossing Highway 434, the proposed route then runs west through a wooded area for 1.77 miles, where it intersects Knoxville Road. The proposed route then follows Knoxville Avenue in a northwestern direction for 0.43 mile before crossing South Poplar Street and intersecting South Preston Highway. Over its length, the route crosses Mill Creek, Cedar Creek, Patty's Branch, Clear Creek, Mud Creek, and Rolling Fork.

A desktop review of threatened and endangered species found a combined total of two plants and two animals listed for Hardin and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route D

Proposed Route D is illustrated in Section 9. Route D is approximately 15.48 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Bardstown, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main in Clermont, Bullitt County, Kentucky. The proposed route runs through Nelson and Bullitt counties, Kentucky.

The proposed route originates at the LG&E's Calvary Transmission pipeline near the intersection of KY-245 and Granite Drive in Bardstown, Kentucky. The route follows KY-245 north the entire 15.48 miles, terminating in front of the Jim Beam Distillery at the intersection of KY-245 and Horticulture Area Road. KY-245 is a main road in Bardstown. It also crosses Withrow Creek and Long Lick Creek. There are two congested sections, each

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approximately 1.5 miles long. The first section includes a quarry and several retail centers with high traffic volume. The second section includes a high concentration of residential areas, several churches, and a hospital. The last 3.6 miles of the road right-a-way run parallel with several utility transmission corridors that could provide an alternative route.

A desktop review of threatened and endangered species found a combined total of 11 plants and three animals listed for Nelson and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route E

Proposed Route E is illustrated in Section 9. Route E is approximately 13.96 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Coxs Creek, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main in Clermont, Bullitt County, Kentucky. The proposed route runs through Nelson and Bullitt counties, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline, roughly 1.1 miles east of the center of Coxs Creek, Kentucky. The proposed line follows the right-of-way of KY-509 west for 5.12 miles, crossing Coxs Creek, Froman Creek, and Samuels Creek. The route intersects KY-3207 and turns south toward KY-245 for 0.56 mile. The proposed route crosses KY-245 and runs north in the right-of-way for 8.28 miles, crossing Long Lick Creek and terminating in front of the Jim Beam Distillery at the intersection of KY-245 and Horticulture Area Road. The last 3.6 miles of the road right-a-way run parallel with several utility transmission corridors that could provide an alternative route. Additionally, departing from the right-of-way and routing pipeline through fields for 0.47 mile at the corner of KY-509 and KY-3207 could be a viable alternative, as the existing route passes within 40 feet of a church and 200 feet of a school.

A desktop review of threatened and endangered species found a combined total of 11 plants and three animals listed for Nelson and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route F

Proposed Route F is illustrated in Section 9. Route F is approximately 13.04 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Coxs Creek, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main in Clermont,

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Bullitt County, Kentucky. The proposed route runs through Nelson and Bullitt counties, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline, roughly 1.1 miles east of the center of Coxs Creek, Kentucky. The proposed line follows the right-of-way of KY-509 west for 2.39 miles, crossing Coxs Creek, Froman Creek, and Samuels Creek until it intersects a utility right-of-way. The proposed route stays in the utility right-of-way for roughly 5.0 miles. The pipeline then intersects KY-245 and runs north in the right-of-way for 5.65 miles, crossing Long Lick Creek and terminating in front of the Jim Beam Distillery at the intersection of KY-245 and Horticulture Area Road. The last 3.6 miles of the road right-of-way run parallel with several utility transmission corridors that could provide an alternative route.

A desktop review of threatened and endangered species found a combined total of 11 plants and three animals listed for Nelson and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route G

Proposed Route G is illustrated in Section 9. Route G is approximately 17.77 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Bardstown, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main in Boston, Nelson County, Kentucky. The proposed route runs through Nelson County, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline, which intersects the Bluegrass Parkway roughly 400 feet south of exit 25 outside of Bardstown, Kentucky. The proposed line follows the right-of-way of Bluegrass Parkway south for 4.58 miles, crossing Beech Fork and Cedar Creek until the overpass of KY-733. The proposed route follows KY-733 northwest for 3.49 miles, turning west on KY-62 for 0.59 miles in to Boston, Kentucky, crossing Lick Creek along both segments. In Boston, the proposed route intersects KY-61 and follows the right-of-way north for 1.86 miles, terminating near the Booker Noe Jim Beam Distillery at the intersection of KY-61 and an existing gas line. As a note, the entirety of the Bluegrass Parkway right-of-way appears to be directly in surface-grade rock, and two horizontal directional drills may be required to cross Beech Fork.

A desktop review of threatened and endangered species found a total of seven plants and two animals listed for Nelson County, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

CONFIDENTIAL INFORMATION**Route H**

Proposed Route H is illustrated in Section 9. Route H is approximately 16.95 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Bardstown, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main in Boston, Nelson County, Kentucky. The proposed route runs through Nelson County, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline on KY-150 near the southern intersection with Pottershop Loop in Bardstown, Kentucky. The proposed route follows a series of utility corridors and county road right-of-ways for 11 miles, crossing Beech Fork and Cedar Creek. County road rights-of-way were used where utility corridors passed through buildings or containment basins. The corridor terminates near the KY-733 overpass of the Bluegrass Parkway. The proposed route then follows KY-733 northwest for 3.49 miles, turning west on KY-62 for 0.59 mile into Boston, Kentucky, crossing Lick Creek along both segments. In Boston, the proposed route intersects KY-61 and follows the right-of-way north for 1.86 miles, then terminates near the Booker Noe Jim Beam Distillery at the intersection of KY-61 and an existing gas line. As a note, fiber optic lines were present in the utility right-of-way, and up to four horizontal directional drills may be required to cross the Beech Fork and the Bluegrass Parkway.

A desktop review of threatened and endangered species found a total of seven plants and two animals listed for Nelson County, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route I

Proposed Route I is illustrated in Section 9. Route I is approximately 16.76 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Coxs Creek, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main near Shepherdsville, Bullitt County, Kentucky. The proposed route runs through Nelson and Bullitt counties, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline on KY-509 east of Hobbs Lane in Coxs Creek, Kentucky. The proposed route follows a series of utility corridors and state road rights-of-way for its entire 16.76 miles. The proposed route follows KY-509 west out of Coxs Creek, Kentucky, for 1.42 miles, then turns south to follow a private drive for 0.4 mile to a utility corridor. The utility corridor would be used for 4.65 miles, where it terminates at KY-523, just north of Deatsville, Kentucky. The proposed

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route then follows a private road for 0.35 mile west and then north onto a utility corridor. The proposed route follows the transmission corridor for 5.56 miles north, where it intersects another utility corridor just south of KY-480. The route then follows this new corridor 4.38 miles to its termination point near Shepherdsville, Bullitt County, Kentucky. As a note, fiber optic and water lines were present in the state road right-of-way.

A desktop review of threatened and endangered species found a combined total of 11 plants and three animals listed for Nelson and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

Route J

Proposed Route J is illustrated in Section 9. Route J is approximately 21.28 miles in length. The proposed route originates at LG&E's Calvary Transmission pipeline in Bardstown, Nelson County, Kentucky. The pipeline will terminate at a proposed LG&E delivery measurement and regulating station on the High-Pressure Distribution Main near Shepherdsville, Bullitt County, Kentucky. The proposed route runs through Nelson and Bullitt counties, Kentucky.

The proposed route originates at LG&E's Calvary Transmission pipeline located on KY-245, near the Granite Drive intersection in Bardstown, Kentucky. The proposed route follows a series of utility corridors and state road rights-of-way for its entire 21.28 miles. The proposed route follows KY-245 northwest out of Bardstown for 9.10 miles, turning north onto KY-523 for 1.19 miles into Deatsville, Kentucky. The KY-523 right-of-way would be used until it intersects KY-509, just north of Deatsville, Kentucky. The proposed route then follows a private road for 0.35 mile west, and then north onto a utility corridor. The proposed route follows the utility corridor for 5.54 miles north, where it intersects another utility corridor just south of KY-480. The route then follows this new corridor 5.10 miles to its termination point near Shepherdsville, Bullitt County, Kentucky. As a note, fiber optic and water lines were present in the state road right-of-way.

A desktop review of threatened and endangered species found a combined total of 11 plants and three animals listed for Nelson and Bullitt counties, Kentucky, per the U.S. Fish and Wildlife Service, Environmental Conservation Online System, Species by County Report included in Section 9.

3.3 Flow Analysis and Preliminary System Design

Design Basis

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Preliminary pipeline design is based on documentation provided to EnSiteUSA from LG&E in Proposal No. 800757, noting the required natural gas delivery pressure of 205 psig at a flow rate of 650 mscfh at the High-Pressure Distribution Main.

Preliminary flow calculations (GASCalc 4.0) indicate an 8.625-inch outside diameter pipe has sufficient capacity for three of the proposed routes (A, B, and C). A 10.750-inch OD pipe has sufficient capacity for five of the proposed routes (D, E, F, G, and H). A 12.750-inch OD pipe has sufficient capacity for two of the proposed routes (I and J).

At all origination points, a launcher/receiver will be required. At the High-Pressure Distribution Main, a launcher/receiver and metering and regulating skid will be required. This will provide operation control and will include measurement equipment, flow control, a pig launcher for in-line inspection and cleaning tools, pipeline isolation, and blow-down valves.

Based on the observed population density and current U.S. Pipeline Safety Regulations (U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration [USDOT/PHMSA]), CFR Title 49 Part 192, §192.179, at least one sectionalizing block valve near the midpoints of the pipeline will be required on all routes.

Portions of each proposed route traverse Class 1, Class 2, and Class 3 population density locations as defined by §192.5 in Table 3.1.

| Class location | Population density¹ | Design factor² |
|-----------------------|--|----------------------------------|
| 1 | fewer than 10 | 0.72 |
| 2 | more than 10 but fewer than 46 | 0.60 |
| 3 | 46 or more | 0.50 |
| 4 | areas in the corridor where buildings with four or more stories above ground are prevalent | 0.40 |

Notes:

¹Buildings intended for human occupancy in a 1,320-foot-wide corridor centered on the pipeline in a continuous mile.

²Design factor to be used in design formula for steel pipe

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The number of significant crossings (road, railroad, waterbody, and wetland) for each route is noted in Table 3.4 below. Permits and/or occupancy agreements will be required for these crossings.

Line pipe would be carbon steel manufactured in accordance with API 5L “API Specification for Line Pipe.” For conceptual design and as the basis for the Opinion of Probable Cost, it is assumed that the pipeline is designed for a maximum allowable operating pressure (MAOP) of 720 psig and the valve station, sectionalizing block valves, and receiving station are designed for ANSI 300 (720 psig) service.

3.4 Comparative Methodology for Route Evaluation

Ranking Hierarchy

The criteria for route selection was listed and placed into category (A through J) and subcategory (C1 through H3) classes to evaluate each route.

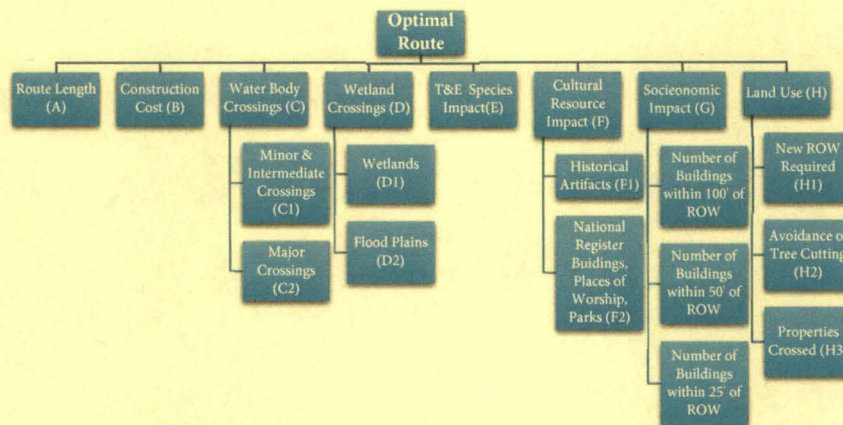


Figure 3.3: Ranking Hierarchy

Intensity Value

Each category, or subcategory, as appropriate, was assigned an intensity value using a 1 to 9 ranking scale.

Table 3.2
Intensity Value

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| LG&E Mt. Washington HPDS | |
|--------------------------|------------------------|
| Intensity Value | Definition |
| 1 | Low Importance |
| 3 | Moderate Importance |
| 5 | Strong Importance |
| 7 | Very Strong Importance |
| 9 | Extreme Importance |

Evaluation Factors

The intensity values were assigned to the categories/subcategories and given a relative weight factor, which is the individual intensity value divided by the sum of all intensity values. The relative weight factor is referred to as the Evaluation Factor.

| Table 3.3 Evaluation Factors LG&E Mt. Washington HPDS | | | | | | | | |
|---|--------------------|---------|--------|---------|--------|--------|--------|---------|
| Factor | Evaluation Factors | | | | | | | |
| | (A) | (B) | (C1) | (C2) | (D1) | (D2) | (E) | (F1) |
| Intensity Value | 1 | 9 | 3 | 7 | 7 | 5 | 5 | 9 |
| Importance Weight | 1.149% | 10.345% | 3.448% | 8.046% | 8.046% | 5.747% | 5.747% | 10.345% |
| Factor | (F2) | (G1) | (G2) | (G3) | (H1) | (H2) | (H3) | Total |
| Intensity Value | 7 | 5 | 7 | 9 | 3 | 5 | 5 | 87 |
| Importance Weight | 8.046% | 5.747% | 8.046% | 10.345% | 3.448% | 5.747% | 5.747% | 100.00% |

Features and Design Considerations

Table 3.4 provides a comparative summary of the major design considerations for the 10 route options.

| Table 3.4 Comparative Summary of Feature and Design Consideration for Route Options LG&E Mt. Washington HPDS | | | | | |
|--|-------|-------|-------|-------|-------|
| Features and Design Considerations | A | B | C | D | E |
| Route Length (miles) | 13.30 | 14.20 | 12.80 | 15.48 | 13.96 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | 1 | 1 | 1 | - | - |
| Number of Stream Crossings | 4 | 7 | 7 | 6 | 5 |
| Wetlands Crossed | | | | | |
| Freshwater Emergent (acres) ¹ | 0.16 | 0.22 | 0.22 | 0.12 | 0.13 |
| Freshwater Forested/Shrub (acres) ¹ | - | 1 | 64 | - | 0 |
| Lakes/Ponds (acres) ¹ | - | - | - | - | - |

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|---|-------|--------|-------|--------|--------|
| Woody Wetlands (acres) ¹ | - | - | - | - | - |
| Length of Route Thru Floodplain Ordinance Review Areas (miles) | - | - | - | 0 | 0 |
| Land Use | | | | | |
| New ROW Required (miles) | 0.10 | - | 10.48 | - | 0.94 |
| Number of Properties Crossed | 77.00 | 129.00 | 96.00 | 139.00 | 104.00 |
| Number of Properties Crossed (per mile) | 5.79 | 9.08 | 7.50 | 8.98 | 7.45 |
| Deciduous Forest (acres) | - | 0.72 | 64.36 | - | - |
| Evergreen Forest (acres) | - | - | - | - | - |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 30 | 91 | 19 | 40 | 55 |
| Buildings Within 100 feet of the ROW (per mile) | 2 | 6 | 1 | 3 | 4 |
| Buildings Within 50 feet of the ROW (Count) | 28 | 18 | 10 | 4 | 5 |
| Buildings Within 50 feet of the ROW (per mile) | 2 | 1 | 1 | 0 | 0 |
| Buildings Within 25 feet of the ROW (Count) | 6 | - | 3 | 1 | - |
| Buildings Within 25 feet of the ROW (per mile) | 0 | - | 0 | 0 | - |
| T&E Species | | | | | |
| Animals | 2 | 2 | 2 | 11 | 11 |
| Plants | 2 | 2 | 2 | 3 | 3 |
| Road & Railroad Crossings | | | | | |
| Number of U.S. Road Crossings | 2 | 2 | 1 | 2 | 1 |
| Number of State Road Crossings | 5 | - | 10 | 4 | 1 |
| Number of County Road Crossings | 3 | 5 | 2 | 21 | 17 |
| Number of City Road Crossings | 2 | 14 | 2 | - | - |
| Number of Railroad Crossings | 2 | 3 | 1 | 2 | 1 |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | - | - | 3 | - | - |
| Number of Schools ² | 1 | - | - | 3 | 4 |
| Number of Places of Worship ² | 4 | 2 | 1 | 4 | 5 |
| Number of Parks ² | - | 1 | 1 | 2 | - |
| National Register Buildings ² | 1 | - | - | - | - |
| Number Recorded Archaeological Sites | - | - | - | - | - |
| Length of Route Thru High-Potential Archaeological Areas (feet) | - | - | - | - | - |
| Length of Route Thru Park Land (feet) | - | - | - | - | - |
| Features and Design Considerations | | | | | |
| | F | G | H | I | J |
| Route Length (miles) | 13.04 | 17.77 | 16.95 | 16.76 | 21.28 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | - | 2 | 2 | - | - |
| Number of Stream Crossings | 6 | 2 | 9 | 10 | 8 |
| Wetlands Crossed | | | | | |
| Freshwater Emergent (acres) ¹ | 0.24 | 0.21 | 0.25 | 0.12 | 0.14 |

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| | | | | | |
|---|-------|-------|-------|--------|--------|
| Freshwater Forested/Shrub (acres) ¹ | 0 | - | - | 0 | - |
| Lakes/Ponds (acres) ¹ | - | - | - | - | - |
| Woody Wetlands (acres) ¹ | - | 1 | 1 | - | - |
| Length of Route Thru Floodplain Ordinance Review Areas (miles) | 0 | - | - | 0 | 0 |
| Land Use | | | | | |
| New ROW Required (miles) | 5.94 | - | 10.28 | 15.32 | 10.99 |
| Number of Properties Crossed | 60.00 | 51.00 | 82.00 | 118.00 | 155.00 |
| Number of Properties Crossed (per mile) | 4.60 | 2.87 | 4.84 | 7.04 | 7.28 |
| Deciduous Forest (acres) | - | - | - | - | - |
| Evergreen Forest (acres) | - | - | - | - | - |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 32 | 18 | 13 | 25 | 48 |
| Buildings Within 100 feet of the ROW (per mile) | 2 | 1 | 1 | 1 | 2 |
| Buildings Within 50 feet of the ROW (Count) | 4 | 13 | 12 | 2 | 11 |
| Buildings Within 50 feet of the ROW (per mile) | 0 | 1 | 1 | 0 | 1 |
| Buildings Within 25 feet of the ROW (Count) | - | 7 | 5 | 1 | 2 |
| Buildings Within 25 feet of the ROW (per mile) | - | 0 | 0 | 0 | 0 |
| T&E Species | | | | | |
| Animals | 11 | 7 | 7 | 11 | 11 |
| Plants | 3 | 2 | 2 | 3 | 3 |
| Road & Railroad Crossings | | | | | |
| Number of U.S. Road Crossings | 1 | 1 | 3 | 1 | 2 |
| Number of State Road Crossings | 1 | 2 | 2 | 4 | 10 |
| Number of County Road Crossings | 6 | 2 | 3 | 2 | 7 |
| Number of City Road Crossings | - | 1 | 1 | 5 | 9 |
| Number of Railroad Crossings | 1 | 1 | 1 | - | 3 |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | - | - | - | - | 1 |
| Number of Schools ² | 3 | 1 | 1 | - | 1 |
| Number of Places of Worship ² | 4 | 2 | 1 | - | 1 |
| Number of Parks ² | - | - | - | - | 3 |
| National Register Buildings ² | - | - | - | - | - |
| Number Recorded Archaeological Sites | - | - | - | - | - |
| Length of Route Thru High-Potential Archaeological Areas (feet) | - | - | - | - | - |
| Length of Route Thru Park Land (feet) | - | - | - | - | - |

Opinion of Probable Cost Comparison

Table 3.5 provides a comparison of the probable costs (Opinion of Probable Cost) for the 10 route options.

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| Features and Design Considerations | Route A | Route B | Route C | Route D | Route E |
|--|-----------|-----------|-----------|-----------|-----------|
| Opinion of Probable Cost (Thousand \$\$) | \$ 36,822 | \$ 39,403 | \$ 37,249 | \$ 42,105 | \$ 37,728 |
| Features and Design Considerations | Route F | Route G | Route H | Route I | Route J |
| Opinion of Probable Cost (Thousand \$\$) | \$ 34,683 | \$ 50,405 | \$ 53,523 | \$ 48,632 | \$ 62,351 |

At this level, the Opinion of Probable Cost may be described as being somewhere between a rough order-of-magnitude estimate and a second-order approximation. The Opinion of Probable Cost has a contingency of plus or minus 20 percent (+/-20%).

The Opinion of Probable Cost is made assuming current pipe and material costs, historical values for rights-of-way (where needed) plus damages, and drawing on empirical knowledge regarding installation costs, variables encountered during construction (number and type of crossings, amount of rock trench), construction duration, and crew (construction, inspection and commissioning) sizes.

Normalized Raw Data

Table 3.6 normalizes the raw data from Tables 3.4 and 3.5.

This is done by summing the values (routes A through J) of each feature in Tables 3.4 and 3.5, then dividing the individual feature value by the sum for that feature.

| Features and Design Considerations | A | B | C | D | E |
|--|-------|-------|-------|-------|-------|
| Route Length (miles) | 0.085 | 0.091 | 0.082 | 0.100 | 0.090 |
| Opinion of Probable Cost (Thousand \$\$) | 0.083 | 0.089 | 0.084 | 0.095 | 0.085 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | 0.143 | 0.143 | 0.143 | 0.000 | 0.000 |
| Number of Stream Crossings | 0.063 | 0.109 | 0.109 | 0.094 | 0.078 |
| Wetlands Crossed | | | | | |
| Freshwater Emergent (acres) ¹ | 0.087 | 0.121 | 0.121 | 0.068 | 0.073 |
| Freshwater Forested/Shrub (acres) ¹ | 0.000 | 0.011 | 0.984 | 0.000 | 0.002 |
| Lakes/Ponds (acres) ¹ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Woody Wetlands (acres) ¹ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Length of Route Thru Floodplain Ordinance Review Areas (miles) | 0.000 | 0.000 | 0.000 | 0.041 | 0.184 |

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| Land Use | | | | | |
|---|----------|----------|----------|----------|----------|
| New ROW Required (miles) | 0.002 | 0.000 | 0.194 | 0.000 | 0.017 |
| Number of Properties Crossed | 0.076 | 0.128 | 0.095 | 0.137 | 0.103 |
| Number of Properties Crossed (per mile) | 0.088 | 0.139 | 0.115 | 0.137 | 0.114 |
| Deciduous Forest (acres) | 0.000 | 0.011 | 0.989 | 0.000 | 0.000 |
| Evergreen Forest (acres) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 0.081 | 0.245 | 0.051 | 0.108 | 0.148 |
| Buildings Within 100 feet of the ROW (per mile) | 0.092 | 0.260 | 0.060 | 0.105 | 0.160 |
| Buildings Within 50 feet of the ROW (Count) | 0.262 | 0.168 | 0.093 | 0.037 | 0.047 |
| Buildings Within 50 feet of the ROW (per mile) | 0.294 | 0.177 | 0.109 | 0.036 | 0.050 |
| Buildings Within 25 feet of the ROW (Count) | 0.240 | 0.000 | 0.120 | 0.040 | 0.000 |
| Buildings Within 25 feet of the ROW (per mile) | 0.283 | 0.000 | 0.147 | 0.041 | 0.000 |
| T&E Species | | | | | |
| Animals | 0.027 | 0.027 | 0.027 | 0.147 | 0.147 |
| Plants | 0.080 | 0.080 | 0.080 | 0.120 | 0.120 |
| Road & Railroad Crossings | | | | | |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | 0.000 | 0.000 | 0.750 | 0.000 | 0.000 |
| Number of Schools ² | 0.071 | 0.000 | 0.000 | 0.214 | 0.286 |
| Number of Places of Worship ² | 0.167 | 0.083 | 0.042 | 0.167 | 0.208 |
| Number of Parks ² | 0.000 | 0.143 | 0.143 | 0.286 | 0.000 |
| National Register Buildings ² | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number Recorded Archaeological Sites | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Length of Route Thru High-Potential Archaeological Areas (feet) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Length of Route Thru Park Land (feet) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Features and Design Considerations | | | | | |
| | F | G | H | I | J |
| Route Length (miles) | 0.084 | 0.114 | 0.109 | 0.108 | 0.137 |
| Opinion of Probable Cost (Thousand \$\$) | 0.078 | 0.114 | 0.121 | 0.110 | 0.141 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | 0.000 | 0.286 | 0.286 | 0.000 | 0.000 |
| Number of Stream Crossings | 0.094 | 0.031 | 0.141 | 0.156 | 0.125 |
| Wetlands Crossed | | | | | |
| Freshwater Emergent (acres) ¹ | 0.134 | 0.117 | 0.138 | 0.065 | 0.076 |
| Freshwater Forested/Shrub (acres) ¹ | 0.002 | 0.000 | 0.000 | 0.002 | 0.000 |
| Lakes/Ponds (acres) ¹ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Woody Wetlands (acres) ¹ | 0.000 | 0.500 | 0.500 | 0.000 | 0.000 |
| Length of Route Thru Floodplain Ordinance Review Areas (miles) | 0.184 | 0.000 | 0.000 | 0.308 | 0.283 |
| Land Use | | | | | |
| New ROW Required (miles) | 0.110 | 0.000 | 0.190 | 0.283 | 0.203 |

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|---|-------|-------|-------|-------|-------|
| Number of Properties Crossed | 0.059 | 0.050 | 0.081 | 0.117 | 0.153 |
| Number of Properties Crossed (per mile) | 0.070 | 0.044 | 0.074 | 0.108 | 0.111 |
| Deciduous Forest (acres) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Evergreen Forest (acres) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 0.086 | 0.049 | 0.035 | 0.067 | 0.129 |
| Buildings Within 100 feet of the ROW (per mile) | 0.100 | 0.041 | 0.031 | 0.061 | 0.091 |
| Buildings Within 50 feet of the ROW (Count) | 0.037 | 0.121 | 0.112 | 0.019 | 0.103 |
| Buildings Within 50 feet of the ROW (per mile) | 0.043 | 0.102 | 0.099 | 0.017 | 0.072 |
| Buildings Within 25 feet of the ROW (Count) | 0.000 | 0.280 | 0.200 | 0.040 | 0.080 |
| Buildings Within 25 feet of the ROW (per mile) | 0.000 | 0.247 | 0.185 | 0.037 | 0.059 |
| T&E Species | | | | | |
| Animals | 0.147 | 0.093 | 0.093 | 0.147 | 0.147 |
| Plants | 0.120 | 0.080 | 0.080 | 0.120 | 0.120 |
| Road & Railroad Crossings | | | | | |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.250 |
| Number of Schools ² | 0.214 | 0.071 | 0.071 | 0.000 | 0.071 |
| Number of Places of Worship ² | 0.167 | 0.083 | 0.042 | 0.000 | 0.042 |
| Number of Parks ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.429 |
| National Register Buildings ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number Recorded Archaeological Sites | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Length of Route Thru High-Potential Archaeological Areas (feet) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Length of Route Thru Park Land (feet) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Weighted Normalized Data

Table 3.7 weighs the normalized data for each route (from Table 3.6) by multiplying the normalized data (Table 3.6) by the evaluation factor (from Table 3.3; also listed in Table 3.6).

| Features and Design Considerations | A | B | C | D | E |
|--|-------|-------|-------|-------|-------|
| Route Length (miles) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Opinion of Probable Cost (Thousand \$\$) | 0.009 | 0.009 | 0.009 | 0.010 | 0.009 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | 0.011 | 0.011 | 0.011 | 0.000 | 0.000 |
| Number of Stream Crossings | 0.002 | 0.004 | 0.004 | 0.003 | 0.003 |
| Wetlands Crossed | | | | | |

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| | | | | | |
|---|-------|-------|-------|-------|-------|
| Freshwater Emergent (acres) ¹ | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 |
| Land Use | | | | | |
| New ROW Required (miles) | 0.000 | 0.000 | 0.007 | 0.000 | 0.001 |
| Number of Properties Crossed | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of Properties Crossed (per mile) | 0.005 | 0.008 | 0.007 | 0.008 | 0.007 |
| Deciduous Forest (acres) | 0.000 | 0.000 | 0.028 | 0.000 | 0.000 |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| Buildings Within 100 feet of the ROW (per mile) | 0.005 | 0.015 | 0.003 | 0.006 | 0.009 |
| Buildings Within 50 feet of the ROW (per mile) | 0.024 | 0.014 | 0.009 | 0.003 | 0.004 |
| Buildings Within 25 feet of the ROW (per mile) | 0.029 | 0.000 | 0.015 | 0.004 | 0.000 |
| T&E Species | | | | | |
| Animals | 0.001 | 0.001 | 0.001 | 0.004 | 0.004 |
| Plants | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 |
| Number of Schools ² | 0.001 | 0.000 | 0.000 | 0.003 | 0.004 |
| Number of Places of Worship ² | 0.002 | 0.001 | 0.001 | 0.002 | 0.003 |
| Number of Parks ² | 0.000 | 0.002 | 0.002 | 0.004 | 0.000 |
| Features and Design Considerations | | | | | |
| | F | G | H | I | J |
| Route Length (miles) | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 |
| Opinion of Probable Cost (Thousand \$\$) | 0.008 | 0.012 | 0.013 | 0.011 | 0.015 |
| Waterbody Crossings | | | | | |
| Number of River Crossings | 0.000 | 0.023 | 0.023 | 0.000 | 0.000 |
| Number of Stream Crossings | 0.003 | 0.001 | 0.005 | 0.005 | 0.004 |
| Wetlands Crossed | | | | | |
| Freshwater Emergent (acres) ¹ | 0.003 | 0.002 | 0.003 | 0.001 | 0.002 |
| Land Use | | | | | |
| New ROW Required (miles) | 0.004 | 0.000 | 0.007 | 0.010 | 0.007 |
| Number of Properties Crossed | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of Properties Crossed (per mile) | 0.004 | 0.003 | 0.004 | 0.006 | 0.006 |
| Deciduous Forest (acres) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Socioeconomic Impact | | | | | |
| Buildings Within 100 feet of the ROW (Count) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Buildings Within 100 feet of the ROW (per mile) | 0.006 | 0.002 | 0.002 | 0.003 | 0.005 |
| Buildings Within 50 feet of the ROW (per mile) | 0.003 | 0.008 | 0.008 | 0.001 | 0.006 |
| Buildings Within 25 feet of the ROW (per mile) | 0.000 | 0.026 | 0.019 | 0.004 | 0.006 |

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| T&E Species | | | | | |
|--|-------|-------|-------|-------|-------|
| Animals | 0.004 | 0.003 | 0.003 | 0.004 | 0.004 |
| Plants | 0.003 | 0.002 | 0.002 | 0.003 | 0.003 |
| Cultural Resources | | | | | |
| Number of Cemeteries ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 |
| Number of Schools ² | 0.003 | 0.001 | 0.001 | 0.000 | 0.001 |
| Number of Places of Worship ² | 0.002 | 0.001 | 0.001 | 0.000 | 0.001 |
| Number of Parks ² | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 |

Route Evaluation

Table 3.8 provides the basis for comparison of the 10 routes. The “Features and Design Considerations” categories are totaled. The lowest numerical value in the “Total” row indicates the least relative impact. A numerical value (1 to 10) was then assigned to each route.

| Table 3.8 Route Evaluation LG&E Mt. Washington HPDS | | | | | |
|---|---------------|---------------|---------------|---------------|---------------|
| Features | Route A | Route B | Route C | Route D | Route E |
| Route Length (miles) | 0.0010 | 0.0010 | 0.0009 | 0.0011 | 0.0010 |
| Opinion of Probable Cost (Thousand \$\$) | 0.1072 | 0.1300 | 0.1034 | 0.1034 | 0.1034 |
| Waterbody Crossings | 0.0136 | 0.0153 | 0.0153 | 0.0032 | 0.0027 |
| Wetlands Crossed | 0.0018 | 0.0027 | 0.0222 | 0.0037 | 0.0121 |
| Land Use | 0.0051 | 0.0083 | 0.0417 | 0.0079 | 0.0071 |
| Socioeconomic Impact | 0.0582 | 0.0292 | 0.0275 | 0.0131 | 0.0132 |
| T&E Species | 0.0031 | 0.0031 | 0.0031 | 0.0077 | 0.0077 |
| Cultural Resources | 0.0166 | 0.0030 | 0.0125 | 0.0089 | 0.0066 |
| Total | 0.2067 | 0.1926 | 0.2266 | 0.1492 | 0.1539 |
| Rank | 9 | 8 | 10 | 1 | 3 |
| Features | Route F | Route G | Route H | Route I | Route J |
| Route Length (miles) | 0.0010 | 0.0013 | 0.0013 | 0.0012 | 0.0016 |
| Opinion of Probable Cost (Thousand \$\$) | 0.1034 | 0.1034 | 0.1034 | 0.1034 | 0.1034 |
| Waterbody Crossings | 0.0032 | 0.0241 | 0.0278 | 0.0054 | 0.0043 |
| Wetlands Crossed | 0.0133 | 0.0124 | 0.0128 | 0.0190 | 0.0178 |
| Land Use | 0.0078 | 0.0025 | 0.0108 | 0.0160 | 0.0134 |
| Socioeconomic Impact | 0.0092 | 0.0362 | 0.0289 | 0.0087 | 0.0172 |
| T&E Species | 0.0077 | 0.0050 | 0.0050 | 0.0077 | 0.0077 |
| Cultural Resources | 0.0051 | 0.0021 | 0.0015 | - | 0.0106 |

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| | | | | | |
|-------|--------|--------|--------|--------|--------|
| Total | 0.1507 | 0.1870 | 0.1916 | 0.1614 | 0.1760 |
| Rank | 2 | 6 | 7 | 4 | 5 |

Using the Comparative Methodology Evaluation, the route with the lowest score, Route D, is considered the preferred route.

3.5 Validation of Comparative Methodology for Route Evaluation

A derivation of the Alternate Route and Analysis and Evaluation model from the Electric Power Research Institute (EPRI) and the Georgia Transmission Corporation (GTC) Standardized Methodology for Siting Overhead Electric Transmission Lines report was used to validate the Comparative Methodology Evaluation.

Table 3.9 groups the Features and Design Considerations categories from the Comparative Methodology Evaluation into three perspectives—Built Environment, Natural Environment, and Engineering Considerations—to provide a simple composite where all perspectives are equally important.

| Table 3.9 Perspective Grouping LG&E Mt. Washington HPDS | |
|---|---|
| Features and Design Considerations | |
| BUILT ENVIRONMENT | |
| Land Use | |
| | New ROW Required (miles) |
| | Number of Properties Crossed |
| | Number of Properties Crossed (per mile) |
| Socioeconomic Impact | |
| | Buildings Within 100 feet of the ROW (count) |
| | Buildings Within 100 feet of the ROW (per mile) |
| | Buildings Within 50 feet of the ROW (count) |
| | Buildings Within 50 feet of the ROW (per mile) |
| | Buildings Within 25 feet of the ROW (count) |
| | Buildings Within 25 feet of the ROW (per mile) |
| Cultural Resources | |
| | Number of Cemeteries ² |
| | Number of Schools ² |
| | Number of Places of Worship ² |
| | Number of Parks ² |
| | National Register Buildings ² |
| | Number of Recorded Archeological Sites |
| | Length of Route Through High-Potential Archeological Areas (feet) |

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| |
|---|
| Length of Route Thru Park Land (feet) |
| NATURAL ENVIRONMENT |
| Waterbody Crossings |
| Number of River Crossings |
| Number of Stream Crossings |
| Wetlands Crossed |
| Freshwater Emergent (acres) ¹ |
| Land Use |
| Deciduous Forest (acres) |
| Evergreen Forest (acres) |
| T&E Species |
| Animals |
| Plants |
| ENGINEERING CONSIDERATIONS |
| Route Length (miles) |
| Opinion of Probable Cost (Thousand \$) |
| Road & Railroad Crossings |
| Number of U.S. Road Crossings |
| Number of State Road Crossings |
| Number of County Road Crossings |
| Number of City Road Crossings |
| Number of Railroad Crossings |

Notes:

¹National Wetland Inventory data source

²Within 660 feet of proposed route

Table 3.10 provides a simple composite ranking where all perspectives are equally important.

| Feature/Consideration | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|-----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Built Environment | 0.0800 | 0.0402 | 0.0533 | 0.0300 | 0.0270 | 0.0221 | 0.0408 | 0.0412 | 0.0247 | 0.0412 |
| Natural Environment | 0.0185 | 0.0213 | 0.0690 | 0.0146 | 0.0224 | 0.0242 | 0.0415 | 0.0456 | 0.0321 | 0.0298 |
| Engineering Considerations | 0.0096 | 0.0103 | 0.0096 | 0.0110 | 0.0098 | 0.0091 | 0.0131 | 0.0138 | 0.0126 | 0.0161 |
| Total | 0.1081 | 0.0718 | 0.1319 | 0.0556 | 0.0593 | 0.0554 | 0.0953 | 0.1006 | 0.0693 | 0.0871 |
| Rank | 9 | 5 | 10 | 2 | 3 | 1 | 7 | 8 | 4 | 6 |

Numerically, the values for Routes A through J in the Simple Composite are the same as the Route Evaluation (Table 3.8) in Section 3.4, totaled for each category.

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Each perspective for the routes in the Simple Composite was then weighted at five times the other perspectives to determine which route is statistically better from each perspective without disregarding the other perspectives (Tables 3.11 – 3.13).

| Feature / Consideration | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Built Environment | 0.4000 | 0.2010 | 0.2664 | 0.1498 | 0.1349 | 0.1105 | 0.2039 | 0.2062 | 0.1233 | 0.2060 |
| Natural Environment | 0.0185 | 0.02 | 0.0690 | 0.0146 | 0.0224 | 0.0242 | 0.0415 | 0.0456 | 0.0321 | 0.0298 |
| Engineering Considerations | 0.0096 | 0.0103 | 0.0096 | 0.0110 | 0.0098 | 0.0091 | 0.0131 | 0.0138 | 0.0126 | 0.0161 |
| Total | 0.4281 | 0.2326 | 0.3450 | 0.1754 | 0.1672 | 0.1438 | 0.2584 | 0.2656 | 0.1679 | 0.2519 |
| Rank | 10 | 5 | 9 | 4 | 2 | 1 | 7 | 8 | 3 | 6 |

| Feature / Consideration | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Built Environment | 0.0800 | 0.0402 | 0.0533 | 0.0300 | 0.0270 | 0.0221 | 0.0408 | 0.0412 | 0.0247 | 0.0412 |
| Natural Environment | 0.0923 | 0.1066 | 0.3449 | 0.0732 | 0.1121 | 0.1210 | 0.2073 | 0.2282 | 0.1603 | 0.1489 |
| Engineering Considerations | 0.0096 | 0.0103 | 0.0096 | 0.0110 | 0.0098 | 0.0091 | 0.0131 | 0.0138 | 0.0126 | 0.0161 |
| Total | 0.1819 | 0.1570 | 0.4078 | 0.1141 | 0.1490 | 0.1522 | 0.2611 | 0.2832 | 0.1976 | 0.2062 |
| Rank | 5 | 4 | 10 | 1 | 2 | 3 | 8 | 9 | 6 | 7 |

| Feature / Consideration | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Built Environment | 0.08 | 0.0402 | 0.0533 | 0.0300 | 0.0270 | 0.0221 | 0.0408 | 0.0412 | 0.0247 | 0.0412 |
| Natural Environment | 0.0185 | 0.0213 | 0.0690 | 0.0146 | 0.0224 | 0.0242 | 0.0415 | 0.0456 | 0.0321 | 0.0298 |
| Engineering Considerations | 0.0479 | 0.0513 | 0.0482 | 0.0549 | 0.0492 | 0.0453 | 0.0654 | 0.0688 | 0.0630 | 0.0807 |
| Total | 0.1464 | 0.1128 | 0.1705 | 0.0995 | 0.0986 | 0.0916 | 0.1477 | 0.1556 | 0.1197 | 0.1517 |
| Rank | 6 | 4 | 10 | 3 | 2 | 1 | 7 | 9 | 5 | 8 |

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The Simple Composite ranks Route F as the preferred route. Route D, however, is so similar in its result that it could also be considered a preferred route.

The Built Environment Bias and the Engineering Considerations Bias both rank Route F as the preferred route. The Natural Environment Bias ranks Route D as the preferred route.

Table 3.14 provides a summary of the biased rankings; Table 3.15 is a summary of the Simple Composite plus all biased rankings.

| Summary - Biased only | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Total | 0.7564 | 0.5024 | 0.9233 | 0.3890 | 0.4148 | 0.3876 | 0.6672 | 0.7044 | 0.4852 | 0.6098 |
| Rank | 9 | 5 | 10 | 2 | 3 | 1 | 7 | 8 | 4 | 6 |

| Summary - Simple Composite + Biased | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Total | 0.8644 | 0.5742 | 1.0552 | 0.4446 | 0.4740 | 0.4430 | 0.7625 | 0.8051 | 0.5545 | 0.6969 |
| Rank | 9 | 5 | 10 | 2 | 3 | 1 | 7 | 8 | 4 | 6 |

Conclusion

The Comparative Methodology for Route Evaluation in Section 3.4 ranked Route F as the preferred route. Route D, however, is again so similar in its results that it could also be considered a preferred route.

This ranking was validated by regrouping the evaluation factors into three perspectives and applying a bias to each perspective to determine which route is statistically better from each perspective. Route F was the preferred route in the biased rankings from the Built Environment and Engineering Considerations perspectives. The summaries of both the Biased ranking and the Aggregate (Simple Composite + Biased) ranking prefer Route F, with Route D ranked closely behind it.

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Section 4 – Regulatory Considerations and Permitting Requirements

4.1 Required Permitting Table

| Table 4.1 Permitting Requirements by Route LG&E Mt. Washington High-Pressure Distribution System | | | | | |
|--|---------|---------|---------|---------|---------|
| Permit | Route A | Route B | Route C | Route D | Route E |
| Kentucky Public Service Commission | X | X | X | X | X |
| KYDOW, Section 401 WQC | X | X | X | X | X |
| KYDOW, Section 402/NPDES Permit for Hydrostatic Test Water Discharges | X | X | X | X | X |
| KYDOW, Section 402/NPDES General Permit for Construction Stormwater | X | X | X | X | X |
| Kentucky Heritage Council, Section 106/Review & Compliance | X | X | X | X | X |
| Kentucky Department of Fish and Wildlife | X | X | X | X | X |
| Kentucky Transportation Cabinet | X | X | X | X | X |
| United States Department of Transportation | X | X | X | X | X |
| USACE, Nationwide Permit No. 12 | X | X | X | X | X |
| USACE, Section 10 Permit | X | X | X | X | X |
| United States Fish and Wildlife Service, Section 7 Consultation | X | X | X | X | X |
| Bullitt County Fiscal Court | X | X | X | X | X |
| Hardin County Planning and Development Commission | X | X | X | | |
| Nelson County Fiscal Court | | | | X | X |
| City of Bardstown | | | | X | |
| City of Radcliff | X | X | X | | |

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| Permit | Route F | Route G | Route H | Route I | Route J |
|---|---------|---------|---------|---------|---------|
| Railroads | X | X | X | | |
| Kentucky Public Service Commission | X | X | X | X | X |
| KYDOW, Section 401 WQC | X | X | X | X | X |
| KYDOW, Section 402/NPDES Permit for Hydrostatic Test Water Discharges | X | X | X | X | X |
| KYDOW, Section 402/NPDES General Permit for Construction Stormwater | X | X | X | X | X |
| Kentucky Heritage Council, Section 106/Review & Compliance | X | X | X | X | X |
| Kentucky Department of Fish and Wildlife | X | X | X | X | X |
| Kentucky Transportation Cabinet | X | X | X | X | X |
| United States Department of Transportation | X | X | X | X | X |
| USACE, Nationwide Permit No. 12 | X | X | X | X | X |
| USACE, Section 10 Permit | X | X | X | X | X |
| United States Fish and Wildlife Service, Section 7 Consultation | X | X | X | X | X |
| Bullitt County Fiscal Court | X | | | X | X |
| Hardin County Planning and Development Commission | | | | | |
| Nelson County Fiscal Court | X | X | X | X | X |
| City of Bardstown | | X | X | | X |
| City of Radcliff | | | | | |
| Railroads | | | | | |

4.2 Permit Descriptions

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- a. **Kentucky Public Service Commission (KYPSC):** A Certificate of Convenience and Necessity may be required from the Kentucky Public Service Commission in accordance with KRS 278.
- b. **Kentucky Division of Water (KYDOW), Section 401 WQC:** A 401 Water Quality Certification (WQC) permit application must be submitted to KYDOW if it is found that there will be a discharge of fill material into any stream and/or wetland considered to be navigable or of high-quality. The 401 WQC must be approved to obtain a Section 10 Permit from USACE.
- c. **Kentucky Division of Water (KYDOW), Section 402/NPDES Permit for Hydrostatic Test Water Discharges:** Hydrostatic Test Water Discharges will require a National Pollutant Discharge Elimination System (NPDES/KPDES) permit. Permit application must be submitted to KYDOW. Discharge locations and associated water bodies that hydrostatic test water will be discharged into must be marked on construction alignment sheets and submitted with the permit application (401 KAR 5:055). A Water Withdrawal Permit may be required for hydrostatic testing (401 KAR 4:010 and 4:200).
- d. **Kentucky Division of Water (KYDOW), Section 402/NPDES General Permit for Construction Stormwater:** An NPDES/KPDES General Permit for Construction Stormwater is required for all projects that disturb greater than 1 acre. KPDES General Permit for Construction Stormwater will be submitted to KYDOW. Construction alignment sheets depicting route and access road locations along with above-ground facility drawings will need to be submitted with the permit application (401 KAR 5:055 and 5:060).
- e. **Kentucky Heritage Council, Section 106/Review & Compliance:** A Section 106/Review & Compliance permit is required for all federally licensed or permitted projects. Permit application will need to be submitted to Kentucky Heritage Council.
- f. **Kentucky Department of Fish and Wildlife (KYDFW):** KYDFW will need to be contacted to perform a site file check for state rare, threatened, and endangered species.
- g. **Kentucky Transportation Cabinet (KYTC):** A KYTC pipeline encroachment permit will be required for interstate and state road crossings.

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- h. **United States Department of Transportation (US DOT):** Pipeline design and operation will be governed by U.S. Code Title 49 CFR Part 192 administered by the Pipeline and Hazardous Materials Safety Administration under the US DOT. In addition, design and operation will be governed by 807 KAR 5:022 "Gas Safety and Service," administered by the Kentucky Public Service Commission.
- i. **United States Army Corps of Engineers (USACE), Nationwide Permit No. 12:** A Nationwide Permit Application must be submitted to the Louisville District, USACE Great Lakes and Ohio River Division, for pipeline crossings of rivers, streams, creeks, and wetlands. The USACE application normally consists of the pipeline route marked on USGS topographic maps, an application letter, cross sections of the stream/creek/ditch crossings, and an explanation of the proposed route. The USACE can determine whether certain crossings are covered under the authority of Nationwide Permit No. 12 for utility lines and that the USACE will issue a letter so stating. The construction will be required to comply with specific conditions of Nationwide Permit 12 and the Regional Conditions imposed by the governing USACE District.
- j. **United States Army Corps of Engineers (USACE), Section 10 Permit:** A Section 10 Permit will be required for any discharges of dredged or fill material into navigable waters of the United States. This permit will not be granted until a 401 Water Quality Certification, issued by the state, is obtained. This will be needed if stream/river crossings are made by means of open-cutting the river bed. This permit will require an Environmental Assessment and is issued by the affected USACE District.
- k. **United States Fish and Wildlife Service, Section 7 Consultation:** A Section 7 Consultation will be required for the proposed route. The Section 7 Consultation is prepared in order to determine whether a project has the potential to cause significant impact on threatened and endangered species.
- l. **Bullitt County Fiscal Court:** An Erosion and Sediment Control Plan will be required and a permit will need to be obtained from the Bullitt County Fiscal Court. For all country roads crossed, a crossing application will be required, and a permit will need to be obtained from the Bullitt County Fiscal Court.

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- m. **Hardin County Planning and Development Commission:** An Erosion and Sediment Control Plan will be required and a permit will need to be obtained from the Hardin County Planning and Development Commission. For all country roads crossed, a crossing application will be required, and a permit will need to be obtained from the Hardin County Planning and Development Commission.
- n. **Nelson County Fiscal Court:** An Erosion and Sediment Control Plan will be required and a permit will need to be obtained from the Nelson County Fiscal Court. For all country roads crossed, a crossing application will be required, and a permit will need to be obtained from the Nelson County Fiscal Court.
- o. **City of Bardstown:** An Erosion and Sediment Control Plan will be required, and a permit will need to be obtained from the city of Bardstown.
- p. **City of Radcliff:** An Erosion and Sediment Control Plan will be required, and a permit will need to be obtained from the city of Radcliff.
- q. **Railroads:** Permits will be required for crossing railroads or railroad properties.

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Section 5 – Right-of-Way and Site Acquisition Considerations

Parcel data was used to characterize land use along the 10 potential route options (Routes A through J). Land use may vary from commercial, developed areas to upland forests to wetlands and open water. In laying out the proposed routes, consideration was given to co-locating the pipeline in existing easements to the extent practical. Using existing easements, whether utility or transportation, is predicated on the assumption that the easement holder and property owner are amenable to co-locating. No cost information on land values was obtained for the routes in this study. A more thorough investigation is needed in order to improve our confidence level on probable right-of-way costs. Exercising eminent domain rights can have a major bearing on right-of-way acquisition costs for the route options not on existing LG&E rights-of-way.

For all routes, temporary land rights (damages) for temporary work space along the pipeline route will be needed. Temporary work space will also be required for installation of road, railroad, waterbody, and wetland crossings.

Route A

Route A is approximately 13.3 miles in length. The pipeline will begin at an existing LG&E Magnolia Transmission Line in Radcliff, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main on South Preston Highway in Lebanon Junction, Kentucky. Facilities will be located in Hardin and Bullitt counties, Kentucky.

Property Value Assessment (PVA) records indicate approximately 77 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least two tracts.

Route B

Route B is approximately 14.2 miles in length. The pipeline will begin at an existing LG&E Magnolia Transmission Line in Radcliff, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main on South Preston Highway in Lebanon Junction, Kentucky. Facilities will be located in Hardin and Bullitt counties, Kentucky.

PVA records indicate approximately 129 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates that a majority of properties traversed are encompassed within existing highway rights-of-way for which co-location rights will need to be

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acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least five of these tracts.

Route C

Route C is approximately 12.8 miles in length. The pipeline will begin at an existing LG&E Magnolia Transmission Line in Radcliff, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main on South Preston Highway in Lebanon Junction, Kentucky. Facilities will be located in Hardin and Bullitt counties, Kentucky.

PVA records indicate approximately 96 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way and utility transmission corridors for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least 71 of these tracts.

Route D

Route D is approximately 15.48 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Bardstown, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main in Clermont, Kentucky. Facilities will be located in Nelson and Bullitt counties, Kentucky.

PVA records indicate approximately 139 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way for which co-location rights will need to be acquired. Additionally, preliminary review indicates new right-of-way will need to be acquired on at least two of these tracts.

Route E

Route E is approximately 13.96 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Coxs Creek, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main in Clermont, Kentucky. Facilities will be located in Nelson and Bullitt counties, Kentucky.

PVA records indicate approximately 111 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way for which co-location rights will need to be acquired.

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Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least two of these tracts.

Route F

Route F is approximately 13.04 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Coxs Creek, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main in Clermont, Kentucky. Facilities will be located in Nelson and Bullitt counties, Kentucky.

PVA records indicate approximately 60 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way and utility transmission corridors for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least five of these tracts.

Route G

Route G is approximately 17.77 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Bardstown, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main in Boston, Kentucky. Facilities will be located in Nelson County, Kentucky.

PVA records indicate approximately 51 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least four of these tracts.

Route H

Route H is approximately 16.95 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Bardstown, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main in Boston, Kentucky. Facilities will be located in Nelson County, Kentucky.

PVA records indicate approximately 82 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way and utility transmission corridors for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least 38 of these tracts.

Route I

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Route I is approximately 16.76 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Coxs Creek, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main near Shepherdsville, Kentucky. Facilities will be located in Bullitt County, Kentucky.

PVA records indicate approximately 118 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way and utility transmission corridors for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least three of these tracts.

Route J

Route J is approximately 21.28 miles in length. The pipeline will originate at an existing LG&E gas pipeline in Bardstown, Kentucky. The pipeline will terminate at a new measurement and regulating station at the High-Pressure Distribution Main near Shepherdsville, Kentucky. Facilities will be located in Bullitt County, Kentucky.

PVA records indicate approximately 178 private land tracts will be impacted by the proposed pipeline route. Preliminary review indicates a majority of properties traversed are encompassed within existing highway rights-of-way and utility transmission corridors for which co-location rights will need to be acquired. Additionally, preliminary review indicates new rights-of-way will need to be acquired on at least seven of these tracts.

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Section 6 – Opinion of Probable Cost

An Opinion of Probable Cost (OPC) is provided for the 10 potential routes (routes A through J) in Table 6.1 below. Each OPC is reported in 2017 dollars. Only limited cost information on land and right-of-way is provided, and no field research for such costs was done for this study. Additionally, field review determined the likelihood of a high quantity of rock, and this was verified by soil surveys for each county, produced by the United States Department of Agriculture (USDA). The type and depth of rock and geological formations, however, were not sampled, tested, or measured. With the exception of right-of-way costs, we believe these OPCs to be within +/-20%. The OPCs for all options used the same assumptions to obtain an estimated cost. Following is the basis for deriving the major cost components.

- 6.1. The costs in the OPCs are based on design and installation according to the requirements of current U.S. Pipeline Safety Regulations (U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration [USDOT/PHMSA]), CFR Title 49 Part 192.

For potential Routes A, B, C, D, E, and F, this was 10.750-inch OD pipe. The pipeline wall thickness (w.t. = 0.365") will allow an operating pressure of 1,426 psig in Class 3 locations and 1,141 psig in Class 4 locations (\$192.5). These operating pressures are above the maximum allowable operating pressure (MAOP) of the supply source.

For potential Routes G, H, I, and J, this was 12.750-inch OD pipe. The pipeline wall thickness (w.t. = 0.375") will allow an operating pressure of 1,029 psig in Class 3 locations and 824 psig in Class 4 locations (\$192.5). These operating pressures are above the MAOP of the supply source.

For all routes, the grade of the steel is B (specified minimum yield strength = 35,000 psig). This grade was selected as a high-strength, readily-available steel that has sufficient ductility to accommodate the field bends that will be required during construction.

- 6.2. The OPC assumes all line pipe will be coated with a standard application of thin film fusion-bonded epoxy (FBE). The OPC also assumes pipe installed at all horizontal directionally drilled (HDD) and bored installations (road and railroad crossings) will be coated with FBE and an outer layer of Powercrete for abrasion resistance.

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- 6.3. The cost of materials (steel and coating material for the pipe, valves, and fittings) is based on the cost of like items for projects that EnSiteUSA has managed recently (2014 to 2015). Prices have been inflated to 2017 dollars.
- 6.4. The mainline valve quantities are based on spacing requirements specified by \$149.179.
- 6.5. The installation costs are compiled from quotes prepared by contractors based in central Kentucky and historical costs from recent EnsiteUSA projects.
- 6.6. The quantity of road and railroad crossing installations are based on information gleaned from windshield and desktop surveys.
- 6.7. The rock trench per foot estimate differed based on the varying rock formations in the study area. The estimates ranged from \$22 per foot to \$100 per foot. These prices were based on historical data from previous EnSiteUSA projects and estimates from contractors. The rock trench prices factor in the anticipated depth of rock as reported in soil surveys by county produced by the USDA and were adjusted per visual review during the windshield survey. The prices also factor in the difficulty of construction for roadways as determined for each rock formation in the USDA soil survey. Additional explanation for rock quantity and pricing are included in Appendix D.
- 6.8. The costs of survey and inspection services are correlated to the estimated construction duration.
- 6.9. The right-of-way, property damage, and environmental permitting costs are based on EnSiteUSA's experience from previous projects. The ability to use existing rights-of-way and the cost associated with such use, when compared to the need for new rights-of-way and the possibility of using eminent domain rights, could have a significant impact on actual right-of-way costs.
- 6.10. The regulating and meter station and tap estimate is based on EnSiteUSA's experience from previous projects.
- 6.11. Total cost for Routes A through J were increased by 3% per annum to account for inflation as reported by the Consumer Price Index for All Urban Consumers (CPI-U) over the time period of 2005 to 2015.

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Comparative Cost Summary

Table 6.1 provides a comparative summary of cost for the 10 routes and two alternate sizes requested for Routes I and J.

| Table 6.1 Opinion Of Probable Cost (2017 USD) LG&E Mt. Washington High Pressure Distribution System | | | | |
|---|----------------------|----------------------|----------------------|----------------------|
| Category | Route A - 10" | Route B - 10" | Route C - 10" | Route D - 10" |
| Right-of-Way and Sites | \$ 93,000 | \$ 284,000 | \$ 1,294,000 | \$ 118,000 |
| Material | \$ 2,913,000 | \$ 3,103,000 | \$ 2,814,000 | \$ 3,354,000 |
| Installation | \$ 23,812,000 | \$ 25,362,000 | \$ 22,938,000 | \$ 27,531,000 |
| Outside Services | \$ 1,346,000 | \$ 1,401,000 | \$ 1,448,000 | \$ 1,226,000 |
| Measurement Stations and Tap | \$ 159,000 | \$ 159,000 | \$ 159,000 | \$ 159,000 |
| Omissions and Contingencies | \$ 8,498,000 | \$ 9,093,000 | \$ 8,596,000 | \$ 9,717,000 |
| Total Amount | \$ 36,822,000 | \$ 39,403,000 | \$ 37,249,000 | \$ 42,105,000 |
| Category | Route E - 10" | Route F - 10" | Route G - 12" | Route H - 12" |
| Right-of-Way and Sites | \$ 176,000 | \$ 747,000 | \$ 40,000 | \$ 1,224,000 |
| Material | \$ 2,973,000 | \$ 2,791,000 | \$ 5,430,000 | \$ 5,378,000 |
| Installation | \$ 24,605,000 | \$ 22,008,000 | \$ 31,368,000 | \$ 32,261,000 |
| Outside Services | \$ 1,108,000 | \$ 973,000 | \$ 1,543,000 | \$ 1,147,000 |
| Measurement Stations and Tap | \$ 159,000 | \$ 159,000 | \$ 393,000 | \$ 393,000 |
| Omissions and Contingencies | \$ 8,707,000 | \$ 8,004,000 | \$ 11,633,000 | \$ 12,121,000 |
| Total Amount | \$ 37,728,000 | \$ 34,683,000 | \$ 50,405,000 | \$ 52,523,000 |
| Category | Route I - 12" | Route I - 16" | Route J - 12" | Route J - 16" |
| Right-of-Way and Sites | \$ 1,869,000 | \$ 1,869,000 | \$ 1,361,000 | \$ 1,361,000 |
| Material | \$ 5,274,000 | \$ 6,110,000 | \$ 6,625,000 | \$ 7,655,000 |
| Installation | \$ 28,845,000 | \$ 31,424,000 | \$ 38,528,000 | \$ 42,178,000 |
| Outside Services | \$ 1,028,000 | \$ 1,028,000 | \$ 1,028,000 | \$ 1,147,000 |
| Measurement Stations and Tap | \$ 393,000 | \$ 160,000 | \$ 393,000 | \$ 160,000 |
| Omissions and Contingencies | \$ 11,223,000 | \$ 12,178,000 | \$ 14,417,000 | \$ 15,751,000 |
| Total Amount | \$ 48,632,000 | \$ 52,769,000 | \$ 62,351,000 | \$ 68,252,000 |

CONFIDENTIAL INFORMATION**Section 7 – Project Schedule**

Routes A, B, D, G, and J are proposed to lay in highway rights-of-way comprised primarily of rock. Due to the topography and the restrictions of construction along the highway, additional construction time, in excess of the EnSiteUSA estimated schedule, will be required for these routes.

The proposed alignment for Route A runs through Fort Knox. This may require additional information to satisfy certificates and permits for construction, environmental and operating permits, and licenses. This additional information and coordination may extend the permitting period.

The last 4 miles of proposed alignments for Routes G and H will be very slow construction due to the type of rock that is in that area.

The proposed alignment for Route D includes two congested sections on KY-245, each approximately 1.5 miles long. The first section includes a quarry and several retail centers with high traffic volume. The second section includes a high concentration of residential areas, several churches, and a hospital. With the increased traffic and congestion along these portions of KY-245, the pipe ditch will not be permitted to remain open overnight. As a result, soil and rock will have to be removed daily, and any open ditches must be closed at night.

Routes I and J are in areas that contain lots of rock. EnSiteUSA assumed in estimating the schedule that blasting is allowed in these areas. If blasting is not allowed, the schedule may be adversely affected and construction costs may increase.

These schedules are based on EnSiteUSA's experience with similar projects; however, variables such as land acquisition, cultural and environmental resource studies, public opposition, rock removal, and regulatory permitting can have a significant impact on schedules, and project duration may be extended depending on the duration of these critical path activities.

A conceptual project schedule is provided in Table 7.1 below.

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| Activity | Routes C, E, F, H, and I | Routes A, B, D, and G |
|---|---------------------------------|------------------------------|
| KY PSC Certification | 6 to 12 months | 6 to 12 months |
| State and local construction, environmental and operating permits and licenses* | 6 to 12 months* | 6 to 12 months* |
| Preliminary Survey and Right-of-Way Acquisition | 6 to 9 months | 6 to 9 months |
| Engineering & Procurement | 9 months | 9 months |
| Construction | 3 to 5 months | 5 to 8 months |
| Total Project | 24 to 35 months | 26 to 38 months |

* Concurrent with certification process

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Section 8 – Route Selection Conclusions and Recommendations

The analyses performed in the system design, the right-of-way and site acquisition considerations, the estimated cost data and project schedule recommend Route F as the preferred route for the Mt. Washington High-Pressure Distribution System.

Constructability

All routes pose significant construction challenges. Route A passes through Fort Knox, and windshield review indicates a high quantity of rock removal will be required. Route B will require purchasing a right-of-way, and windshield review indicates a high quantity of rock removal will be required. Route C will require purchasing a right-of-way, and a co-location easement with an existing pipeline. Routes D and J pass through congested areas. Routes E, F, and I pass through several small creeks. Routes G and H each cross Beech Fork twice, which will require two HDDs. Windshield review of Route G indicates a higher than typical quantity of rock removal will be required. Route H will also require two more HDDs at the crossings of the Bluegrass Parkway. All routes cross several county roads and highways.

Cost

The OPC presented for all routes may be described as being between a rough order-of-magnitude estimate and a second-order approximation. With the exception of right-of-way costs, we believe these OPCs to be within +/-20%. The OPCs for all routes excluded right-of-way costs for co-located installation on existing highway rights-of-way.

Routes F is expected to be the most cost-effective option at approximately \$34.7 million, followed by Route A at \$36.8 million.

Comparative Ranking

EnSiteUSA's Comparative Methodology and the modified EPRI & GTC Analysis and Evaluation Simple Composite Model ranked Route D the preferred route.

The Simple Composite ranks Route F as the preferred route. The Built Environment Bias and Engineering Considerations Bias both rank Route F as the preferred route. The Natural Environment Bias ranks Route D as the preferred route.

The Aggregate Route Ranking Summary includes the results of both methods in ranking the routes, and the results are shown in Table 3.15 below.

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| Summary - Simple Composite + Biased | Route A | Route B | Route C | Route D | Route E | Route F | Route G | Route H | Route I | Route J |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Total | 0.8644 | 0.5742 | 1.0552 | 0.4446 | 0.4740 | 0.4430 | 0.7625 | 0.8051 | 0.5545 | 0.6969 |
| Rank | 9 | 5 | 10 | 2 | 3 | 1 | 7 | 8 | 4 | 6 |

Recommended Route

Route F is the recommended route. This recommendation is based on the observed field conditions, existing and projected land use, estimated construction duration, and cost.

Route D produced very similar results to Route F and, as seen in the tables in Section 3, had results often within a few thousandths of Route F. A main distinction between Route F and Route D is the use of the transmission corridor versus the roadway right-of-way. Two major considerations may increase the variations in the results for these routes. First, negotiating right-of-way use may produce significant variations in cost specific to the right-of-way used. Second, the ability to blast rock, rather than mechanical removal of rock, for each right-of-way type may alter the cost and schedule. Current opinion of probable cost assumes blasting is acceptable in all rights-of-way; due to the confidential nature of this project, further inquiry of these considerations was not pursued.

This recommendation is based on EnSiteUSA's experience with similar projects. Variables such as cultural and environmental resource studies, land acquisition, public opposition, and regulatory permitting can have a significant impact on the selection of a preferred route and should be examined in more detail before a final decision is made.

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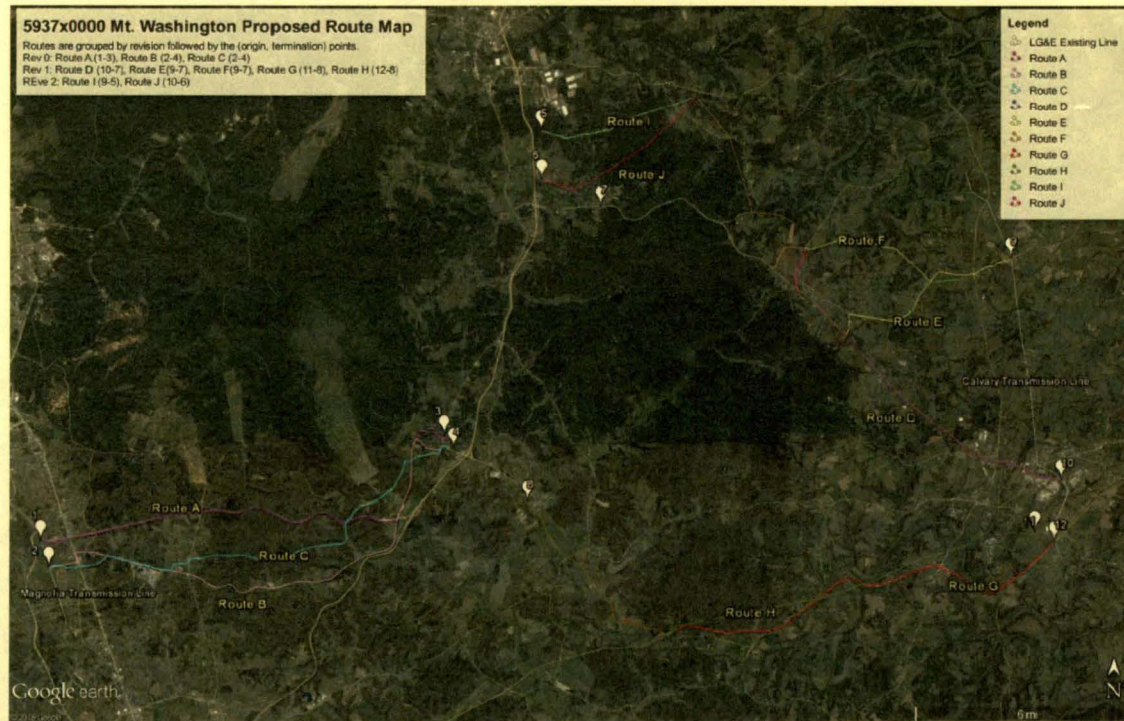
Section 9 – Appendices

| <u>Section</u> | <u>Description</u> |
|----------------|---|
| A | Proposed Route Maps |
| B | Evaluation Matrix |
| C | Hydraulic Analysis |
| D | References |
| E | Soil Variability and Construction Cost Matrix |
| F | Route Pictures |

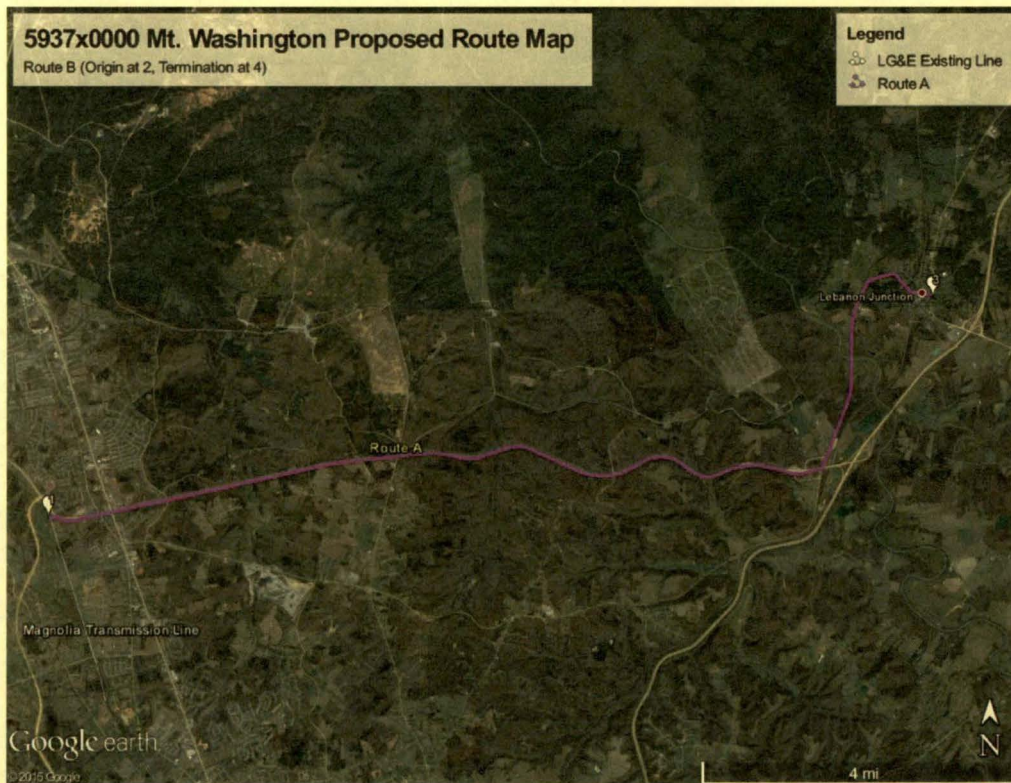
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Section 9 – Appendix A: Proposed Route Maps



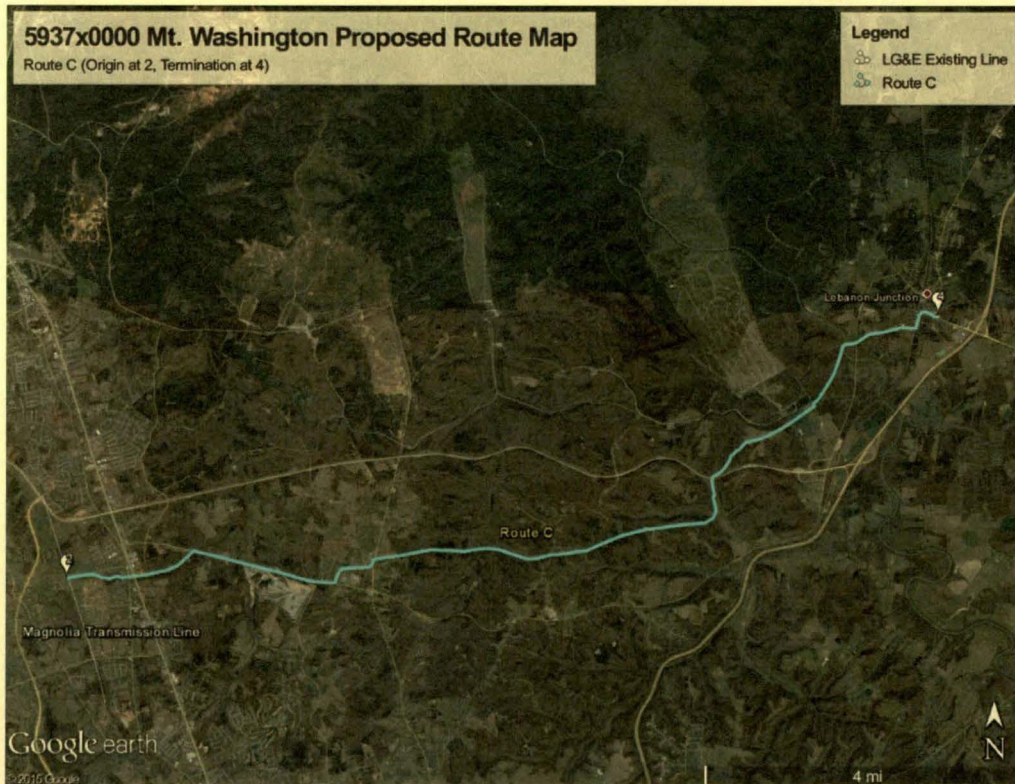
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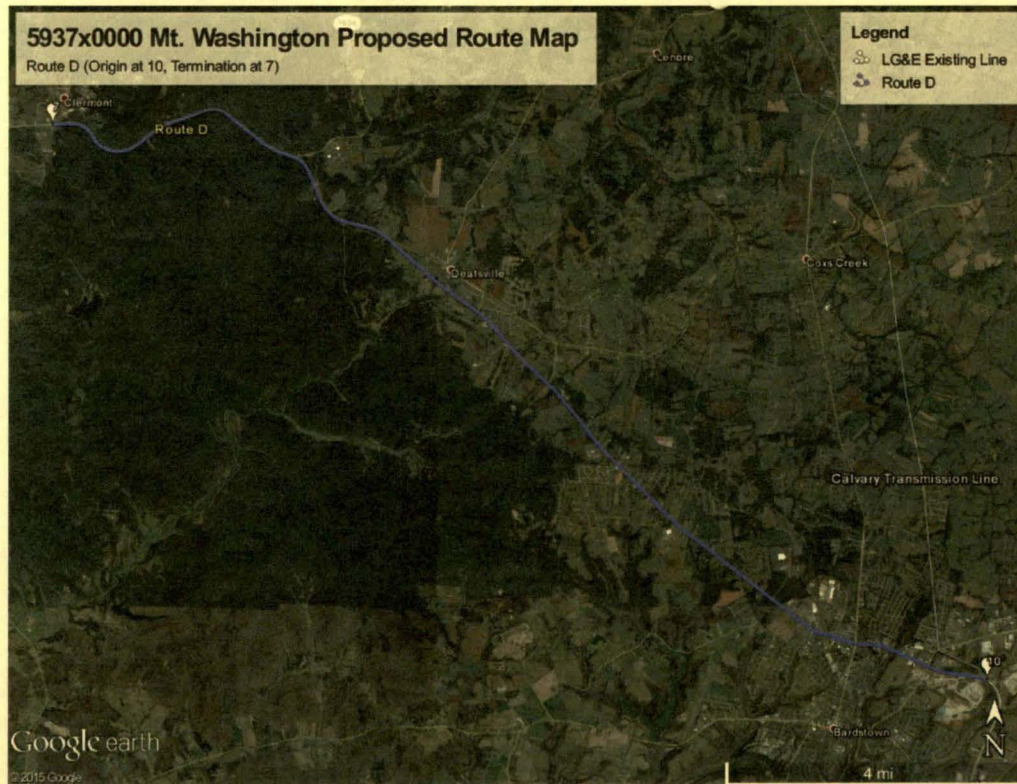
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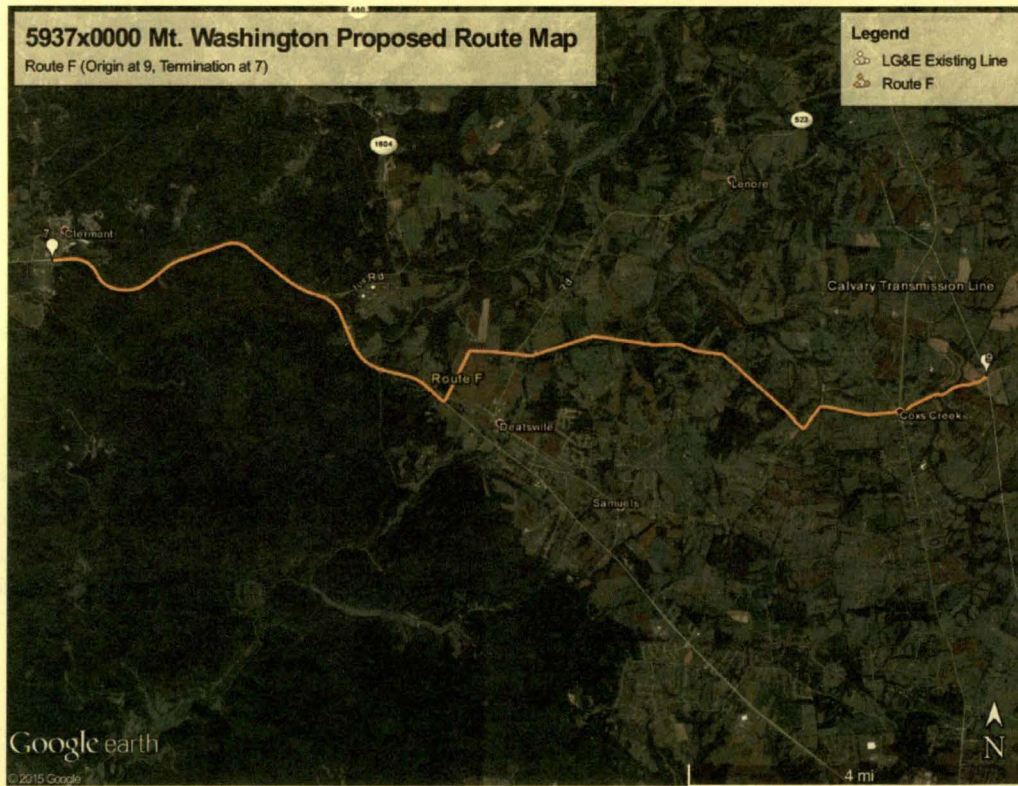
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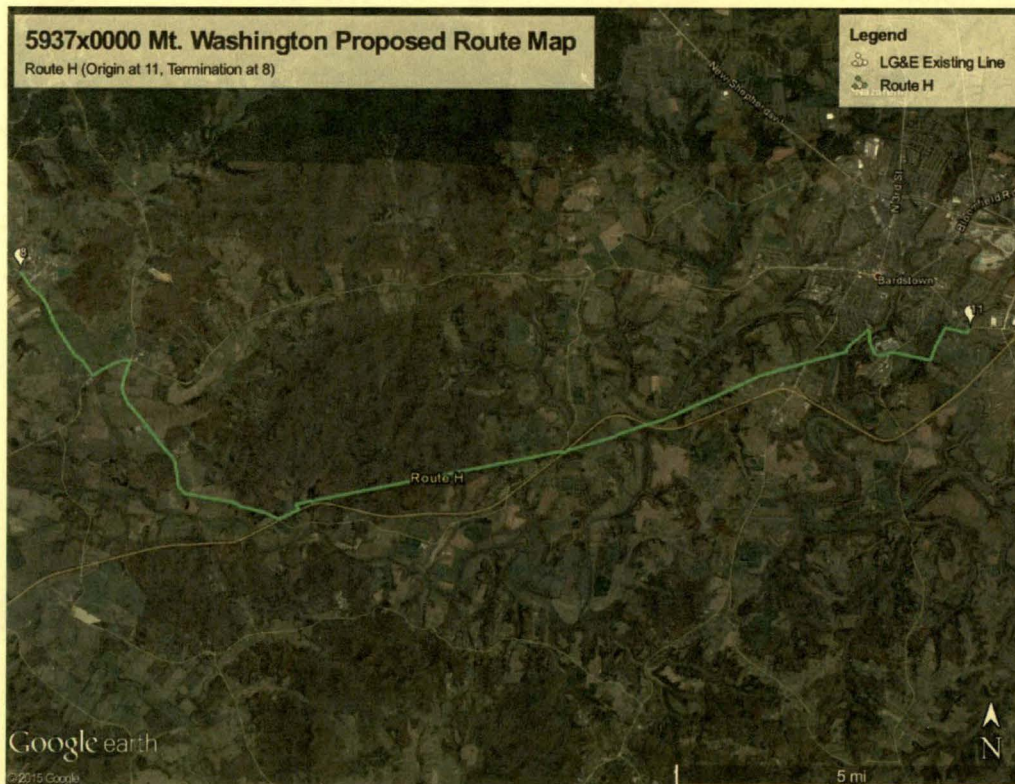
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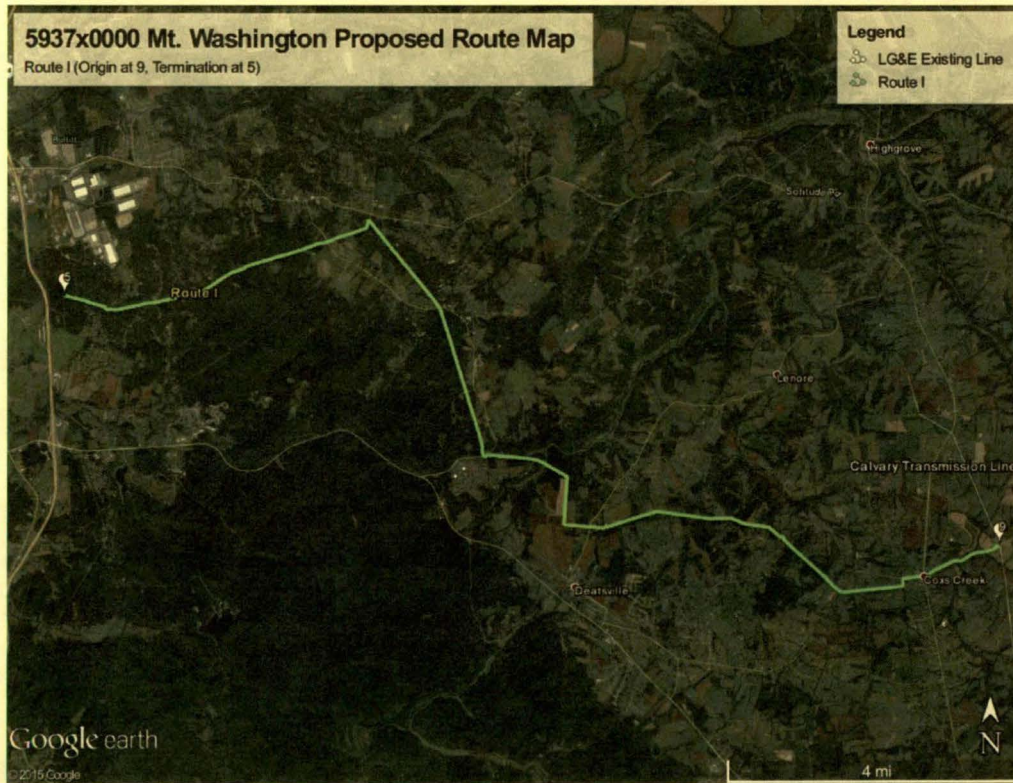
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Request for Quotation
Opinion of Probable Cost



| Line Item | Unit of Measure | Quantity | Unit Cost | Item Cost | Assumptions |
|--|-----------------|----------|------------|-------------------|--|
| NEPA (Environmental Assessment) | lot | 1 | \$ 32,000 | \$ 32,000 | if federal nexus is established (cost may vary depending on federal agency) |
| Project Management | mo. | 6 | \$ 2,400 | \$ 14,400 | (16 hours per week) |
| Master Project Schedule & Updates | mo. | 6 | \$ 600 | \$ 3,600 | (4 hours per month) |
| Bi-Weekly Progress Reporting | mo. | 6 | \$ 600 | \$ 3,600 | (4 hours per month) |
| Restoration Plan | lot | 1 | \$ 7,500 | \$ 7,500 | |
| Blasting Plan | ea. | 1 | \$ 3,200 | \$ 3,200 | per plan |
| Agricultural Plan | lot | 1 | \$ 2,750 | \$ 2,750 | |
| Residential Mitigation Plans | ea. | 1 | \$ 4,500 | \$ 4,500 | (Per plan; number of residential areas are not available) |
| HDD Omissions & Contingency Plan | lot | 1 | \$ 5,200 | \$ 5,200 | |
| Winterization Plan | lot | 1 | \$ 2,500 | \$ 2,500 | |
| Invasive Species Plan | lot | 1 | \$ 3,600 | \$ 3,600 | |
| Unanticipated Discovery Plan | lot | 1 | \$ 2,500 | \$ 2,500 | |
| IV. Land | | | | \$ 180,725 | |
| Field Office | | | | | |
| Lease | mo. | 6 | \$ 3,500 | \$ 21,000 | |
| Equipment | mo. | 6 | \$ 1,500 | \$ 9,000 | |
| Office Supplies | mo. | 6 | \$ 500 | \$ 3,000 | |
| Permits | | | | | |
| Road Crossing Permit Preparation | hours | 40 | \$ 68 | \$ 2,725 | Assume 20 Road Crossings |
| Right-of-Way Pre-Acquisition Preparation | | | | | |
| Database Set-Up and Maintenance | lot | 1 | \$ 30,000 | \$ 30,000 | |
| Right-of-Way Supervision/Office Support/Agents | lot | 1 | \$ 115,000 | \$ 115,000 | |
| Right-of-Way Acquisition | | | | | |
| Right-of-Way Supervision/Office Support/Agents | lot | | \$ 214,422 | \$ - | |
| Permanent Easement (Assumes Condemnation) | miles | | \$ 90,909 | \$ - | |
| Pipe Yards/Staging Areas | ea. | | \$ 60,000 | \$ - | |
| Valve Sites | ea. | | \$ 10,000 | \$ - | |
| Access Roads | lot | | \$ 18,000 | \$ - | |
| Document Recording | lot | | \$ 2,500 | \$ - | |
| Condemnation | | | | | |
| Right-of-Way Support | lot | | \$ 57,000 | \$ - | |
| Appraisal Costs | ea. | | \$ 75,000 | \$ - | |
| Legal | ea. | | \$ 200,000 | \$ - | |
| Construction | | | | | |
| Right-of-Way Support | lot | | \$ 87,500 | \$ - | |
| Temporary Workspace | miles | | \$ 49,565 | \$ - | |
| Damage Payments (Timber and Crops) | lot | | \$ 392,000 | \$ - | |
| V. Surveying | | | | \$ 213,216 | |
| Preliminary | | | | \$ 150,988 | |
| Office Labor | Hours | 308 | \$ 92 | \$ 28,336 | Survey is completed when leaves are off trees. Assume required man-power is 3 x 2-man survey crews. R.O.W is to be cleared prior to survey work. Topographic survey to cover a 150' wide corridor. |
| Field Labor | Hours | 870 | \$ 109 | \$ 94,482 | |
| Equipment | Days | 121 | \$ 43 | \$ 5,203 | |
| Mileage | Miles | 8,900 | \$ 1 | \$ 5,785 | |
| Per Diem | Days | 121 | \$ 142 | \$ 17,182 | |
| Utility Surveys | | | | \$ 62,228 | Assume required man-power is 3 x 2-man survey crews. Utility survey is limited to 20 road crossings. Does not include probing for utility depth. |
| Office Labor | Hours | 82 | \$ 92 | \$ 7,544 | |
| Field Labor | Hours | 372 | \$ 109 | \$ 40,399 | |
| Equipment | Days | 37 | \$ 43 | \$ 1,591 | |
| Mileage | Miles | 3800 | \$ 1 | \$ 2,470 | |
| Per Diem | Days | 72 | \$ 142 | \$ 10,224 | |

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Request for Quotation
Opinion of Probable Cost



| Line Item | Unit of Measure | Quantity | Unit Cost | Item Cost | Assumptions |
|---|-----------------|----------|-----------|------------|---|
| VI. Aerial Photography | | | | \$ 27,500 | |
| Aerial Photography | lot | 1 | \$ 27,500 | \$ 27,500 | Photography is completed when leaves are off trees. Included a 500' wide corridor |
| VII. Mapping and Drafting | | | | \$ 106,674 | |
| Alignment Mapping | miles | 10.23 | \$2,500 | \$ 25,575 | Assume Landowners, Plan, Profile, Material, Class Location Bands |
| HDD Drawing | ea. | 1 | \$840 | \$ 840 | |
| Erosion Prevention and Sedimentation Control Grade Plans | miles | 10.23 | \$470 | \$ 4,808 | |
| Plats (GFO, Boundary and Condemnation) | landowners | 40 | \$235 | \$ 9,400 | Assume Non-Certified Easement Exhibits |
| Permit Drawings | miles | 10.23 | | \$ - | |
| Road Crossing Drawings | ea. | 4 | \$600 | \$ 2,400 | Assume 20 Road Crossings |
| Waterbody Crossing Drawings | ea. | 2 | \$190 | \$ 380 | |
| Utility Coordination Drawings | ea. | 10 | \$590 | \$ 5,900 | |
| Engineering Design Drawings | lot | | | \$ - | |
| Mechanical Drawings | lot | 1 | \$ 21,780 | \$ 21,780 | |
| Electrical Drawings | lot | 1 | \$ 13,330 | \$ 13,330 | |
| Civil Drawings | lot | 1 | \$ 7,720 | \$ 7,720 | |
| Structural Drawings | lot | 1 | \$ 4,680 | \$ 4,680 | |
| As-Built Drawings | % | | 20% | \$ 9,861 | Optional |
| VIII. Engineering | | | | \$ 272,590 | |
| Project Meetings and Coordination | weeks | 26 | \$ 1,380 | \$ 35,880 | 6 Engineers for 2 hours each week |
| Client Standard and Typical Drawing Review | hours | 100 | \$ 115 | \$ 11,500 | |
| Pipeline | hours | 96 | \$ 115 | \$ 11,040 | |
| Buoyancy and Pipeweight Requirements | hours | 24 | \$ 115 | \$ 2,760 | Pipe Specifications are finalized prior to calculations. |
| L/R Foundation Design | hours | 10 | \$ 115 | \$ 1,150 | |
| Mainline Valves | hours | 32 | \$ 115 | \$ 3,680 | Quantity to be determined per 192 Specifications |
| Gas Supply Interconnect Facilities | | | | | |
| Launcher-Receiver Design | hours | 80 | \$ 115 | \$ 9,200 | |
| Meter and Ancillary Piping Design | hours | 48 | \$ 115 | \$ 5,520 | |
| Mechanical Design | hours | 180 | \$ 115 | \$ 20,700 | |
| Electrical Design | hours | 128 | \$ 115 | \$ 14,720 | |
| Structural Design | hours | 52 | \$ 115 | \$ 5,980 | |
| HDD Crossing | hours | 40 | \$ 115 | \$ 4,600 | Assume 1 HDD Crossing design required |
| Bored Crossings | hours | 80 | \$ 115 | \$ 9,200 | Assume 20 Road Crossings requiring 3 Engineering hours each |
| AC Mitigation Review | lot | 1 | \$ 40,000 | \$ 40,000 | |
| Permitting/Regulatory Liaison, Coordination, and Management | hours | 40 | \$ 115 | \$ 4,600 | |
| Geotechnical Investigation | ea. | | | \$ - | |
| Geotechnical Management & Coordination | ea. | 60 | \$ 115 | \$ 6,900 | Includes SOW preparation, contract negotiation, Land & Survey coordination, Daily Geotechnical contractor management |
| Geotechnical Sampling and Analysis - Cox Creek | ea. | 1 | \$ 28,000 | \$ 28,000 | includes two (4) 60-foot deep borings |
| Geotechnical Sampling and Analysis - Other Crossings | ea. | 1 | \$ 16,000 | \$ 16,000 | includes one (2) 40-foot deep borings |
| Geotechnical Sampling and Analysis - L/R Facility | ea. | 2 | \$ 10,000 | \$ 20,000 | includes two (2) 20-foot deep borings |
| Design Specifications | lot | | \$ 115 | \$ - | Provided by Client |
| Material Specifications | lot | 24 | \$ 115 | \$ 2,760 | |
| Construction Specifications | lot | 60 | \$ 115 | \$ 6,900 | Assume 3 Engineers at 20 hours each (Electrical, Mechanical, Civil/Structural) |
| Construction Bid Package Preparation, Bid Meetings and Bid Analysis | lot | 100 | \$ 115 | \$ 11,500 | Includes 40 hours of bid document preparation, 40 hours for Bid Meeting preparation and attendance, and 20 hours for Bid Analysis |
| IX. TOTAL ESTIMATE AT +/- 10% | | | \$ | 1,160,190 | |

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