NEW JERSEY NATURAL GAS COMPANY

PREPARED DIRECT TESTIMONY OF JOHN B. WYCKOFF

I. INTRODUCTION

Q. Please state you name, affiliation and business address.

A. My name is John B. Wyckoff, P.E., and I am the Director of Engineering for New Jersey Natural Gas Company (the "Company" or "NJNG"). My business address is 1415 Wyckoff Road, Wall, New Jersey 07719.

Q. Please describe your responsibilities as Director of Engineering for New Jersey Natural Gas Company.

A. As Director of Engineering, I oversee the engineering design, project management, construction, and system planning of NJNG's transmission and distribution system, as well as the contractor construction quality control and scheduling, and facility mapping functions.

Q. What is the purpose of your testimony in this proceeding?

A. My testimony describes the proposed construction and design of NJNG's Southern Reliability Link Project (the "Southern Reliability Link" or "Project").

Q. Please generally explain the Project design.

A. The Project is an approximately 28 mile long transmission line connecting the Transcontinental Pipe Line Co. interstate pipeline system ("Transco") to NJNG's distribution system in the Township of Manchester. Currently, the interstate connections for the Bay, Central and Ocean Divisions, serving Monmouth, Ocean and Burlington Counties, are all located in Middlesex County at the northern end

of the service area. NJNG's transmission is a looped system off a central backbone. However, because the interstate interconnections are all at the northern end of the system, potential interruptions to the existing interstate supply or within NJNG's intrastate transmission would most likely affect customers in the southern portion of the Monmouth County and Ocean and Burlington Counties. As designed, by providing redundant supply to the southern end of NJNG's transmission system, the Project would increase system reliability.

Q. How much natural gas will the Project provide to NJNG?

A. The Project is expected to provide 180,000 Dekatherms per day ("Dkth/d"), or more than 25% of winter design day capacity. NJNG anticipates that future system upgrades will eventually allow for additional throughput.

Q. Can you describe the Project in more detail?

A. Yes. The Project consists of the installation of approximately 28 miles of new 30", 0.500 wall thickness transmission line. The route is accurately described in the Testimony of Craig Lynch and Barry Baker. The pipeline will be manufactured in accordance with the applicable American Petroleum Institute Standard 5L with specified minimum yield strength of 60,000 pounds per square inch ("psi") and minimum tensile strength of 75,000 psi. The proposed transmission line will be constructed in full accordance with N.J.A.C. 14:7 and the Federal Regulations for the Transportation of Natural and Other Gas by Pipeline, Part 192, Title 49 of the Code of Federal Regulations. It is designed for Class 4 Location and will be designed to accommodate in-line inspection devices. Once constructed, it will be

operated and maintained according to NJNG's transmission integrity management program.

Q. What is a Transmission Integrity Management Program?

A. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration has promulgated rules that require all operators of natural gas transmission pipelines to adopt Transmission Integrity Management Programs ("TIMP"). These integrity management rules have four primary objectives: (1) accelerating the integrity assessment of pipelines in High Consequence Areas ("HCAs"); (2) improving operator integrity management systems; (3) improving government's role in reviewing the adequacy of integrity programs and plans; and, (4) providing increased public assurance in pipeline safety.

Q. Please describe the Company's Transmission Integrity Management Program.

A. NJNG's TIMP is a written framework describing how the four objectives described above will be implemented. Regarding the first objective, all HCAs must be identified as part of an operator's initial integrity management framework.[1] HCA is not a term associated with the safety or condition of a particular pipeline. Rather, it is an industry term created to improve pipeline safety by focusing comprehensive inspections on transmission line segments near locations where people live and work or are known to congregate on a

[1] See 49 C.F.R. §192.905. HCAs are based on identified sites where people congregate near the pipeline meeting one of three criteria: (1) an outside area or open structure occupied by 20 or more persons on more than 50 days in any 12-month period (the days need not be consecutive); (2) a building occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period (the days and weeks need not be consecutive); or (3) a facility occupied by persons of limited mobility, e.g., hospitals, prisons, day-care facilities, schools, retirement communities or assisted living centers. HCAs can also be based on the pipeline Class location.

regular basis. HCAs receive an added layer of inspection to avoid incidents that otherwise would have the largest negative consequence on the public. These inspections are supplemental to the safety requirements that apply to all natural gas transmission lines. Based on New Jersey's dense population and NJNG's overall commitment to safety, NJNG made the decision to treat its entire transmission pipeline system, all 227 miles of it, as being located in an HCA; even if a section of transmission pipe is not located in an HCA according to the pipeline safety code. The Company's philosophy and historical practice has been to take the most conservative approach in operating its transmission and distribution systems. And we will apply this philosophy and practice to the Project. Accordingly, the Southern Reliability Link Project is designed to comply with the most stringent federal and state pipeline safety standards even though the majority of the transmission line is not located in an HCA according to the pipeline safety code.

Q. Please describe the pressure tests that will be conducted on the Project's transmission line.

The Project's transmission line will be subjected to 100% non-destructive testing on all welds and a minimum of 1,500 psig of hydrostatic test pressure for 24 hours. As part of this test, it will be subjected to a strength test pressure of approximately 1,800 psig for no greater than one hour, intended to produce 90% of its Specified Minimum Yield Strength. As a result, the Maximum Allowable Operating Pressure ("MAOP") of this section of 30-inch main will be rated at 722 psig, an MAOP equivalent to that of NJNG's existing transmission system.

Q. Can you describe Project construction?

A. Construction is expected to take up to approximately one year. Multiple construction crews would work simultaneously on different sections of the project. Each construction site would be approximately one-quarter mile long. Work would include trenching and backfilling, as well as the preparation and moving of pipe. Directional drilling would be used to pass under most creeks or streams. Traffic control, road closings, detour routes, as well as the need for night work would be coordinated with local police and township/county officials. Emergency access would always be allowed in accordance with local ordinances. In an effort to minimize any inconvenience, daily construction activities would be coordinated with residents and businesses adjacent to the construction. To the extent that unique circumstances arise regarding adjacent residents and business, NJNG will, as it has in the past, work with residents and business to address the special concerns of their circumstances. At the end of the workday, the road would be opened for normal traffic.

Q. Can you describe NJNG's efforts to date to obtain required permits and approvals for the Project?

A. The Project pipeline alignment in the Township of Manchester runs through the coastal zone which is within the jurisdiction of the New Jersey Department of Environmental Protection's ("DEP") Land Use Regulations Program ("LURP"). In that regard, NJNG has met with DEP to discuss the LURP Application, which includes either a Freshwater Wetlands General Permit or Individual Permit, N.J.A.C. 7:7A, confirmation of field wetlands delineations, a CAFRA application,

N.J.A.C. 7:7, and verification of Flood Hazard Area Permits-by-Rule, N.J.A.C. 7:13, for the portions of the Project under DEP Land Use Regulation jurisdiction. These discussions have also addressed Threatened and Endangered Species protection.

The Project also runs through the Joint Base McGuire-Dix-Lakehurst within the "Military & Federal Installation Area" of the New Jersey Pinelands National Reserve. NJNG is currently awaiting execution of the owner's authorization from the Base Commander. Once the owner's authorization is received, an application for the Project will be submitted to the Pinelands Commission for a determination that the Project conforms to the requirements of the New Jersey Pinelands Commission Comprehensive Management Plan, N.J.A.C. 7:50-4.22.

NJNG also intends to submit applications for Utility Highway Occupancy/Road Opening Permits as needed from the New Jersey Department of Transportation, Burlington, Monmouth and Ocean Counties, the Townships of Chesterfield, North Hanover, Upper Freehold, Plumsted, Jackson, and Manchester. In addition, NJNG intends to submit an application for Certification of its Soil Erosion and Sediment Control Plan to the Burlington, Ocean and Freehold Soil Conservation Districts.

Q. Does this conclude your prepared direct testimony?

A. Yes, it does.

NEW JERSEY NATURAL GAS COMPANY

PREPARED DIRECT TESTIMONY OF
BARRY A. BAKER

I. INTRODUCTION

Q. Please state you name and business address.

A. My name is Barry A. Baker. My business address is 625 West Ridge Pike, Suite E-100, Conshohocken, PA 19428.

Q. By whom are you employed and in what capacity?

A. I am the Power & Industry Business Unit Lead and Department Manager for Impact Assessment & Permitting department for the Philadelphia Metro Region of AECOM Technology Corp. ("AECOM") which acquired my former employer URS Corporation ("URS") in October 2014. In this role, which has not changed as a result of the merger, I am a Certified Project Manager, a Principal Geographic Information Systems ("GIS") Specialist, and the region lead for transmission projects. I manage projects for siting utility transmission facilities. I have been employed by AECOM since it acquired URS and by URS for approximately ten years in my current role. In this position I have been responsible for siting studies both as a Project Manager and as a technical lead for utility line siting as well as new power development throughout the northeast region of the U.S., including New Jersey, Pennsylvania, New York, Connecticut, Ohio, Illinois, Virginia, Delaware and Maryland. I also manage the region's Impact Assessment & Permitting Department where I am responsible for a staff of approximately 50 individuals including biologists, ecologists, and GIS

specialists. Prior to joining URS, I held similar GIS and environmental development lead positions for other environmental and government consultants.

Q. Please explain what AECOM does in the context of utility projects.

A. AECOM provides comprehensive, life cycle services for utility projects, from alternative route analyses, licensing and permitting, conceptual engineering, right-of-way services, and public involvement in detailed engineering and design, geotechnical engineering and subsurface investigation, site preparation, constructions management, and regulatory compliance.

Q. Please describe your education and business experience.

A. I received a Bachelor of Science with Honors degree in Environmental Science from the University of East Anglia in Norwich, England in 1996. A key focus of my formal education was on the use of GIS and computer applications for environmental problem solving. My additional continuing education relevant to my current position includes the following courses and programs:

- Approximately 50 URS Project Management Classes necessary for formal certification.
- Creating and Integrating Data for Natural Resource Applications (taught by Environmental Systems Research Institute, Inc., "ESRI")
- Geoprocessing with ArcGIS Desktop (ESRI)
- Spatial Hydrology Using ArcView (ESRI)
- Introduction to ArcIMS (ESRI)
- System Architecture Design for GIS (ESRI)

Q. Please describe your responsibilities in connection with the New Jersey Natural Gas Company Southern Reliability Link (the "Project").

A. New Jersey Natural Gas ("NJNG") retained AECOM to assist in the evaluation and development of alternative routes for the Project. I led the team that conducted the siting study. The AECOM siting process incorporates GIS technology, statistical evaluation, site assessment, and expert judgment into the decision-making process. The overall objective of the study was to select a Project route that would best minimize impacts to the local communities and the natural environment while still being practicable to construct by NJNG. The study is attached hereto as Exhibit 2.

I also coordinate the overall environmental permitting and approval efforts on behalf of NJNG, including surveys, investigations, and permit preparation and submittals to federal, state, and local agencies. These efforts include and will include wetland delineations, cultural resources investigations, threatened and endangered species surveys, erosion and sedimentation control plans and related approvals, National Pollution Discharge Elimination System ("NPDES") stormwater permits, Section 404 Clean Water Act permits, as needed, from the U.S. Army Corps of Engineers, as well as consultation and coordination with these agencies and others as necessary.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to sponsor and explain the Southern Reliability Link Project Alternatives Analysis ("Alternatives Analysis"), dated April 2015. The

Alternatives Analysis describes the methodology used to review alternative routes and why the Selected Route was selected for the NJNG Project.

Q. Are you sponsoring any exhibits?

A. Yes. A copy of my curriculum vitae is attached as Exhibit 1. I am also sponsoring the Southern Reliability Link Project Alternatives Analysis ("Alternatives Analysis"), which is attached as Exhibit 2. The Alternatives Analysis is a narrative description of the analysis of alternative routes for the Project. AECOM prepared the Alternatives Analysis under my supervision.

Q. Please summarize your conclusion.

A. The Project consists of two sections. AECOM, in coordination with NJNG, considered multiple alternative routes for each section – five in Section 1 and four in Section 2. The Selected Routes for both Section 1 and Section 2 will result in minimum combined impacts to the built environment and natural environment while still being a feasible engineering design.

II. OVERVIEW OF ROUTE EVALUATION PROCESS

Q. Please explain the Tier 1 Analysis for the Project.

A. Details relating to the Tier 1 Analysis are set forth in Section 1 of the Alternatives Analysis. The first step in evaluating project alternatives is the Tier 1 Analysis, which considers system alternatives that could accomplish the Project's objectives. The project objectives are set forth in the accompanying testimony of Craig A. Lynch, also an exhibit to this petition. System alternatives considered by NJNG include (1) no action, (2) postponed action, (3) system alternatives (4)

operational alternatives, and (5) a new service feed. In this case, only the Project would accomplish the Project's objectives. Therefore, we proceeded to analysis of alternative routes for the Project. The alternative routes are the focus of the Alternatives Analysis.

Q. Please explain how the study area was determined.

A. NJNG and AECOM conducted a detailed siting analysis to determine the routes for the Project that best balance social, environmental, engineering and economic considerations. That analysis included the determination of a Project Study Area, background research regarding the overall environmental setting within the Project Study Area, identification and analysis of alternative routes, evaluation of the alternative routes and, finally, identification of the Selected Route. The Study Area for the alternatives analysis was determined based on the physical location of the project start and end points, the geographic characteristics of the region and professional judgment.

The Study Area was intended to encompass all potential routes connecting the Transco pipeline compressor station in Chesterfield Township to the NJNG transmission system in Manchester Township. The Chesterfield Township compressor station is the only gate available for NJNG on the Transco pipeline consistent with the Project's purpose. The Manchester Township transmission system is the only feasible location for connecting a redundant main feed to the Ocean and Monmouth County distribution system meeting the Project's goals.

Q. Explain the methodology employed to develop alternative routes for the Project.

A. The goal of the Alternatives Analysis was to identify a route that minimizes the impact to the built and natural environments to the maximum extent practicable, while still maintaining the technical and economic viability of the Project. The Alternatives Analysis was used to determine the most suitable route for a 30-inch underground transmission main connecting the Transco compressor station in Chesterfield Township and transmission system in Manchester Township.

The framework used for this siting study incorporates GIS technology, statistical evaluation, and professional judgment into the decision-making process. The approach formalizes many of the methods and principles used in the industry and by consultants, including URS and AECOM, over the last several years.

Identification of alternative routes took into consideration opportunities to parallel existing pipeline and other linear utility rights of way ("ROWs"), opportunities to co-locate within or parallel to existing road ROWs, and opportunities to cross undeveloped land. Identifying alternative routes also involves consideration of potential impacts from three perspectives, including: (1) the Built Environment, which addresses human and cultural resources including residential neighborhoods, other community-valued buildings, and historic sites; (2) the Natural Environment, which addresses plants, animals, aquatic resources, ecological resources, and natural habitat; and (3) Engineering Considerations

which addresses maximizing co-location and minimizing cost and schedule challenges for the Project by seeking the shortest path or using existing ROWs, while avoiding areas that pose significant construction obstacles.

The Project was considered in two sections because the eastern portion of the study area is within the New Jersey Pinelands National Reserve. The regulatory implications of the Pinelands Comprehensive Management Plan only apply to that portion of the Project within the Pinelands and, therefore, require a separate analysis. As a result, the western portion of the Project is described and analyzed as Section 1 and the eastern portion of the Project is described and analyzed as Section 2.

Q. Explain the methodology employed to evaluate the alternative routes for the Project.

The alternative routes are evaluated based on quantitative and qualitative analysis to determine a Selected Route. To assess the advantages and disadvantages of the various alternative routes, metrics were generated for specific route features, such as the number of residential properties within 150 feet of the pipeline, the acres of wetlands crossed, or the length of line paralleling roadways. These feature metrics were organized within three perspectives – Built Environment, Natural Environment, and Engineering Considerations (described above) – to capture the critical elements that must be considered when siting a pipeline.

The quantitative evaluation scored and compared the alternative routes according to specific evaluation metrics. The quantitative metrics were normalized, to allow for comparison of unrelated data, and weighted based on AECOM/URS experience with other projects and information AECOM received from NJNG regarding public input specific to the Project. Normalization and weighting allow for overall scoring for each alternative route. Lower scores are preferred as they indicate potentially less impact along that route.

By way of example, passing within 150 feet of a residence is one of the metrics generated for the quantitative alternatives analysis. The alternative route that passes within 150 feet of the most residences would be normalized to a score of 100 for that factor, while the route that passes within 150 feet of the fewest residences would be normalized to a score of 0 for that factor. The weighting factor for passing within 150 feet of residences is 30% of the built environment total. So the route passing the most residences would have a weighted score of 30 within the built environment perspective. The built environment represents 37.5% of the total factors considered, and, accordingly, passing within 150 feet of the most structures would result in a quantitative assessment score of 11.25 for that factor alone. The highest possible weighted score, including all factors, would be 100 for a route that scored worst for every factor. Note that passing within 150 feet of residences is the largest consideration (*i.e.*, results in the most total points) of any factor considered.

The qualitative evaluation incorporated the results of the quantitative evaluation with the professional judgment of the siting team towards specific non-measurable aspects of the Project. The qualitative evaluation is an essential step in the selection process because not all criteria can be counted and scored. Each alternative was assessed based on several important considerations, such as visual concerns, community concerns, schedule delay risk, special permit issues, and construction, maintenance, and accessibility issues. Qualitative assessment involves ranking the impacts from low to high and weighting each factor to arrive at a total score that allows each route to be compared. Qualitative evaluations such as these provide essential insight into the determination of the Selected Route.

III. IDENTIFICATION OF SELECTED ROUTE

Q. Please describe the Selected Route.

A. The Selected Route will start in Chesterfield Township at a proposed Transco compressor station at 14 Bordentown-Chesterfield Road (Block 204; Lot 1). From there it will follow Bordentown-Chesterfield Road (CR 528), Chesterfield-Crosswicks Road (CR 677), Mathews Lane, private easements through three properties, and Arneytown-Chesterfield Road (CR 528) in Chesterfield Township. Crossing into North Hanover, the route will follow Arneytown-Chesterfield Road (CR 528), Arneytown Chesterfield Road (CR 664), private easements through two properties, and Arneytown Chesterfield Road (CR 664). In Upper Freehold Township, the route will follow Arneytown-Hornerstown Road (CR 27), Millstream Road, and Monmouth Road (CR 537). Through the Township of Plumsted, the

route will follow Monmouth Road (CR 537), Hornerstown Road (CR 26), Pinehurst Road (CR 539), Lakewood Road (CR 528), Fisher Road (CR 24), W. Colliers Mills Road (CR 640), and Pinehurst Road (CR 539). In the Township of Jackson, the route will continue along Pinehurst Road (CR 539), which turns into Whiting-New Egypt Road (CR 539). Just before the border between the Township of Jackson and Manchester Township, the route will turn into the fenced portion of the Joint Base McGuire-Dix-Lakehurst ("Joint Base") and follow the base's southern fence line along access roads, East Boundary Road, East Clubhouse Lake Road, Lakehurst Naval Air Center Taxiway, Broome Road, Lakehurst Naval Air Center Access Road, and Lakehurst-Whitesville Road, before exiting the Joint Base along CR 547. The route will then cross CR 547, continue through several easements through private properties, then follow Lowell Road and Route 70 before ultimately terminating by tying into NJNG's existing transmission system at the intersection on Colonial Drive south of NJ State Route 70 in Manchester Township.

Chapter 5.0 (Summary and Conclusions) of the Alternatives Analysis describes the Selected Route as Section 1 Route B and Section 2 Route D. Figure 4.3 depicts the Selected Route.

A. SECTION 1

Q. Please explain the analysis and selection of the Selected Route for Section 1 of the Project.

A. Alternative Routes A, B, C, D, and E were evaluated and compared against each other to determine the Selected Route for Section 1. The alternative routes are described in Section 4.5.1 and depicted in Figure 4-2a. Evaluation of the Alternative Routes included a combination of quantitative analysis based on weighted metrics, as well as a qualitative review by the siting team. The specific quantitative metrics and their definitions are provided in Table 4-1a. The quantitative assessment of the Section 1 alternative routes is summarized in Tables 4-1b and 4-1c. The qualitative analysis performed by the siting team included an assessment of visual issues, community issues, special permit issues, construction/maintenance accessibility, and schedule delay risk specific to each Alternative Route. The results of the qualitative assessment of the Section 1 alternative routes are summarized in Table 4-1d.

The quantitative results are discussed in detail in Section 4.5.4. A review of the results of the quantitative analysis indicates that Section 1 Route B would have fewer impacts than the other alternatives. Route B had the second lowest score for the built environment, the lowest score for the natural environment, and the third lowest score for engineering considerations. By comparison, for the built environment Route C had the highest score and Route E had the lowest score. For the natural environment, Route D had the highest score by far and, as

mentioned above, Route B had the lowest score. For Engineering Considerations, Route E had the highest score by far and Route C had the lowest score. Overall, Route B received the lowest total quantitative score, which indicates that Route B is expected to have the least total impact of the alternative routes.

The qualitative results are discussed in detail in Section 4.5.5. A review of the results of the qualitative analysis, summarized in Table 4-1d, indicates that Section 1 Route B had the lowest total score for qualitative concerns. Route B had the lowest score for special permit concerns, construction, maintenance and accessibility and schedule delay risk. Route B had the middle score for visual concerns and community concerns. By way of comparison, Route D had the lowest scores and Route C had the highest scores for visual concerns and community concerns. Route D had the highest scores for special permit concerns, construction/maintenance accessibility, and schedule delay risk. Overall, Route B had the lowest qualitative score, indicating that it would have relatively limited concerns and permitting requirements compared to the other four alternatives.

Based on the quantitative and qualitative assessments of the Alternative Routes, the Siting Team selected Alternative B for Section 1.

B. SECTION 2

Q. Please explain the analysis and selection of the Selected Route for Section 2 of the Project.

A. Alternative Routes A, B, C, and D were evaluated and compared against each other to determine the Selected Route for Section 2. The Section 2 alternative routes are described in Section 4.6.1 and depicted in Figure 4-2b. As with Section 1, evaluation of the alternative routes included a combination of quantitative analysis based on weighted metrics, as well as a qualitative review by the siting team. The specific quantitative metrics for Section 2 and their definitions are provided in Table 4-2a. The quantitative assessment of the Section 2 alternative routes is summarized in Tables 4-2b and 4-2c. As with Section 1, the qualitative analysis performed by the siting team included an assessment of visual issues, community issues, special permit issues, construction/maintenance accessibility, and schedule delay risk specific to each Alternative Route. The results of the qualitative assessment of the Section 2 alternative routes are summarized in Table 4-2d.

The quantitative results are discussed in detail in Section 4.6.4. A review of the results of the quantitative analysis indicates that Section 2 Route D would have fewer impacts than the other alternatives. Route D had the lowest score for the built environment and engineering considerations, and the highest score for the natural environment. By comparison, for the built environment and engineering consideration, Route C had the highest score. For the natural environment,

Route B had the lowest score. Overall, Route D received the lowest total quantitative score, which indicates that Route D is expected to have the least total impact of the alternative routes.

The qualitative results are discussed in detail in Section 4.6.5. A review of the results of the qualitative analysis, summarized in Table 4-2d, indicates that Section 2 Route D had the lowest total score for qualitative concerns. Route D had the lowest score for all categories. By way of comparison, Route C had the highest scores for all categories. As explained in Section 4.6.5, Routes A, B, and C all pass through restrictive Pinelands Management areas where such development is not a permissible use, resulting in higher qualitative permitting scores. Overall, Route D had the lowest qualitative score, indicating that it would have relatively limited concerns and permitting requirements compared to the other four alternatives.

Based on the quantitative and qualitative assessments of the Alternative Routes, the Siting Team selected Alternative D for Section 2.

CONCLUSION

Q. Based on your experience and expertise, does the Alternatives Analysis constitute a reasonable and thorough study consistent with current siting methods?

A. Yes. The Siting Study Report was conducted using a detailed and transparent methodology and based on many years of URS/AECOM experience in such studies.

Q. In your expert opinion, is the Selected Route recommended in the Alternatives Analysis the appropriate route for the Project?

A. Yes. As detailed above, the Project will provide a transmission route that would minimize combined impacts to communities and the environment while still being practicable to construct.

Q. Does this complete your direct testimony?

A. Yes, it does.

AECOM

Barry A. Baker

Senior Project Manager

Impact Assessment & Permitting Department Manager

Areas of Expertise

Project management of critical issues analysis and permitting for energy and power plant projects.

Advanced user of ArcGIS and extensions, including complex model development for siting and risk analysis.

Database design and creation for field collection and analysis.

Years of Experience

With AECOM/URS: 10 Years
With Other Firms: 12 Years

Education

BS Environmental Science (Honors) /1996/ University of East Anglia (England)

Overview

Mr. Baker has nineteen years environmental experience and three additional years' experience in construction and laboratory work. Mr. Baker is a URS Certified Project Manager and manages the Impact Assessment & Permitting Department of the AECOM Philadelphia Metro Region. Mr. Baker is also the Power & Industry Business Unit Leader for the Region. In these roles Barry manages projects for siting and permitting of energy lines, authors sections of state utility commission applications, and provides testimony support for utility commission hearings. He has completed energy projects in NJ, PA, DE, OH, MD, NY, IL, and VA. He also manages projects for power plant siting (natural gas, coal gasification, hydro, and solar), including natural gas pipeline and transmission line route identification, fatal flaw/critical issues studies, and permitting for new plants, with work conducted in NJ, PA, MD, DE, OH, NY, MA, and CT.

Project Specific Experience

Technical Task Manager, Pipeline Siting and Permitting of SRL Project, Central NJ, NJNG:
Manager of permitting team and technical siting manager for the development of the proposed Southern Reliability Link 30-inch gas pipeline. Siting analysis includes development and comparison of alternative alignments. Permitting efforts, include wetland delineations, T&E species reviews and multiple botanical studies; agency coordination in Pinelands, NJDEP, Army Corps and the associated permit applications.

Project Manager, Transmission Siting and Permitting of Six Transmission Lines, and BPU Support, Southern NJ, Atlantic City Electric:
Overall manager of permitting team and technical siting manager for the rebuild or development of six transmission lines within southern New Jersey. Siting analysis included development and comparison of alternative alignments for both overhead and underground options. Permitting efforts, include wetland delineations, T&E species reviews and multiple botanical studies; agency coordination in Pinelands, NJDEP, Army Corps and the associated permit applications.

Permitting Project Manager and Technical Task Manager, GBW Transmission Siting and BPU Filings, Northern and Southern NJ, PSE&G:
Overall manager of permitting team and technical siting manager for the development of two new 230 kV transmission line upgrade projects within New Jersey – one within north central NJ (North Central Reliability Project) and the second in south central NJ (Burlington

Camden Project). Siting analysis included development and comparison of alternative alignments for both overhead and underground options. The project study area involved highly complex and constrained environments including some of the most densely populated areas of the U.S. Technical tasks involved data acquisition and geoprocessing, complex model development and analysis, natural and human resource assessments and general project mapping. Additional tasks included public outreach presentation support, BPU filing and testimony support, data integration for next step engineering, and licensing and permitting strategy development. Permitting team has been responsible for the overall program management of permitting sub-consultants, permitting strategy in coordination with PSE&G; agency meetings and outreach; and detailed Level 3 schedule development.

Technical Task Manager, GSRP Transmission Siting, Northern NJ, PSE&G:
Technical siting manager for the development of a new 50-plus mile 500 kV transmission line and associated substations within New Jersey. Siting analysis developed seven alternative alignments across the project study area within highly complex and constrained environments including some of the most densely populated areas of the U.S. The comprehensive analysis and resulting report to support a BPU filing was completed on time despite an extremely compressed schedule and under budget. Technical tasks involved data acquisition and geoprocessing, complex model development and analysis, natural and human resource assessments and general project mapping.

Project Manager, BSB Transmission Siting, Central NJ, PSE&G:
Project manager for conducting a high-level alternative route analysis as part of PSE&G's Branchburg – Somerville - Bridgewater (BSB) 230 kV Transmission project. An existing single circuit 230 kV transmission line and associated right-of-way (ROW) already ran between Flagtown – Somerville - Bridgewater and the preference was to rebuild this line to double circuit 230 kV. From a best siting practice perspective, the rebuilding in place option is normally the preferred alternative since this alternative normally minimizes impacts to the human and natural environments. However, to be compliant with the requirements of the NJDEP freshwater wetlands and stream encroachment permit application, an alternative's analysis was completed given the concerns of a documented and publicized bald eagle nest within the existing Flagtown to Somerville section of ROW. Technical tasks involved data acquisition and geoprocessing, complex model development and analysis, natural and human resource assessments and general project mapping.

Technical Task Manager, Environmental Constraints Review Gas Pipelines, McKean County, PA, Seneca Resources: Technical task lead for environmental constraints review of two 8-mile gas pipelines in McKean County, PA. Work included the desktop assessment and critical issues review and permitting needs for the ROW along with environmental impact assessments to wetlands and other critical habitats.

Right-of-way investigation involved detailed analysis of land use and other critical aspects using an appropriately scaled linear siting approach to determine potential right-of-ways.

Technical Task Manager, Environmental Constraints Review Underground Electric Transmission Line, Delaware County, PA Confidential Client: Technical task lead to evaluate and compare the natural and social environmental impacts, zoning considerations, and permitting scenarios of four underground transmission line route alternatives in Delaware County, PA. The evaluation was completed within the context of the requirements defined by the Pennsylvania Public Utilities Commission (PUC). Additionally URS identified, evaluated, and developed a matrix that compared the permitting that may be required for each of the alternatives along with strategies to avoid or mitigate the permit requirements.

Project Manager, PPL Northeast/Pocono 230kV Transmission Siting & PUC Filings; Peckville-Varden Siting & PUC Filings; and Paupack Substation Connection Siting & PUC Filings; Environmental and Cultural Resource Studies; and Chapter 102 and 105 Permitting - Multiple Counties, PA, PPL: Project Manager and technical siting lead for ~ 60-miles of new 230kV transmission lines and substations, along with rebuild of 69kV lines and connectors in northeast PA. Siting methodology incorporates an adapted EPRI-GTC transmission siting process using a URS build GIS model application to assist with stream-lining the siting process. Work involves data acquisition, mapping, and environmental analysis; Letter of Notification and Full Siting Application support for PUC filings, along with testimony support for the PUC filings. Additional tasks included public outreach presentations and initial environmental coordination with Agencies for PNDI review and PHMC consultation. Permitting efforts, include wetland delineations, T&E species reviews e.g., Bog Turtle, Indiana Bat, rattlesnakes, and multiple botanical studies; agency coordination; Chapter 102 NPDES Individual Permit applications and Chapter 105 Joint Permit applications.

Project Manager, New Generation Siting, Northeast U.S., Multiple Clients:
Project manager and technical siting lead for fourteen separate multistate (PA, NJ, MD, DE, NY, CT, MA, and OH) siting analysis and environmental assessments for new power generation projects; (Combined Cycle, Peaking, Solar, Hydroelectric, and IGCC). Work included selecting optimal site locations based on proximity analysis to critical infrastructure and right of ways; site layout and design; and environmental impact assessments to wetlands and other critical habitats; additional review of socio-economic climate at potential facilities was also included. Right-of-way investigation involved detailed analysis of land use and other critical aspects using an appropriately scaled linear siting approach to determine potential right-of-ways. Further tasks included Landowner identification and purchase introductions, Township

AECOM

committee presentations and negotiations, and land Option negotiation assistance. Multiple sites have reached option agreement status, provisional permitting review (fatal flaw/critical issues), and full permitting. Many development projects listed in the PJM Queues are the direct result of this work.

Project Manager, New Generation Critical Issues Analysis and Permitting, Northeast U.S., Multiple Clients:
Managed permitting projects and Critical Issues Analysis for development of new power generation facilities in PA, NJ, and CT. Responsible for all aspects of project teamwork including land use, water diversion / discharge, zoning, and air permitting activities. CT project tasks included application for State funding that successfully allowed client to receive multi-million dollar grant funding, along with full approval through the CT Siting Council.

Specialized Training

2005 – 2009 / URS Project Management Certification (50-courses)
2009 / Geoprocessing with ArcGIS Desktop
2008 / Creating and Integrating Data for Natural Resource Applications
2005 / Working with ArcPAD
2003 / Introduction to ArcIMS
2003 / System Architecture Design for GIS
2003 / SAIC Common Approach Guidance for CMMI
2002 / SAIC Integrated Measurements for Managers and Technical Staff
2002 / Working with ModelBuilder
2002 / Programming with Avenue
2001 / Spatial Hydrology Using ArcView 3.x
2000 / Introduction to ArcView 3.x

Publications

"The Importance of CMMI/DMSO in Subsurface Simulation", Session 5 Environmental Technology I - Business and Industry Symposium 2004 Advanced Simulation Technologies Conference, April 18 - 22 2004, Crystal City Arlington, VA

Contact Information

625 West Ridge Pike, Suite E-100
Conshohocken, PA 19428
Ph. 610.832.3580
Fax. 610.832.3501
barry.baker@aecom.com

Southern Reliability Link Project
Alternatives Analysis

Burlington, Monmouth, and Ocean Counties, New Jersey

APRIL 2015

Prepared For:

New Jersey Natural Gas

New Jersey Natural Gas Company
1415 Wyckoff Road
P.O Box 1468
Wall, NJ 07719

Prepared By:

AECOM

625 West Ridge Pike, Suite E-100
Conshohocken, PA 19428

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Acronym	Definition
A.D.	Anno Domini
B.P.	Before Present
BMP	Best Management Practice
BOMARC	Boeing Michigan Aeronautical Research Center
CMP	NJ Pinelands Commission Comprehensive Management Plan
CR	County Route
DLUR	Division of Land Use Regulation
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FW	Freshwater
GIS	Geographic Information Systems
MHW	mean high water
msl	mean sea level
NEPA	National Environmental Policy Act
NJBPU	New Jersey Board of Public Utilities
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NJFHA	New Jersey Flood Hazard Areas
NJNG	New Jersey Natural Gas
NJNHP	New Jersey Natural Heritage Program
NPL	National Priority List
NT	Non-trout
NWI	National Wetland Inventory
NWPS	National Wilderness Preservation System
NWR	National Wildlife Refuge
ONRW	Outstanding National Resource Waters
PL	Pinelands Waters
RCRA	Resource Conservation and Recovery Act
ROW	right-of-way
SC	saline coastal
SE	saline estuarine
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Office
SRL	Southern Reliability Link Project
SWRPA	Special Water Resource Protection Area

Acronym	Definition
T&E	Threatened and Endangered
TM	Trout maintenance
TP	Trout production
TSD	Treatment, Storage, and Disposal
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	Watershed Management Area

EXECUTIVE SUMMARY

This report presents the findings of a comprehensive alternatives analysis that was performed by New Jersey Natural Gas (NJNG) to identify a route to construct a new 30-inch natural gas transmission pipeline between specific supply and connection points in Burlington County and Ocean County, New Jersey, referred to herein as the Southern Reliability Link (SRL) Project. The overall objective of the analysis was to identify a route for a new natural gas transmission line route that would minimize impacts both to communities and the environment while providing for constructability, operation, and maintenance of the pipeline.

Need for the Project

In recent years, winter season curtailments, and concerns over system reliability resulting from having a single major interstate supplier with a connection at the northern end of NJNG's service area, have led NJNG to reevaluate their system. These evaluations resulted in the identification of unique system vulnerabilities that will be addressed by the SRL Project. Located in the southern portion of NJNG's service territory, and supplied from a second interstate supplier (Transcontinental Gas Pipe Line Company, LLC (Transco)), the SRL Project will provide redundancy of supply and increase system resilience.

Environmental Setting

The proposed pipeline will cross an area consisting of a variety of land uses and natural resources. Land uses include public roadways, residential properties, forested areas, or agricultural lands. Natural resources include preserved/conserved lands, floodplains, streams, wetlands, and potential threatened and endangered species habitat.

A portion of the proposed pipeline will cross through the New Jersey (NJ) Pinelands Area, where the NJ Pinelands Commission regulates development through the implementation of the NJ Pinelands Comprehensive Management Plan (CMP) (N.J.A.C. 7:50). Due to the special regulatory considerations applied within the Pinelands Area, the Project Study Area was evaluated in two sections:

- Section 1 originates in Chesterfield Township at the proposed Transco compressor station connecting to their interstate pipeline system, and extends east to the Pinelands Area boundary (**Figure 2-1**).

- Section 2 begins at the Pinelands Area boundary and extends east to the project terminus at potential connection points with NJNG's existing natural gas infrastructure in Manchester Township (**Figure 2-1**).

Alternatives Analysis Method

The methodology used in the alternatives analysis was designed to identify potential pipeline routes that minimize impacts on natural resources, cultural resources, and

residential property to the greatest extent. Both quantitative and qualitative evaluation techniques were used in the analysis. The quantitative evaluation was used to initially score and rank the alternative routes according to certain selected criteria. Subsequently, a qualitative evaluation that incorporated professional judgment, external agency comments, and local governmental input was conducted to reach a decision regarding the selected route.

The alternatives analysis consisted of four fundamental phases:

1. Define the *Project Study Area*: The study area for the alternatives analysis was determined based on the physical location of the project start and end points, the geographic characteristics of the region and professional judgment.

2. Generate *Alternative Routes*: Alternative Routes most suitable for pipeline alignments within the Project Study Area were generated taking into account three primary perspectives:

    a. protection of the built environment (i.e., churches, schools, and residences)

    b. protection of the natural environment (i.e., wetlands, streams, and forests), and,

    c. engineering considerations (i.e., length in roadway, bridge crossings, and major utility crossings).

3. Evaluate the *Alternative Routes*: Use select criteria to quantitatively and qualitatively assess the Alternative Routes;

4. Determine the *Selected Route*: Use the information from the quantitative and qualitative assessment to determine the Selected Route.

Alternative Analyses Conclusions

Based on the quantitative and qualitative analyses of the SRL Project Study Area, the Section 1 Route B Alternative combined with the Section 2 Route D Alternative has been identified as the Selected Route for the Project.

The alignment of the Selected Route is presented in **Figure E-1.**

1.0 INTRODUCTION AND PROJECT NEED

New Jersey Natural Gas Company (NJNG) is a public utility that supplies natural gas to approximately 500,000 customers in New Jersey's Monmouth, Ocean, Morris, Middlesex and Burlington Counties. In recent years, winter season curtailments, and concerns over system reliability resulting from having a single major interstate supplier, the Texas Eastern Transmission System (TETCO), have led NJNG to reevaluate their system. These evaluations have identified system vulnerabilities that the proposed pipeline will address. NJNG is proposing to construct the Southern Reliability Link (SRL) Project to provide a second, redundant, natural gas feed into the southern portion of the NJNG distribution system. The second feed will be from a second major interstate supplier (Transcontinental Gas Pipe Line Company, LLC (Transco)). This new feed will require the construction of a new 30-inch natural gas transmission pipeline between specific supply and connection points in Burlington and Ocean Counties.

PURPOSE AND NEED

NJNG considered and evaluated various system, design and construction alternatives during the project development process. This evaluation followed a tiered approach. In the first tier, NJNG examined five potential alternatives and their ability to fulfill the basic objectives of the Project. Alternatives included:

1. No Action
2. Postponed Action
3. System Alternatives
4. Operational Alternatives
5. A New Service Feed

As proposed, the SRL Project will provide an additional, redundant supply of natural gas to the NJNG system. Located in the southern end of the system, the second supply, from an alternate supplier of natural gas (Transco) will increase system resilience. Approximately 85% of NJNG's winter season peak day capacity is supplied from a single connection with TETCO. The TETCO connection is northwest of the NJNG system. Therefore, NJNG's customers, particularly those in Ocean, Burlington, and Monmouth counties are the most vulnerable and are likely to be adversely affected by a supply interruption or system failure. NJNG asserts that the proposed connection to the Transco system is the preferred option for meeting the project objectives of:

- Providing an alternate source of natural gas, with a tie-in in the southern portion of the NJNG distribution system; and
- Providing an alternate source of natural gas from a second provider.

In accordance with the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey Board of Public Utilities (BPU) implementing policies, NJNG considered and evaluated various system, design, and construction alternatives during development of the Project. The evaluation of project alternatives followed a tiered

approach. First, potential alternatives, including the No-Action, Postponed Action, System Alternatives, Operational Alternatives, and a New Service Feed were evaluated to identify whether those alternatives were capable of fulfilling the project objectives. Alternatives incapable of fulfilling the basic objectives of the proposed project were considered non-viable and eliminated from further consideration. Viable alternatives (i.e., those which could fulfill the project's objectives) were carried forward for a more detailed, second tier review. For this second tier review, NJNG identified several potential Design and Construction Alternatives (alternative routes) that could accomplish the project's objectives.

The following sections provide detailed descriptions of these alternatives and the results of NJNG's Tier 1 Analysis.

1. NO ACTION ALTERNATIVE

Under the No-Action Alternative, NJNG would not construct the Project. This alternative eliminates the potential impacts resulting from construction activities; however, it does not meet the project objectives as defined above. Specifically, NJNG would not provide a second, redundant, supply of natural gas and system resilience would not be improved.

If the proposed facilities are not constructed, the objectives of the project would not be realized. As such, NJNG has determined that the No Action Alternative is not a viable option.

2. POSTPONED ACTION ALTERNATIVE

The Postponed Action Alternative involves delaying implementation of the proposed project for some period of time. If approved and ultimately constructed, impacts associated with the Postponed Action Alternative would be similar to those associated with the proposed project.

The Postponed Action Alternative is usually selected when insufficient information is available to thoroughly assess a proposed project; however, sufficient information is available to assess the proposed SRL Project. Furthermore, the Postponed Action Alternative fails to accomplish the project objectives. Specifically, as with the No Action Alternative, the Postponed Action Alternative fails to provide a redundant supply of natural gas to the NJNG system. NJNG has therefore determined that the Postponed Action Alternative is not a viable option.

3. SYSTEM ALTERNATIVES

System Alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed project. A viable system alternative would make it unnecessary to construct all or part of the proposed SRL Project, although some modifications or additions to another existing pipeline system may be required to increase its capacity, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts that could be less than, similar to, or potentially greater than those associated with the proposed SRL Project. In order to be a viable system alternative to the proposed SRL Project, potential system alternatives must also meet the project

objectives defined above.

All of the existing interstate connections for NJNG's service area are located at the northern end of the service area. Therefore, system alternatives cannot accomplish the project objective of creating a tie-in to the southern portion of the NJNG system. NJNG has therefore determined that System Alternatives are not a viable option.

4. OPERATIONAL ALTERNATIVES

Operational alternatives consist of modifications to system operation, such as increasing the system operating pressure, which could meet project objective. As with System Alternatives, project objectives cannot be met if a new connection to a second source of natural gas in the southern portion of the NJNG system is not made. NJNG has therefore determined that Operational Alternatives are not a viable option.

5. A NEW SERVICE FEED

Installation of a new service feed involves the construction of approximately 28 miles of 30-inch diameter pipeline between specific supply and connection points in Burlington County and Ocean County. The New Service Feed provides an alternate source of natural gas, with a tie-in in the southern portion of the NJNG distribution system, and provides an alternate source of natural gas from a second provider. NJNG has determined that installation of a new service feed is the only viable alternative to fulfill the basic purpose and need of the SRL Project.

ALTERNATIVES ANALYSIS

An alternatives analysis was conducted to select a pipeline route for the proposed SRL Project. The pipeline will be located underground, however a pig[1] launcher will be located at Transco's facility in Chesterfield Township and valve settings will be located along the pipeline route to provide sectionalized shut-down points.

The objective of the alternatives analysis is to identify a pipeline route that avoids and/or minimizes adverse impacts to the natural, cultural, and social environments to the maximum extent practical, while still maintaining the economic viability and technical feasibility of the Project.

Prior to initiating the alternatives analysis, background research was conducted regarding the overall environmental setting within the Project Study Area. The results of this research are provided in **Chapter 2.0** (Environmental Setting). The alternatives analysis process, described in detail in **Chapter 3.0** and implemented in **Chapter 4.0** of this report, initially determined the extent of the Project Study Area and then reviewed the environmental setting within this area to identify opportunity and constraint features. A visual and technical review process using detailed information from within the Project Study Area was then used to identify alternative routes. Quantitative analyses were then

[1] A pig generally is a device inserted into a pipeline to clean, inspect, or maintain pipelines.

conducted on each of the alternative routes based on three broad categories – the built environment, the natural environment, and engineering considerations. In conjunction with the quantitative analyses, a qualitative assessment process was conducted to evaluate aspects of he alternative routes that are less susceptible to quantitative evaluation, such as special permitting requirements and community concerns. Based on the results of the quantitative and qualitative analyses, a Selected Route was identified for the Project. This report describes the detailed alternatives analysis process and route selection.

2.0 ENVIRONMENTAL SETTING

This chapter provides background information regarding the general environmental setting within the Project Study Area. The environmental setting is divided into two main sections:

- Natural environment components, such as streams, wetlands, and preserved lands, and
- Human/built environment components, such as residential development, linear utility corridors, and historic sites.

The features identified during the environmental setting review generally define the potential opportunities and constraints within the Project Study Area.

The Project Study Area was developed based on the two proposed endpoints, which include the proposed Transco compressor station in Chesterfield Township, Burlington County and NJNG's existing transmission system connection point in Manchester Township, Ocean County. The Project Study Area extends from Burlington County southeast through Monmouth County and then to Ocean County (**Figure 2-1**).

A portion of the Project Study Area crosses through the New Jersey (NJ) Pinelands Area, where the NJ Pinelands Commission regulates development through the implementation of the NJ Pinelands Comprehensive Management Plan (CMP) (N.J.A.C. 7:50). Due to the special regulatory considerations applied within the Pinelands Area, the Project Study Area was evaluated in two sections:

- **Section 1** originates in Chesterfield Township at the proposed Transco compressor station and extends east to the Pinelands Area boundary (**Figure 2-1**).
- **Section 2** begins at the Pinelands Area boundary and extends east to the project terminus at potential connection points with NJNG's existing natural gas infrastructure in Manchester Township (**Figure 2-1**).

The information contained in this report was obtained from a variety of Federal, State, and local GIS databases, published reports and maps, and field reconnaissance surveys of the Project Study Area.

2.1 Natural Environment

Features of the natural environment are an important consideration in the alternatives analysis process. This section provides a general description of the environmental setting of the Project Study Area including the physiography and geology, surface waters, vegetation, special use areas, and wildlife.

2.1.1 Physiographic Region and Topography

The State of New Jersey is divided into several physical geographic regions known as physiographic provinces, which are defined by unique geology, soil types, topographic expression, and landforms. The Project Study Area is contained entirely within the Coastal Plain Physiographic Province (N.J. Geological Survey 2003) (**Figure 2-2**). The general landscape of the Coastal Plain is generally flat to very gently undulating. However, erosion-resistant gravel or iron-cemented sediment underlies upland areas and

isolated hills.

2.1.2 Geology and Soils

Bedrock geology of the Project Study Area is shown in **Figure 2-3**. Principle rock formations that occur within the Project Study are presented in **Table 2-1.** The Coastal Plain is comprised of sequences of quartz sand, mixed with clay and glauconitic sands (N.J. Geological Survey 2006).

Table 2-1: Geologic Formations within the Project Study Area

Geologic Feature Name	Lithology
Cohansey Formation	quartz sand, medium- to coarse grained
Englishtown Formation	quartz sand, fine- to coarse-grained, locally interbedded with thin- to thick beds of clay
Hornerstown Formation	glauconite sand, fine- to medium-grained
Lower Member	quartz sand and clay
Manasquan Formation	quartz-glauconite sand, clayey; and fine grained quartz sand or silt
Marshalltown Formation	quartz and glauconite sand, silty, and clayey
Mt. Laurel Formation	quartz sand, fine- to coarse-grained, slightly glauconitic
Navesink Formation	glauconite sand, clayey
Shrewsbury Member	quartz sand, fine- to coarse-grained
Vincentown Formation	quartz sand, medium-grained, clayey; and glauconitic near base; locally a calcarenite or coquina
Wenonah Formation	quartz sand, fine-grained, silty, clayey micaceous
Woodbury Formation	clay-silt

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service's (NRCS) Soil Series Geographic Database for Burlington, Monmouth and Ocean Counties, soils within the Project Study Area range from very poorly drained to excessively drained (USDA, NRCS 2008). **Table 2-2** lists the soil series mapped within the Study Area. The USDA/NRCS rating of the hydric capacity of these soils is illustrated in **Figure 2-4a.** Additionally, soils with a high acidic rating, which can have some bearing on pipeline corrosion, are illustrated in **Figure 2-4b**.

Table 2-2: Soil Series within the Project Study Area

Series ID	Series Name	Drainage Class
AdmA	Adelphia fine sandy loam, 0 to 2 percent slopes	Moderately well drained
AdmB	Adelphia fine sandy loam, 2 to 5 percent slopes	Moderately well drained
AdmkA	Adelphia fine sandy loam, clayey substratum, 0 to 2 percent slopes	Moderately well drained

Series ID	Series Name	Drainage Class
AdmmA	Adelphia high glauconite variant fine sandy loam, 0 to 2 percent slopes	Moderately well drained
AdmmB	Adelphia high glauconite variant fine sandy loam, 2 to 5 percent slopes	Moderately well drained
AdnA	Adelphia loam, 0 to 2 percent slopes	Moderately well drained
AdnB	Adelphia loam, 2 to 5 percent slopes	Moderately well drained
AtsA	Atsion sand, 0 to 2 percent slopes	Poorly drained
BerAr	Berryland sand, 0 to 2 percent slopes, rarely flooded	Very poorly drained
BerAt	Berryland sand, 0 to 2 percent slopes, frequently flooded	Very poorly drained
BugA	Buddtown loamy fine sand, 0 to 2 percent slopes	Moderately well drained
BugB	Buddtown loamy fine sand, 2 to 5 percent slopes	Moderately well drained
BuhA	Buddtown fine sandy loam, 0 to 2 percent slopes	Moderately well drained
BuhB	Buddtown fine sandy loam, 2 to 5 percent slopes	Moderately well drained
CoeAs	Colemantown loam, 0 to 2 percent slopes, occasionally flooded	Poorly drained
CokB	Collington sandy loam, 2 to 5 percent slopes	Well drained
CokC2	Collington sandy loam, 5 to 10 percent slopes, eroded	Well drained
CokC2	Collington sandy loam, 5 to 10 percent slopes	Well drained
CokD3	Collington sandy loam, 10 to 15 percent slopes, severely eroded	Well drained
ComA	Collington fine sandy loam, 0 to 2 percent slopes	Well drained
ComB	Collington fine sandy loam, 2 to 5 percent slopes	Well drained
ComC	Collington fine sandy loam, 5 to 10 percent slopes	Well drained
ConA	Collington loam, 0 to 2 percent slopes	Well drained
ConB	Collington loam, 2 to 5 percent slopes	Well drained
DoaA	Donlonton fine sandy loam, 0 to 2 percent slopes	Somewhat poorly drained
DobA	Donlonton loam, 0 to 2 percent slopes	Somewhat poorly drained
DocB	Downer loamy sand, 0 to 5 percent slopes	Well drained
DoeA	Downer sandy loam, 0 to 2 percent slopes	Well drained
DoeB	Downer sandy loam, 2 to 5 percent slopes	Well drained
EveB	Evesboro sand, 0 to 5 percent slopes	Excessively drained
EveC	Evesboro sand, 5 to 10 percent slopes	Excessively drained
EveD	Evesboro sand, 10 to 15 percent slopes	Excessively drained
FanA	Fallsington fine sandy loam, 0 to 2 percent slopes	Poorly drained
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	Somewhat poorly drained
FrfB	Freehold loamy sand, 0 to 5 percent slopes	Well drained
FrfC	Freehold loamy sand, 5 to 10 percent slopes	Well drained
FrkB	Freehold sandy loam, 2 to 5 percent slopes	Well drained

Series ID	Series Name	Drainage Class
FrkC3	Freehold sandy loam, 5 to 10 percent slopes, severely eroded	Well drained
FrkD2	Freehold sandy loam, 10 to 15 percent slopes, eroded	Well drained
FrkD3	Freehold sandy loam, 10 to 15 percent slopes, severely eroded	Well drained
FrmA	Freehold fine sandy loam, 0 to 2 percent slopes	Well drained
FrmB	Freehold fine sandy loam, 2 to 5 percent slopes	Well drained
FrmC	Freehold fine sandy loam, 5 to 10 percent slopes	Well drained
FrmD	Freehold fine sandy loam, 10 to 15 percent slopes	Well drained
FrmE	Freehold fine sandy loam, 15 to 25 percent slopes	Well drained
GahB	Galloway sand, 0 to 5 percent slopes	Moderately well drained
GamB	Galloway loamy sand, 0 to 5 percent slopes	Somewhat poorly drained
HbmB	Hammonton loamy sand, 0 to 5 percent slopes	Moderately well drained
HboA	Hammonton sandy loam, 0 to 2 percent slopes	Moderately well drained
HocB	Holmdel sandy loam, 2 to 5 percent slopes	Moderately well drained
HodA	Holmdel fine sandy loam, 0 to 2 percent slopes	Moderately well drained
HodB	Holmdel fine sandy loam, 2 to 5 percent slopes	Moderately well drained
HodkA	Holmdel fine sandy loam, clayey substratum, 0 to 2 percent slopes	Moderately well drained
HodkB	Holmdel fine sandy loam, clayey substratum, 2 to 5 percent slopes	Moderately well drained
HumAt	Humaquepts, 0 to 3 percent slopes, frequently flooded	Poorly drained
JdrA	Jade Run fine sandy loam, 0 to 2 percent slopes	Poorly drained
KeaA	Keansburg fine sandy loam, 0 to 2 percent slopes	Very poorly drained
KeoA	Keyport loam, 0 to 2 percent slopes	Moderately well drained
KeoB	Keyport loam, 2 to 5 percent slopes	Moderately well drained
KeoC	Keyport loam, 5 to 10 percent slopes	Moderately well drained
KeoD	Keyport loam, 10 to 15 percent slopes	Moderately well drained
KeoE	Keyport loam, 15 to 25 percent slopes	Moderately well drained
KreA	Kresson fine sandy loam, 0 to 2 percent slopes	Somewhat poorly drained
KrhA	Kresson loam, 0 to 2 percent slopes	Somewhat poorly drained
KrhB	Kresson loam, 2 to 5 percent slopes	Somewhat poorly drained
LakB	Lakehurst sand, 0 to 5 percent slopes	Moderately well drained
LakhB	Lakehurst sand, loamy substratum, 0 to 5 percent slopes	Moderately well drained
LakkB	Lakehurst sand, clayey substratum, 0 to 5 percent slopes	Moderately well drained
LasB	Lakewood sand, 0 to 5 percent slopes	Excessively drained
LasC	Lakewood sand, 5 to 10 percent slopes	Excessively drained
MakAt	Manahawkin muck, 0 to 2 percent slopes, frequently flooded	Very poorly drained

Series ID	Series Name	Drainage Class
MaoC	Marlton sandy loam, 5 to 10 percent slopes	Moderately well drained
MapB	Marlton fine sandy loam, 2 to 5 percent slopes	Well drained
MapC	Marlton fine sandy loam, 5 to 10 percent slopes	Well drained
MarB	Marlton loam, 2 to 5 percent slopes	Well drained
MumA	Mullica sandy loam, 0 to 2 percent slopes	Very poorly drained
MunA	Mullica fine sandy loam, 0 to 2 percent slopes	Very poorly drained
MunhA	Mullica fine sandy loam, loamy substratum, 0 to 2 percent slopes	Very poorly drained
PefB	Pemberton sand, 0 to 5 percent slopes	Moderately well drained
PeftB	Pemberton sand, thick surface , 0 to 5 percen. slopes	Moderately well drained
PegB	Pemberton loamy sand, 0 to 5 percent slopes	Moderately well drained
PhbB	Phalanx loamy sand, 2 to 5 percent slopes	Well drained
PssA	Psamments, 0 to 3 percent slopes	Well drained
SaeB	Sassafras fine sandy loam, 2 to 5 percent slopes	Well drained
SaeC	Sassafras fine sandy loam, 5 to 10 percent slopes	Well drained
SaekB	Sassafras fine sandy loam, clayey substratum, 2 to 5 percent slopes	Moderately well drained
ShrA	Shrewsbury sandy loam, 0 to 2 percent slopes	Poorly drained
ShsA	Shrewsbury fine sandy loam, 0 to 2 percent slopes	Poorly drained
ShskA	Shrewsbury fine sandy loam, clayey substratum, 0 to 2 percent slopes	Poorly drained
ThfB	Tinton sand, 0 to 5 percent slopes	Well drained
ThfC	Tinton sand, 5 to 10 percent slopes	Well drained
ThftB	Tinton sand, thick surface, 0 to 5 percent slopes	Well drained
ThgB	Tinton loamy sand, 0 to 5 percent slopes	Well drained
ThgB	Tinton loamy sand, 0to 5 percent slopes	Well drained
ThgC	Tinton loamy sand, 5 to 10 percent slopes	Well drained
URSAAB	Urban land, sandy, 0 to 8 percent slopes	Excessively drained
WedB	Westphalia loamy fine sand, 2 to 5 percent slopes	Well drained
WeeA	Westphalia fine sandy loam, 0 to 2 percent slopes	Well drained
WeeB	Westphalia fine sandy loam, 2 to 5 percent slopes	Well drained
WobB	Wooodmansie sand, 0 to 5 percent slopes	Well drained
WobC	Woodmansie sand, 5 to 10 percent slopes	Well drained
WofA	Woodstown fine sandy loam, 0 to 2 percent slopes	Moderately well drained
WofkA	Woodstown fine sandy loam, clayey substratum, 0 to 2 percent slopes	Moderately well drained
WofkB	Woodstown fine sandy loam, clayey substratum, 2 to 5 percent slopes	Moderately well drained

2.1.3 Surface Waters

Surface water resources mapped within the Project Study Area include freshwater streams, rivers, floodplains, open water (ponds and lakes) and wetlands. The information presented in this section is based upon publicly available data from the NJDEP and the USGS.

The NJDEP divides the State into 20 Watershed Management Areas (WMAs). The Study Area traverses three (3) WMAs, which are listed in **Table 2-3** and illustrated in **Figure 2-5**. Major streams and lakes shown on USGS topographic maps are also illustrated on **Figure 2-5** and discussed below (refer also to **Section 2.1.3.3**).

Table 2-3: Watershed Management Areas within the Project Study Area

WMA Number	Name of Watershed Management Area
13	Barnegat Bay
19	Rancocas
20	Assiscunk, Crosswicks, and Doctors

2.1.3.1 Streams and Rivers

Surface water quality standards are developed by NJDEP pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et seq. Water quality criteria are developed for both fresh and saline waters for individual pollutants to protect aquatic life (i.e., plants and animals that live and reproduce in water) and human health. Criteria are developed to protect water quality for designated uses, including survival, growth and reproduction of aquatic life, and drinking water and fish consumption for human health protection. Uses identified include: drinking water supply, fish consumption, shellfish resources, propagation of fish and wildlife, recreation and agricultural and industrial water supplies.

These uses are designated for a particular waterbody through the assignment of surface water classifications. Surface waters classified as FW1 are not subject to any human-produced wastewater discharges; they are designated as set aside for posterity to represent the natural aquatic environment and associated biota. Additional designated uses for FW1 waters include primary and secondary contact recreation; maintenance, migration and propagation of aquatic biota, as well as any other reasonable uses. All other freshwaters are considered FW2 waters. Designated uses for FW2 waters include: maintenance, migration and propagation of aquatic biota, primary and secondary contact recreation, industrial and agricultural water supply, public water supply and any other reasonable uses. Freshwaters are further classified based on their ability to support trout: trout production (FW2-TP), trout maintenance (FW2-TM), or non-trout (FW2-NT). Additionally, there are three levels of antidegradation designations: Outstanding National Resource Waters (ONRW), which include waters within the NJ Pinelands (classified as "PL" waters), as well as FW1 waters. The other antidegradation categories are Category One waters (C1), and Category Two (C2) waters. All waters of the State are classified and assigned with one of the three antidegradation designations. C1 waters are protected from "measurable or calculable changes" in water quality; this classification is frequently applied to waters flowing through parks, wildlife refuges and to FW2-TP streams (NJDEP 2010).

Several of the waterways in the Project Study Area are designated as ONRW, and classified as PL waters. They are maintained in their natural state and changes are allowed only toward natural water quality. Major streams and lakes shown on USGS topographic maps that are present in the Project Study Area are illustrated in **Figure 2-5**.

In addition to surface water quality standards, NJDEP has implemented riparian zone protection standards within the Flood Hazard Area Control Act rules (N.J.A.C. 7:13), Theses rules require riparian zones that are 50, 150, or 300 feet in width along each side of surface waters throughout the State. The riparian zone width depends on the environmental resources being protected, with the most protective 300-foot riparian zone applicable to waters designated as Category One (C1) and certain upstream tributaries. Certain waters supporting trout, or habitats of threatened or endangered species critically dependent on the watercourse to survive, or watercourses which flow through areas that contain acid-producing soil deposits, receive a 150-foot riparian zone.

Table 2-4 shows the major rivers and streams located within the Project Study Area, along with their classifications:

Table 2-4: River and Stream Classifications within the Project Study Area

River/Stream Name	Water Quality Classification
Annaricken Brook	FW2-NTC1
Annaricken Brook UNT	FW2-NTC1
Assiscunk Creek	FW2-NTC1
Assiscunk Creek UNT	FW2-NTC1
Bacons Run	FW2-NT
Bacons Run UNT	FW2-NT
Barkers Brook UNT	FW2-NT
Beaverdam Brook	FW2-NT
Beaverdam Brook UNT	FW2-NT
Blacks Branch	PL
Blacks Branch UNT	PL
Blacks Creek	FW2-NT
Blacks Creek UNT	FW2-NT
Bog Run	FW2-NT
Bog Run UNT	FW2-NT
Bordens Mill Branch	PL
Bordens Mill Branch UNT	FW2-NT
Crafts Creek	FW2-NT
Crafts Creek UNT	FW2-NT
Crosswicks Creek	FW2-NT
Crosswicks Creek UNT	FW2-NT
Dark Branch	PL
Dark Branch UNT	PL
Deep Run	FW2-NT

River/Stream Name	Water Quality Classification
Deep Run UNT	FW2-NT
Dove Mill Branch	FW2-NTC1
Dove Mill Branch UNT	FW2-NTC1
Elisha Branch	PL
Fern Brook	FW2-NT
Fern Brook UNT	FW2-NT
Forked Brook	PL
Forked Brook UNT	PL
Gaskin Branch	PL
Gaskin Branch UNT	PL
Gaunts Brook	PL
Gaunts Brook UNT	PL
Goodwater Branch	PL
Harris Branch	PL
Harris Branch UNT	PL
Jensen Lake	FW2-NT
Jumping Brook	FW2-NT
Jumping Brook UNT	FW2-NT
Lahaway Creek	FW2-NT
Lahaway Creek UNT	FW2-NT
Little Hurricane Branch	PL
Little Hurricane Branch UNT	PL
Long Brook	PL
Long Brook UNT	PL
Manapaqua Brook	PL
Manapaqua Brook UNT	PL
Maple Root Branch	PL
Maple Root Branch UNT	PL
Middle Ruckels Branch	PL
Middle Ruckels Branch UNT	PL
Miry Run	FW2-NT
Miry Run UNT	FW2-NT
North Ruckels Branch	PL
North Ruckels Branch UNT	PL
North Run	FW2-NT
North Run UNT	FW2-NT
Obhanan Ridgeway Branch	PL
Obhanan Ridgeway Branch UNT	PL
Old Hurricane Brook	PL
Old Hurricane Brook UNT	FW2-NT

River/Stream Name	Water Quality Classification
Pleasant Run	FW2-NT
Pleasant Run UNT	FW2-NT
Prospertown Brook	FW2-NT
Prospertown Brook UNT	FW2-NT
Ridgeway Branch	PL
Ridgeway Branch UNT	PL
Shannae Brook	PL
Shannae Brook UNT	PL
Shoppen Run	FW2-NT
South Branch Metedeconk River UNT	FW2-NTC1
South Hurricane Brook	PL
South Hurricane Brook UNT	PL
South Ruckels Branch	PL
South Ruckels Branch UNT	PL
Stony Ford Brook	FW2-NT
Stony Ford Brook UNT	FW2-NT
Success Branch	PL
Success Branch UNT	PL
Sucker Run	FW2-NT
Sucker Run UNT	FW2-NT
Thorton Creek UNT	FW2-NT
Toms River	FW2-NTC1
Toms River UNT	FW2-NTC1
Uncoded Tributary	PL
Union Branch	PL
Union Branch UNT	FW2-NT
Wrangle Brook	FW2-NTC1
Wrangle Brook UNT	FW2-NTC1

2.1.3.2 100-year Floodplains

Areas adjacent to streams and rivers that would be inundated by a flood elevation that has a one-percent annual chance of being equaled or exceeded are designated as 100-year floodplains. The Federal Emergency Management Agency (FEMA) delineates the extent of 100-year floodplains for larger rivers and streams on Flood Insurance Rate Maps (FIRMs). Under the New Jersey Flood Hazard Areas (NJFHA) program, NJDEP also maps the floodplains within the State and, due to the methodology used, produce floodplains that may differ from those generated by FEMA. Since the FEMA floodplain data is available in GIS format, and NJFHS data was not available in GIS format, FEMA data was used for the floodplain analysis conducted as part of this siting study in lieu of the NJFHA data. (NJFHA rules were followed for other aspects of the project development, however.) The FEMA floodplain areas are mapped as Special Flood

Hazard Areas (SFHA) and are further classified based on risk of flooding. A designation of Zone A or AE signifies that the area is subject to inundation by the 100-year flood. Areas designated as Zone X are subject to moderate or minimal hazards from principal sources, while Zone X500 are areas within the 100- and 500-year flood zones.

The 100-year floodplain boundaries shown on **Figure 2-6** were acquired from FEMA datasets. Most of the major streams and rivers listed in **Table 2-4** possess associated 100-year floodplains, but not all are mapped by FEMA. The 100-year floodplains associated with all rivers, streams, and tributaries with drainage basins greater than 50 acres are regulated by the NJDEP, but not all of these floodplains are pre-determined, and some may require delineation to identify the extent of the regulated areas.

2.1.3.3 Open Water

In addition to streams and rivers, numerous lakes and ponds are located throughout the Project Study Area. Ponds and lakes within the Project Study Area were identified using the National Hydrologic Data Set (NHD) and are illustrated in **Figure 2-6**. **Table 2-5** lists these features along with approximate size and water quality classification:

Table 2-5: Open Water Bodies within the Project Study Area

Waterbody Name	Size (km sq.)	Water Quality Classification
Bass Lake	0.083	PL
Bunker Hill Lake	0.057	FW2-NT
Butterfly Pond	0.079	FW2-NTC1
Cassville Lake	0.049	FW2-NTC1
Clayton Brothers Sand Mining Company Lake #1	0.985	PL
Club House Lake	0.09	PL
Colliers Lake	0.087	Not listed
Colliers Pond	0.01	Not listed
Cookstown Pond	0.001	Not listed
Glidden Lake	0.057	PL
Horicon Lake	0.239	PL
Kuser Pond	0.005	Not listed
Oakford Lake	0.165	FW2-NT
Pickerel Lake	0.099	PL
Prospertown Lake	0.351	FW2-NT
Success Lake	0.231	PL
Shanock Lake		FW2-NT
Turnmill Lake	0.259	PL

2.1.3.4 Wetlands

Based on NJDEP 2010 Land Use/Land Cover GIS data, wetlands within the Project Study Area include palustrine forested (PFO), palustrine scrub/shrub (PSS) and palustrine emergent (PEM) systems (**Figure 2-6**) (NJDEP 2010). These wetlands are generally associated with river and stream corridors. Wetlands are classified in accordance with the Cowardin classification system (Cowardin et al. 1979), which also includes open waters (e.g., streams, ponds, lakes) as wetlands. Wetlands depicted in the NWI database are based primarily on aerial photographic interpretation of photographs taken in the 1980s. The locations of wetlands were confirmed to be generally accurate as mapped per preliminary field observations; however, detailed wetland delineations will be required as project design progresses.

Wetland permits available under the Freshwater Wetlands Protection Act at N.J.A.C. 7:7A do not restrict permit availability by wetland type (PFO, PSS, and PEM); however, PFO wetlands are sometimes regarded as providing higher habitat value. Additionally, the conversion of one wetland type to another (PFO to PSS or PEM) is considered wetland disturbance, and is therefore counted toward permit acreage thresholds. Restoration and mitigation for disturbances to PFO wetlands can also be more complex than PSS or PEM wetlands, in that forest structure is often dependent on slow growing tree species, which can require decades of growth to reach maturity. Alternately, PSS and PEM wetlands are capable of achieving habitat maturity after several growing seasons, based on the growth rates of the particular species. Identifying wetland type is also valuable for related ecological studies, including wildlife and/or threatened and endangered species studies. In addition to regulating wetlands, NJDEP also regulates transition areas or buffers adjacent to wetlands. The magnitude of the transition area is governed by the value of the wetlands: 150 feet for exceptional resource value wetlands; 50-feet for intermediate value wetlands; and no transition area for ordinary value wetlands.

Specific wetlands may be provided additional regulatory protection based on their inclusion on the EPA Priority Wetland list (USEPA 1994). This list recognizes those wetland areas that are considered to be the most important and vulnerable wetlands in the State as identified by various environmental groups and Federal and State agencies. Within the Project Study Area, all wetlands which are components of the Barnegat Bay tributary system are considered to be EPA Priority Wetlands.

2.1.4 Vegetation Communities

Vegetation within the Study Area includes undeveloped vegetated lands and maintained plant communities, such as agricultural fields, lawns and landscaped areas. Forest and agricultural lands are the primary vegetative cover types. Forested wetlands are present at several locations within the Project Study Area, with larger areas associated with the larger river and stream systems. Wetlands are discussed in more detail in **Section 2.1.3.4** above.

In Burlington and Monmouth counties, upland forest composition is primarily dominated by American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), tulip poplar (*Liriodendron tulipifera*), and various oak species (*Quercus spp.*) with an understory comprised of multiflora rose (*Rosa multiflora*) and honeysuckle (*Lonicera spp.*).

Forested wetlands consist of communities largely dominated by red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua),* and silky dogwood *(Cornus amomum).*

In the Ocean County, the study area extends through portions of the Pinelands Area and upland forested plant communities transition to a mixed deciduous/coniferous forest dominated by pitch pine (*Pinus rigida*), various oak species, and lowbush blueberry (*Vaccinium vacillans*) as is typical of vegetative communities within the NJ Pinelands. Forested wetlands consist of communities dominated by pitch pine, sweet gum, and highbush blueberry (*Vaccinium corymbosum*) as well as Atlantic white cedar (*Chamaecyparis thyoides*) wetlands.

2.1.5 Threatened and Endangered Species

The project study area contains potentially suitable habitat for Federally and NJ State listed threatened and endangered (T&E) species.

Within the Project Study Area, the potential for T&E animal species was evaluated using the NJ Landscape Project Mapping (Version 3.1) (**Figure 2-7**). The potential presence of T&E plant species was assessed using the NJ Natural Heritage Program (NJNHP) Grid Maps, General Locations of Rare Plant Species and Ecological Communities, (NJ Natural Heritage Program 2009). Forty-three Federally and/or State listed T&E animal species and 92 listed plant species are known to occur within the Pinelands Area (NJPC 2012). Potentially suitable habitat for the T&E species listed in **Table 2-6** has been identified within the Project Study Area.

Table 2-6: Potential Threatened and Endangered Species Habitat in Project Study Area

Common Name	Scientific Name	Federal Listing Status	NJ Listing Status
Bald Eagle*	*Haliaeetus leucocephalus*	Not Listed	Endangered (breeding)
Bog Turtle* (**)	*Glyptemys muhlenbergii*	Threatened	Endangered
Least Tern	*Sternula antillarum*	Not Listed	Endangered
Timber Rattlesnake* (**)	*Crotalus horridus*	Not Listed	Endangered
Upland Sandpiper	*Bartramia longicauda*	Not Listed	Endangered
Barred Owl*	*Strix varia*	Not Listed	Threatened
Northern Pine Snake	*Pituophis melanoleucus*	Not Listed	Threatened
Pine Barrens Treefrog*	*Hyla andersonii*	Not Listed	Threatened
Red-Headed Woodpecker	*Melanerpes erythrocephalus*	Not Listed	Threatened
Long's Woolgrass	*Scirpus longii*	Not Listed	Endangered, LP
Narrow-leaf Vervain	*Verbena simplex*	Not Listed	Endangered, LP
Pine Barrens Boneset	*Eupatorium resinosum*	Not Listed	Endangered, LP

Common Name	Scientific Name	Federal Listing Status	NJ Listing Status
Sickle-leaved golden-aster	*Pityopsis falcata*	Not Listed	LP
Slender Rattlesnake Root	*Prenanthes autumnalis*	Not Listed	LP

Notes:
* Classified as *Wetland Dependent* per NJ Freshwater Wetlands Protection Act (N.J.A.C. 7:7A)
**Classified as *Critically Dependent on Water Quality for Survival* per NJ Flood Hazard Area Control Act (N.J.A.C. 7:13)
LP Indicates taxa listed by the Pinelands Commission as threatened or endangered within the Pinelands Preservation Area (N.J.A.C. 7:50-6.27).

2.1.6 Special Use Areas

This section describes areas that are set aside for special use by humans or wildlife because of their uniqueness or value. Such areas include federally designated wilderness areas, federally designated wild and scenic rivers, federal, state, and county park lands, NJDEP National Priority Heritage Sites, and the NJ Pinelands Area.

2.1.6.1 Wilderness Areas

In 1964, the Wilderness Act was passed and 54 areas, representing 9.1 million acres, in 13 states were designated as wilderness. This federal law established these areas as part of the National Wilderness Preservation System (NWPS). Since 1964, the NWPS has grown almost every year and now includes 756 areas (109,492,591 acres) in 44 states and Puerto Rico.

There are no areas designated under the NWPS (NWPS 2009) in the Project Study Area.

2.1.6.2 Wild and Scenic Rivers

No federally designated wild and scenic rivers are located within the Project Study Area (USFWS 2011).

2.1.6.3 National, State, and County Park Lands

The Project Study Area includes two NJ State Wildlife Management Areas: Manchester Wildlife Management Area and Colliers Mills Wildlife Management Area (**Figure 2-8**).

The Project Study Area also includes several county parks, municipal parks, and recreation areas. In addition to providing passive recreation opportunities, these parklands provide valuable habitat for the region's wildlife.

Parklands within the Project Study Area are identified in **Figure 2-8.** Each of the counties and municipalities in the Project Study Area also has a number of parks, recreation areas, and county golf courses that provide both active and passive recreational opportunities as well as valuable wildlife habitat.

2.1.6.4 Natural Heritage Priority Sites

The NJDEP Natural Heritage Priority Sites were created to identify critically important areas to conserve New Jersey's biological diversity, with particular emphasis on rare plant species and ecological communities (NJDEP ONLM 2001). Natural Heritage Priority Sites are designated by NJDEP based on analysis of information in the New Jersey

Natural Heritage Database. Each site is ranked according to its significance for biological diversity using a scale developed by The Nature Conservancy, the network of Natural Heritage Programs across the U.S., and the New Jersey Natural Heritage Program. The global biodiversity significance ranks range from B1 to B5, with B1 designating the highest significance. It should be noted that these ranks are for planning and conservation purposes and as such are not regulatory in nature. Therefore these sites do not cover all known habitat for federal or state endangered and threatened species in New Jersey.

The Project Study Area contains one Natural Heritage Priority Site (partially located within its boundaries): West of Hornerstown, Monmouth County – B4

West of Hornerstown is a wooded ravine and floodplain of Crosswicks Creek. The ravine is covered with mature deciduous forest and the floodplain is crisscrossed with numerous marshes (both wooded and open), small ponds, or pools, and swampy woods following large and small tributaries. The primary boundary encompasses wetlands that are habitat to rare plant species. The secondary boundary includes immediately adjacent uplands and wetlands that drain toward the wetland habitat. Also of concern, but not included within the boundaries are watershed lands upstream of the site.

West of Hornerstown is ranked B4, signifying moderate significance on a global level, such as a viable occurrence of a globally rare element, a good occurrence of any ecological community, a good or excellent occurrence or only viable state occurrence of an element that is critically imperiled in the State, an excellent occurrence of an element that is imperiled in the State, or a concentration (4+) of good occurrences of elements that are imperiled in the State or excellent occurrences of elements that are rare in the State. The site contains a good population of a State-listed Endangered Plant Species.

2.1.6.5 NJ Pinelands Area

The NJ Pinelands Commission issues two types of standard approvals for development projects proposed within the NJ Pinelands: Certificate of Filing and Public Development Approval. In order to obtain either of these approvals, proposed activities must meet the Land Use (Subchapter 5) and Development Standards (Subchapter 6) of the NJ Pinelands Comprehensive Management Plan (CMP) at N.J.A.C. 7:50.

Within the CMP, natural gas transmission lines are included in the use of the term "Public Service Infrastructure." The term is defined at N.J.A.C. 7:50 -2.11 as "sewer service, gas, electricity, water, telephone, cable television and other public utilities developed linearly, roads and streets and other similar services provided or maintained by any public or private entity."

The boundary of the New Jersey Pinelands National Reserve is illustrated in **Figure 2-8.**

2.1.6.5.1 Pinelands Management Areas

The New Jersey Pinelands National Reserve is divided into two sections: a Protection Area and a Preservation Area. Within the Pinelands Protection Area and Preservation Area extent boundaries, specific resource areas are further classified into distinct Management Areas, each with their own development criteria, as described in the CMP. The Pinelands Management Areas are shown on **Figure 2-9** and include:

- Preservation Area District;
- Agricultural Production Area;
- Special Agricultural Production Area;
- Forest Area;
- Rural Development Area;
- Military and Federal Installation Area;
- Pinelands Towns, and
- Regional Growth Areas.

2.1.6.5.2 Preservation Area District

The Preservation Area District is the heart of the Pinelands environment and the most critical ecological region. It consists of a large, contiguous wilderness-like area of forest which supports diverse plant and animal communities and is home to many threatened and endangered species. Residential development is generally not permitted, except for one acre lots in designated infill areas (total 2,072 acres) and special "cultural housing" exceptions, on minimum 3.2 acre lots for property owned by families prior to 1979. Designated infill areas permit only limited commercial uses. Natural gas transmission/distribution (Public Service Infrastructure) use is conditionally permitted, as it can be permitted at the Towns' discretion if it will serve only the needs of the Preservation Area District.

2.1.6.5.3 Agricultural Production Area

These are areas of active agricultural use, generally upland field agriculture and row crops, including adjacent areas with soils suitable for the expansion of agricultural operations. Farm-related housing on 10 acres and non-farm housing on 40 acres are allowed. Permitted non-residential uses are agricultural commercial and roadside retail within 300 feet of preexisting commercial uses. Natural gas transmission/distribution (Public Service Infrastructure) use can be permitted at the Towns' discretion.

2.1.6.5.4 Special Agricultural Production Area

These are areas primarily used for berry agriculture and horticulture of native Pinelands plants. Only residential farm-related housing on 40 acres, and expansion of existing non-residential uses are permitted. Natural gas transmission/distribution (Public Service Infrastructure) use is conditionally permitted, as it can be permitted at the Towns' discretion if it will serve only the needs of the Special Agricultural Production Area District.

2.1.6.5.5 Forest Area

Similar to the Preservation Area District in terms of ecological value, this is a largely undeveloped area which is an essential element of the Pinelands environment. It contains high quality water resources and wetlands and provides suitable habitat for many threatened and endangered species. Permitted residential densities average one home for every 28 acres. Natural gas transmission/distribution (Public Service Infrastructure) use is conditionally permitted, as it can be permitted at the Towns' discretion if it is intended to serve primarily the needs of the Forest Area District.

2.1.6.5.6 Rural Development Area

This is a transitional area that balances environmental and development values between conservation and growth areas. Limited, low-density residential development and roadside retail is permitted. Residential densities average one home for every five acres. Natural gas transmission/distribution (Public Service Infrastructure) use can be permitted at the Towns' discretion.

2.1.6.5.7 Military and Federal Installation Area

These are Federal enclaves within the Pinelands. Permitted uses are those associated with function of the installation or other public purpose uses. Natural gas transmission/distribution (Public Service Infrastructure) use is conditionally permitted if it is associated with the function of the Federal installation, or is sanctioned by the installation and undertaken for public use purpose on behalf of another level of government.

2.1.6.5.8 Pinelands Villages and Towns

Pinelands Villages include 247 small, existing, spatially discrete settlements which are appropriate for infill residential, commercial and industrial development compatible with their existing character. There are 6 spatially discrete Pinelands Towns. Residential development is permitted on minimum 1-acre lots if not sewered, and 2 to 4 homes per acre with sewers. Commercial and industrial uses are also permitted, including natural gas transmission/distribution (Public Service Infrastructure).

2.1.6.5.9 Regional Growth Area

These are areas of existing growth and adjacent lands capable of accommodating regional growth influences while protecting the essential character and environment of the Pinelands. Residential development of approximately 3 homes per acre with sewers is permitted. Commercial and industrial uses are also permitted, including natural gas transmission/distribution (Public Service Infrastructure).

2.1.7 Wildlife

Typical wildlife species found within the Project Study Area include those found in wetlands, forested habitats, scrub-shrub habitats, open/agricultural lands and developed or disturbed areas within New Jersey. A diversity of wildlife habitats exist within the Project Study Area primarily within special use areas such as preserved open space lands. The area is likely to contain numerous common and state listed birds, including waterfowl, wading birds, raptors, woodpeckers and songbirds.

Common mammals expected to be present within the Study Area include white-tailed deer (*Odocoileus virginianus*), common muskrat (*Ondatra zibethicus*), raccoon (*Procyc . lotor*), skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), woodchuck (*Marmota monax*), gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis marsupialis*) and eastern cottontail (*Sylvilagus floridanus*).

2.2 Human and Built Environment

Human impacts on the natural environment of the Project Study Area are represented by a number of development types and land use patterns. These are discussed below using

classifications of the land use codes provided through the NJDEP Land Use/Land Cover dataset (NJDEP 2010). These major classifications are shown in **Figure 2-10**.

The information presented in the following sections describes the human and built environment, as it exists today. Over the past 35 years, the population in the area has increased significantly, leading to an increase in the number of homes, businesses, and industries, and resulting in the high-density development patterns present today.

2.2.1 Government Services

County and municipal bodies that are located within the Project Study Area provide government services to the region. Each municipality provides standard government services, except where shared service arrangements have been made between adjacent municipalities.

County government offices are located in Mount Holly (Burlington), Freehold (Monmouth), and Toms River (Ocean), New Jersey. **Table 2-7** lists the 11 municipalities located partially or wholly within the Project Study Area.

Table 2-7: Municipalities in the Project Study Area

Municipalities		
Bordentown Township	Manchester Township	Plumsted Township
Chesterfield Township	Mansfield Township	Springfield Township
Jackson Township	New Hanover Township	Upper Freehold Township
Lakehurst Borough	North Hanover Township	

2.2.2 Agriculture

Agricultural lands are a significant portion of the land use within the Project Study Area, with a majority of these lands located within the western half. Most of the agricultural areas are used to grow row crops such as corn, soybeans, wheat, and assorted vegetables, but some of the areas contain orchards and others are used for grazing farm animals.

The New Jersey Department of Agriculture's State Agricultural Development Committee (SADC) oversees the Farmland Preservation Program that has preserved many farms across the state. The SADC coordinates with County Agriculture Development Boards, municipal governments, nonprofit organizations, and landowners to develop the plans to preserve specific farmlands. Most farms have entered the Farmland Preservation Program through the sale of their development rights. Incentives for the landowners include financial aid, capital to expand agricultural operations, limited protection from government acquisition of land through eminent domain, and protection from public and private nuisance complaints. This program safeguards farms from development in perpetuity. Each of the counties within the Project Study Area has developed county-specific farmland management or farmland preservation plans. Most of the farms in the Project Study Area that are preserved under the Farmland Preservation Program are located in Burlington and Monmouth Counties (**Figure 2-8**).

2.2.3 Urban

Urban lands, which consist of industrial, commercial, and residential lands, also comprise

a significant portion of the Project Study Area. The largest urban areas are the Fort Dix and McGuire Air Force base complex in the south-central portion of the Project Study Area and the Lakehurst Naval Air Station in the eastern portion. Most of the residential and commercial development is located along the major roadways and concentrated in towns including Columbus, Cookstown, New Egypt, Manchester, and Lakehurst.

2.2.4 Proposed Developments

Indications of additional planned residential developments within the Project Study Area were identified during preparation of this report. According to the U.S. Census Bureau, the population of Burlington County increased by 5.6% between 2000 and 2010; Monmouth County increased by 2.4%, and Ocean County increased by 11.39% during the same time frame (U.S. Census 2011). Much of the residential growth in recent years has occurred in the southern and eastern portions of the Project Study Area, which is also the area of heaviest proposed development.

2.2.5 Educational Services

The low population density within the Project Study Area is associated with only a handful of schools in the vicinity. Many of the individual townships and boroughs have their own public school districts. Some of the districts are composed solely of one building that serves the needs of kindergarten to twelfth grade; others, such as the School District of Plumsted Township, have separate elementary, middle and high schools. The Project Study Area contains four properties associated with educational services.

2.2.6 Forest, Wetlands, and Water

Large tracts of forested lands are located in the central and eastern portions of the Project Study Area. Most of these forests are associated with the Pinelands Area. Wetland areas are noted across the Project Study Area with large concentrations located within Joint Base McGuire-Dix-Lakehurst (JB MDL) and within Manchester and Colliers Mills Wildlife Management Areas. Open water features are also concentrated in these two areas with the largest being Mirror Lake, Brindle Lake, and Success Lake.

Many state, county and municipal parks and natural areas are associated with these forested and wetland areas. Through the efforts of land preservation programs, such as the NJDEP Green Acres Program, additional properties have been preserved as open space. Parks and other conserved natural areas are illustrated in **Figure 2-8** and also discussed in **Section 2.1.6.3** as important habitat for wildlife.

2.2.7 Transportation

Major transportation corridors within the Study Area include NJ Route 70, and County Routes (CR) 527, 528, 537, 539, 543, 545, 616, 660, 665 and 677. All of these roadways serve as important corridors for both local and commuter traffic, and also serve as important connectors for tourist traffic to New Jersey shore points.

The three counties associated with the Project Study Area contain a comprehensive network of major roadways, rail transit systems, and freight rail lines that exist near the Project Study Area. Primary highways in these three counties include the New Jersey Turnpike, I-195, and State Route 70. These roadways connect to other major transportation corridors in the region and are illustrated in **Figure 2-11**.

2.2.8 Barren Lands

Barren or vacant lands are sporadically present within the Project Study Area and are associated with a variety of land cover types. In addition to undeveloped, cleared lands, barren land areas include extractive mining areas, altered land, and transitional areas.

2.2.9 Other Linear Features

Additional linear features present in the Project Study Area include pipelines and existing electric transmission corridors, as illustrated in **Figure 2-11**.

2.2.9.1 Pipelines

Two gas pipelines identified by PowerMap, Existing Utility Corridors (Platts PowerMap 2012-2013) data traverse along the boundary of the Project Study Area. The Transco natural gas pipeline infrastructure crosses southwest to northeast along the northwestern edge of the Project Study Area, while a NJNG pipeline crosses west to east along the northeastern edge.

2.2.9.2 Transmission Corridors

A transmission corridor is the area of land used by transmission, cable, or telephone lines to deliver services to customers. The corridors provide a pathway for physical structures, such as wires and poles or towers, which provide connection between energy suppliers, resources, or other utilities and the consumer of these services.

In the Project Study Area, transmission corridors are owned by Jersey Central Power and Light (JCP&L), Public Service Electric and Gas Company (PSE&G), and PECO Energy Company (PECO). Individual cable and telephone service providers are also located in some of these corridors. The largest transmission corridors in the Project Study Area are JCP&Ls transmission lines. From these high-voltage lines, smaller distribution lines run to provide electricity to the surrounding communities.

2.2.10 Historic, Cultural, and Archaeological Resources

The State of New Jersey is rich in both prehistoric and historic (ca. 1600 A.D. to present) cultural resources. The Project Study Area contains sites, districts, structures, buildings, and objects that have archaeological, historic, architectural, and cultural significance. Prehistoric resources include archaeological sites and objects from the prehistoric period that are known to exist as well as those subject to future discovery. A brief overview of the prehistoric setting of New Jersey, along with typical attributes of areas in which these sites have potential to be found, is provided in the following section. Information regarding significant prehistoric and historic cultural resources registered or eligible to be registered in New Jersey and the National Register of Historic Places (NRHP) are listed in **Table 2-8** and their locations are shown on **Figure 2-12**.

2.2.10.1 Prehistoric Setting

The Project Study Area crosses multiple archaeological site grids, which indicate the potential for sensitive archaeological resources (**Figure 2-12**). These site grids indicate that there is the potential for prehistoric archaeological sites from each of the three major prehistoric periods, including the *Paleo-Indian Period* (12,000 – 10,000 Before Present [B.P.]), *Archaic Period* (910,000 – 3,000 BP), and *Woodland Period* (2,700 B.P. – 1,600

A.D.), to be present within the Project Study Area. While there are differences in the sizes, use durations, and characteristics of prehistoric sites from each period, all are typically located in proximity to previously important resources, such as river terraces, streams, marshes, and estuarine environments. Proximity of previously resource-rich locales (where food, lithic, or other resources would have been abundant), in conjunction with well-drained, level, or gently sloping soils, serves as a discriminating factor in determining areas with a high potential for prehistoric occupation. Due to their cultural value, the locations of many archaeological sites are not made publicly available.

2.2.10.2 Historic and Cultural Resources

Historic periods that cover the time between initial European contact with Native American inhabitants of New Jersey and the present time include European Intrusion (1500 A.D. – 1700 A.D.), Initial Colonial Settlement (1630 A.D. –1775 A.D.), Early Industrialization, Urbanization, and Agricultural Development (1775 A.D. –1860 A.D.), Suburban Development (1840 A.D. – A.D. 1940), Immigration and Agricultural, Industrial, Commercial, and Urban Expansion (1850 A.D. –1920 A.D.), Metropolitan New Jersey (1910 A.D. –1945 A.D.), and Modern New Jersey (1945 A.D. – Present). Historic cultural resources noted in **Table 2-8** are illustrative of these periods.

Table 2-8: New Jersey and NRHP Resources within the Project Study Area

Name	Status
Arneytown Historic District	Listed
Cassville Crossroads Historic District	Listed
Lakehurst Historic District	Identified
New Egypt Historic District	Eligible
New Jersey Southern Railroad Historic District	Eligible
Recklesstown Historic District (Village of Chesterfield)	Listed
Anthony Woodward House (1351-64)	Identified (Indv.)
Bank of Mid-Jersey Branch Office	Listed (HD)
Boeing Michigan Aeronautical Research Center (BOMARC) Missile Site	Eligible (Indv.)
Cassville Hotel/Whitney's Taven	Listed (HD)
Cassville United Methodist Church	Listed (HD)
Chambers Building	Eligible (HD)
Chesterfield House	Listed (HD)
Chesterfield Township Elementary School	Listed (HD)
Clayton House	Listed (HD)
Diner	Eligible (HD)
Edward B. Woodward House (1351-10)	Identified (Indv.)
Emson House (Albert W. Hopkins Goose Farm)	Eligible (Indv.)
Farm Complex	Eligible (Indv.)
General Store	Listed (HD)
Gilbert House	Listed (HD)
Higgins House	Listed (HD)
Jan's	Eligible (HD)

Name	Status
Jewell House	Listed (HD)
Kessler House	Listed (HD)
Methodist Episcopal Church	Eligible (HD)
Municipal Building	Listed (HD)
New Egypt Firehouse	Eligible (HD)
New Egypt Library	Eligible (HD)
NJ Route 70 Bridge over NJS Southern Secondary	Eligible (HD)
NJS Communications Kiosk	Eligible (HD)
NJS Signal Bridge	Eligible (HD)
Old Chamber Building	Eligible (HD)
Peppler House	Listed (HD)
Plumsted Township Municipal Building	Eligible (HD)
Prospertown-Cassville Road	Eligible (Indv.)
Province Line Road Streetscape/Ellisdale Town (1351-60)	Identified (Indv.)
Rulon House	Listed (HD)
Satterthwait House	Listed (HD)
Stucco Rancher	Listed (HD)
Tantum House	Listed (HD)
Thomas Leonard House (1351-12)	Identified (Indv.)
Thomas Woodward House (1351-65)	Listed (HD)
Troth House	Listed (HD)
Van Hise/Van Ness/Long House	Listed (HD)
Weiner Department Store	Eligible (HD)

2.2.11 Hazardous Materials

According to the NJDEP 2012 Known Contaminated Sites List for NJ, various known contaminated sites are located within the Project Study Area, including approximately 10 superfund sites (**Figure 4-1**).

3.0 OVERVIEW OF ANALYSIS METHODOLOGY

This chapter provides an overview of the methodology used to define and evaluate the alternative routes and select the route. A detailed discussion of how this process was implemented for the project is provided in **Chapter 4**. The alternatives analysis identified major opportunities and constraints within the Project Study Area, identified viable alternative routes, and then used a quantitative and qualitative evaluation process to compare these routes. The methodology used for the alternatives analysis, as described in this section, provided a framework from which to select the routes most suited for a natural gas pipeline corridor. The ultimate goal of the study was to select a route that avoids or minimizes adverse impacts to the cultural/built and natural environments to the maximum extent practicable, while still maintaining the economic viability and technical feasibility of the project.

Prior to initiation of the analysis used to identify alternative routes, background research was conducted regarding the overall environmental setting within the Project Study Area. This information is provided within **Chapter 2.0** (Environmental Setting).

The implementation of the alternatives analysis phases for the Southern Reliability Link Project are described in detail in **Chapter 4.0** (Alternative Route Selection Process and Results).

3.1 Alternatives Analyses Methodology

The methodology utilized in these analyses incorporates GIS technology, statistical evaluation, and professional judgment into the decision-making process. Data was drawn from a variety of sources including state and local GIS databases, field reconnaissance surveys, information supplied by public agencies, published documents and publicly available electronic information. The approach formalizes many of the methods and principles used in the industry and by consultants over the last several years.

The alternatives analysis methodology used for this project includes both quantitative and qualitative evaluation techniques. The quantitative evaluation was used to initially develop, score, and rank alternative routes according to certain selected criteria. Subsequently, a qualitative evaluation that incorporated practical information regarding construction, real estate, permitting, and other relevant aspects of the project was conducted in order to reach a decision regarding the selected route.

The process consisted of four fundamental phases:

1. Define the *Project Study Area*: The study area for the alternatives analysis was determined based on professional judgment, the geographic characteristics of the region, and the physical location of the existing endpoints.
2. Generate *Alternative Routes*: Alternative Routes most suitable for pipeline alignments within the Project Study Area were generated taking into account three primary perspectives:
    a. protection of the built environment;
    b. protection of the natural environment; and,
    c. engineering considerations.

3. Evaluate the *Alternative Routes*. Use select criteria to quantitatively and qualitatively assess the Alternative Routes.
4. Determine the *Selected Route*. Use the information from the quantitative and qualitative assessment to determine the Selected Route.

3.1.1 Overview of Phase I – Definition of the Project Study Area

An initial task in the alternatives analysis was the definition of the Project Study Area. The study area was selected based on the geographic characteristics of the region, as well as the physical location of the existing endpoints of the analysis. In general, a selected study area should be within reasonable distance of the endpoints of the proposed pipeline and it should provide the opportunity to identify multiple potentially feasible alternative pipeline routes for further evaluation. In this case, the boundaries of the study area were developed based on a review of USGS maps, state and county road maps, aerial photographs, and GIS analysis. Constraints such as major roadways, rivers, national parks, residential development, and the locations of the endpoints can play key roles in determining the boundaries of the study area.

3.1.2 Overview of Phase II – Alternative Route Generation

In this step, multiple alternative routes were generated within the Project Study Area for Section 1 and Section 2. The routes took into consideration three general potential opportunity scenarios, including:

- opportunities to parallel existing pipeline and other linear utility ROWs;
- opportunities to co-locate within or parallel to existing road ROWs; and,
- opportunities to cross undeveloped land (cross country).

Each of these opportunity scenarios presents conditions generally favorable for the development of new linear utilities. Paralleling existing ROWs can limit new resource impacts by possibly overlapping ROWs and minimizing the need for new access roads, use of roadway ROWs can limit impacts to residential properties and natural resources; and crossing undeveloped lands can limit engineering concerns by reducing interactions with other utility resources. Most alternative pipeline routes are typically hybrids of these opportunity scenarios, with each route consisting of its own unique combination.

In contrast to the potential benefits, these opportunity scenarios sometimes also involve aspects that may prove to be detrimental to the proposed pipeline. For example, paralleling an existing transmission line involves considerations regarding cathodic protection. Installation and operation of the cathodic protection equipment and monitoring of these conditions is a design factor to be considered. Similarly, these existing utility ROWs may extend through areas of sensitive natural resources that were not protected during the initial development of the ROW corridor. Paralleling a utility ROW through a state park or a wildlife refuge area may negate the benefits of co-locating with the ROW.

Identification of the alternative routes was conducted through analysis of aerial photographs and USGS maps that took into account an assessment of land uses and

natural resources. Variables reviewed during this process are based on three fundamental perspectives:

- *Built environment* - protecting human and cultural resource areas, by reducing potential project conflicts with existing residential neighborhoods and other community-valued buildings or historic sites.
- *Natural environment* - protecting plants, animals and aquatic resources, by minimizing the project impact to ecological resources and natural habitat.
- *Engineering considerations* - maximizing co-location and minimizing cost and schedule challenges for the project, by seeking the shortest path or using existing ROWs, while avoiding areas that pose significant construction obstacles, such as steep slopes or those used for unique agricultural practices.

Each route takes into consideration varying aspects of these perspectives. Some routes are guided toward socially built areas to protect sensitive natural resources, such as state parks, while other routes may be guided toward open fields and forested areas to avoid dense residential areas. Engineering considerations ranging from the use of existing roads for construction access to the extent of co-location in a road ROW that will require extensive coordination with local utilities are also involved in the route alignments.

3.1.2.1 State Regulatory Framework on Analysis Methodology

The NJDEP provides protection to natural resources, including streams, flood hazard areas, riparian zones, wetlands and open waters, coastal areas, tidal waters and estuaries, as well as habitat for threatened and endangered species, and cultural resources through various environmental laws and implementing regulations. Within the Pinelands Area, the NJ Pinelands Commission implements the land use and development standards for the CMP. Different levels of protection are assigned to these resources depending on resource value or classification. The environmental resources protected by these regulatory programs were described in **Chapter 2.0** of the report. The levels of protection determined by New Jersey regulatory agencies were incorporated into the methodology, especially in determining avoidance areas. The special regulatory framework of the NJ Pinelands Commission and the CMP necessitated a methodology which evaluated the Project Study Area within two sub-sections (Sections 1 and 2).

3.1.2.1.1 Farmland Preservation Program

The New Jersey Department of Agriculture's State Agricultural Development Committee (SADC) oversees the Farmland Preservation Program that has preserved many farms across the state. The SADC coordinates with County Agriculture Development Boards, municipal governments, nonprofit organizations, and landowners to develop the plans to preserve specific farmlands. Most farms have entered the Farmland Preservation Program through the sale of their development rights. Incentives for the landowners include financial aid, capital to expand operations, limited protection from government acquisition of land through eminent domain, and protection from public and private nuisance complaints (SADC 2015). This program safeguards farms from development in perpetuity. Each of the counties within the Project Study Area has developed county-specific farmland management or farmland preservation plans. Most of the farms in the

Project Study Area that are preserved under the Farmland Preservation Program are located in Burlington and Monmouth Counties.

Specific parcels which are designated as Preserved Farmland through the NJ Department of Agriculture are preserved in perpetuity. Only farming activities can occur on these lands. Permits to cross these lands are not available, and are expressly prohibited by law.

3.1.2.1.2 NJ Pinelands Area

Development projects proposed within the NJ Pinelands are subject to compliance with the Land Use and Development Standards of the Pinelands Comprehensive Management Plan, N.J.A.C. 7:50 (CMP), administered by the NJ Pinelands Commission. The NJ Pinelands Commission issues two types of standard approvals for development projects proposed within the NJ Pinelands: Certificate of Filing and Public Development Approval. In order to obtain either of these approvals, proposed activities must meet the Land Use (Subchapter 5) and Development Standards (Subchapter 6) of the CMP.

Within the CMP, natural gas transmission lines are included in the use of the term "Public Service Infrastructure." The term is defined at N.J.A.C. 7:50 -2.11 as "sewer service, gas, electricity, water, telephone, cable television and other public utilities developed linearly, roads and streets and other similar services provided or maintained by any public or private entity." Public Service Infrastructure is only permitted, or conditionally permitted, in certain Land Use Management Areas within the Pinelands, and therefore is a significant siting constraint.

3.1.2.1.3 Streams

Section 2.1.3 describes NJDEP surface water quality standards, criteria, and classifications and provides an overview of FEMA flood hazard area mapping. NJDEP regulations related to flood hazard areas are summarized in the following paragraphs.

The New Jersey Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 *et seq.*, and implementing regulations, N.J.A.C. 7:13, afford protection to streams based in part on surface water classification. The regulated riparian zone varies based on stream classification and other factors, ranging from 300-foot riparian zones (along PL and C1 waters and some tributaries), to 150-foot zones (TP and TM freshwaters, waters with water quality dependent threatened and endangered species, and streams through areas of acid producing soils), or to 50-foot zones along all other regulated waters. In addition to regulating activity within the riparian zone, activities within the flood hazard area, which includes the floodway and flood fringe, are also regulated under the New Jersey Flood Hazard Area Control Act. Depending on the type and location of a proposed activity, a permit may be required from the NJDEP, Division of Land Use Regulation (DLUR) prior to construction.

3.1.2.1.4 Wetlands

Freshwater wetlands, unmapped tidal wetlands, and State open waters in New Jersey are regulated under the New Jersey Freshwater Wetlands Protection Act, N.J.S.A. 13-9B-1 *et seq.*, and implementing regulations, N.J.A.C. 7:7A. The NJDEP has assumed authority for implementing protection of navigable waters and wetlands in accordance with Section 404 of the Federal Water Pollution Control Act, 33 U.S.C. §§1251 *et seq.*, commonly referred to as the Clean Water Act. Accordingly, with the exception of interstate and

tidal waters, jurisdiction for these resources falls primarily to the NJDEP DLUR. While the NJDEP DLUR also regulates interstate and tidal waters, the USACE retains Clean Water Act authority in these areas.

The New Jersey Freshwater Wetlands Protection Act, N.J.A.C. 7:7A identifies three different wetland classifications: exceptional resource value, intermediate resource value, and ordinary resources value.

- *Exceptional resource value* wetlands are those that provide habitat for certain threatened or endangered species or which discharge to FW1-TP or FW2-TP waters or their tributaries.
- *Ordinary resource value* wetlands include certain isolated wetlands, drainage ditches, swales, and detention facilities created in uplands which do not meet the definition of exceptional value.
- All other freshwater wetlands are considered *intermediate resource value* wetlands.

NJDEP also regulates transition areas or buffers adjacent to wetlands. Transition areas range in width from 150-feet for exceptional resource value, to 50-feet for intermediate value, to 0-feet for ordinary value wetlands.

Wetlands under the jurisdiction of the NJ Pinelands Commission are identified using Pinelands specific methodology, the 1991 *New Jersey Pinelands Commission Manual for Identifying and Delineating Pineland Area Wetlands*. Pinelands wetland transition areas vary by wetland quality and proposed activity, and are determined using the 1985 *Buffer Delineation Model for NJ Pinelands Wetlands*. In accordance with the CMP, wetland transition areas can extend up to 300 feet from the upland/wetland boundary.

Any permanent or temporary disturbance to State open waters, freshwater wetlands, or transition areas would require a permit from NJDEP and/or the NJ Pinelands Commission. Mitigation would be required in accordance with permit conditions.

3.1.2.1.5 Protected Lands and Sensitive Habitats

Federal, State, county and municipal parklands often support rare, threatened, and endangered (T&E) species, provide important wildlife habitat or wetlands, or function as floodplains. Many of these lands are protected through the regulatory programs described in previous sections. Throughout much of the Project Study Area, protection specific to T&E species is implemented through the New Jersey Freshwater Wetlands Protection Act and New Jersey Flood Hazard Area Control Act.

Within the Pinelands Area, the CMP regulates development which may adversely affect T&E species, including specific Pinelands listed species.

Potentially suitable T&E species habitat is mapped by the New Jersey Landscape Project, which was developed using New Jersey Natural Heritage Program Database records and habitat suitability models. Landscape Project Version 3.1 provides habitat mapping for the entire State. The New Jersey Landscape Project ranks potentially suitable habitat value based on the listing status of the species and record of occurrence. The following

five categories, or conservation ranks, are assigned for habitats throughout the State based on the conservation status of species present:

- Rank 1 = minimum size requirements are met and suitable habitat is present, however, no species records
- Rank 2 = records for non-listed state species of special concern
- Rank 3 = records for state threatened species
- Rank 4 = records for state endangered species
- Rank 5 = records for federally endangered or threatened species

These rankings, as applicable within the Project Study Area, are illustrated in **Figure 2-7**.

State, county, and municipal parklands, as well as privately owned preserved open space are subject to various development regulations. Activities proposed on public or private parcels acquired with funds from – or encumbered by – the NJ Green Acres Program would require a formal diversion of those properties, subject to review and approval of the NJ State House Commission. The Green Acres Program also administers the leasing of State owned parklands.

Green Acres encumbered parcels are presented in **Figure 2-8**.

3.1.3 Overview of Phase III – Alternative Route Evaluation

To assess the advantages and disadvantages of the alternative routes, feature metrics, or specific parameters measured for a particular feature were considered for each of the Section 1 and Section 2 alternative routes. The metrics were based on the three perspectives noted above (built environment, natural environment, and engineering considerations) and consist of several factors, including, for example, the number of residences within 150 feet and the number of stream crossings per route. These quantitative feature metrics were normalized, assigned relative weights, and organized within the three perspectives (built environment, natural environment and engineering considerations). The metrics were normalized to provide a means to compare the data. Using a normalized 0-100 scale allows the different data values to be mathematically combined and compared without being distorted by differences in measurement scale. Establishing these quantitative values allowed overall scoring for each alternative route. Lower scores are preferred as they indicate potentially less impact along that route. The numerical score provides an objective reference for comparing each of the alternative routes.

The next step in the analysis was to incorporate the information provided in the quantitative assessment and to apply professional judgment to qualitatively rank the alternative routes. Each alternative was assessed based on five important considerations, including visual concerns, community concerns, schedule delay risk, special permit issues, and construction, maintenance, and accessibility issues.

3.1.4 Overview of Phase IV – Selected Route Determination

This quantitative and qualitative analyses process was designed to evaluate the alternatives and determine a final Selected Route in an objective, consistent, and

comprehensive manner. A Selected Route can be determined through the evaluation of these values and conclusions.

4.0 ALTERNATIVE ROUTE SELECTION PROCESS AND RESULTS

The objective of this alternatives analysis was to identify the most suitable route for construction of a new 30-inch natural gas transmission pipeline between specific supply and connection points in Burlington and Ocean Counties, New Jersey. Increasing resilience in this region was identified as part of the project need described in **Chapter 1.0**. The following sections review the development of the Project Study Area (**Section 4.1**), describe the different project sections (**Section 4.2**), evaluate the opportunity and constraints identified in the Project Study Area (**Section 4.3**), and describe the implementation of the methodology used to generate the alternative routes (**Section 4.4**). **Section 4.5** describes the Section 1 alternative routes and provides the evaluation process used to determine the Selected Route for that section. **Section 4.6** describes the Section 2 alternative routes and provides the evaluation process used to determine the Selected Route for that section.

4.1 Development of the Project Study Area

The Project Study Area was developed based on the locations of the proposed supply and connection points in Burlington and Ocean Counties. Given the approximate 28-mile length between these endpoints, it was deemed impractical to extend the Project Study Area more than approximately 14-miles on either side of the direct path between these locations. Doing so would result in a longer pipeline alignment that would likely involve increased impacts to natural resources, affected landowners, and project technical challenges. These limits follow best practices by preventing the alternative routes from being unnecessarily long or complex and provide sufficient space and opportunity for feasible alternative route development. The resulting Project Study Area is illustrated in **Figure 2-1**.

4.2 Project Sections

A unique aspect of the Southern Reliability Link Project is that a portion of the Project Study Area crosses through the NJ Pinelands Area, where the NJ Pinelands Commission regulates development through the implementation of the NJ Pinelands Comprehensive Management Plan (CMP) (N.J.A.C. 7:50). In order to evaluate the special regulatory considerations applied within the Pinelands Area, the Project Study Area was evaluated as two sub-sections, referred to as Section 1 and Section 2. Each phase of the alternative's analysis process was then applied to each Section independently. The Sections consist of the following:

- **Section 1** originates in Chesterfield Township at the proposed Transco compressor station connecting to their interstate pipeline system, and extends east to the Pinelands Area boundary (**Figure 2-1**).
- **Section 2** begins at the Pinelands Area boundary and extends east to the project terminus at potential connection points with NJNG's existing natural gas infrastructure in Manchester Township (**Figure 2-1**).

4.3 Opportunities and Constraints

As discussed in **Chapter 2.0** (Environmental Setting), land use in the Project Study Area contains residential development, conserved lands, and public use areas that are considered constraints in the alternative route development process. The public use activity areas typically include land uses such as cemeteries, public parks, athletic fields, and preserved areas of open space that are valued from a cultural and environmental perspective. These open areas were considered avoidance features. Other typical opportunity areas, such as paralleling existing transmission line ROWs, highways, or railroad alignments, or using more culturally acceptable areas of open space (e.g. undeveloped lots) were considered more favorably where available and practicable.

Section 2 of the Project Study Area traverses through the Pinelands Area, and as such had unique land use and development constraints implemented by the CMP. Pursuant to Subchapter 5 of the CMP, each Pinelands Management Area has specific standards for permitted land use and intensities (**Section 2.1.6.5**). Subchapter 6 of the CMP implements certain development standards based on both natural resources and development type.

4.4 Generating the Alternative Routes

Detailed datasets from within the Project Study Area were used to generate alternative routes. These routes were identified as being the most suitable for development of a new natural gas pipeline by taking into account three distinct perspectives - built environment, natural environment, and engineering considerations.

4.4.1 Datasets Used for Alternative Routes

Datasets specific to each distinct perspective - built environment, natural environment, and engineering considerations - were used to identify avoidance areas from each perspective. Datasets for the alternative route analysis of Section 1 and Section 2 were customized to include unique features of each study area:

- Bedrock Geology for NJ (NJDEP 2002)
- Coastal Area Facility Review Act (CAFRA) Zone (NJDEP)
- Coastal Plain Sediments with the Potential to Form Acidic (Sulfate) Soils (NJDEP)
- Existing Utility Corridors (Platts PowerMap 2012)
- Farmland Preservation Parcels (NJ Department of Agriculture)
- FEMA Q3 Flood Data (Accessed: 10/30/2014)
- Freshwater Mussel Habitat & Vernal Habitat (NJDEP 2012)
- Green Acres Parcels (NJOIT, "Green Acres" selected from tax data attribute "FacName")
- Historic Properties of NJ (NJHPO)
- Landscape Project 3.1 Species-Based Habitat (NJDEP 2012)
- Natural Heritage Grid Map (NHP, November 2009 Version)
- Natural Heritage Priority Sites (NHP)

- NJ Roadway and Railroad Network (NJDOT)
- NJDEP 2012 Land use/Land Cover (NJDEP 2015)
- NJDEP County Open Space and Recreation Areas in New Jersey (Version 201107)
- NJDEP State Owned, Protected Open Space and Recreation Areas in New Jersey (Version 200812)
- Physiographic Provinces of NJ (NJDEP 2002)
- Pinelands Area Boundary as per NJSA13:18a-11(a) (NJ Pinelands Commission; NJDEP)
- Pinelands Management Areas (NJ Pinelands Commission; NJDEP)
- SSURGO Soils Data (NRCS 2013)
- Superfund Sites (EPA 2014)
- Surface Water Quality Standards (NJDEP 2007)
- Watershed Management Areas in NJ (NJDEP 2009)

Figure 4-1 illustrates the identified avoidance areas used to develop alternative routes, taking into account the three perspectives.

4.4.1.1 Avoidance Areas – Built Environment

Typical avoidance areas related to the built environment perspective include federal and state-listed historic and archeological sites, structures, and districts, residential, school, and church parcels. Other potential built avoidance area categories, such as sites of ritual importance are not present within the Project Study Area.

4.4.1.2 Avoidance Areas – Natural Environment

Avoidance areas related to the natural environment perspective included Wildlife Refuges, certain Management Areas within the NJ Pinelands, unique natural areas identified by NJDEP's Natural Heritage Priority List, and state, national, county and city parks. Other potential natural avoidance categories, such as USFWS Wilderness Areas, and federally designated wild and scenic rivers are not present within the Project Study Area.

4.4.1.3 Avoidance Areas – Engineering Considerations

Avoidance areas related to the engineering consideration perspective included large open waters, EPA Superfund sites, and mines and quarries. Alignment of the gas pipeline to parallel a high tension electric wire transmission ROW involves additional pipeline design and operation considerations related to cathodic protection.

4.4.2 Identifying the Alternative Routes

In the chronological application of the methodology, alternative routes within Section 2 were developed first. The determination of a Selected Route for Section 2 defined the required connection points to be reached by alternative routes for Section 1. Although Section 2 was identified first, the discussion provided in this alternatives analysis report will present Section 1 first and Section 2 second.

Alternative routes for Section 2 were initiated at two points along the western Pinelands Area boundary, specifically along CR 539. Eastern endpoints for Section 2 were

identified at several locations where NJNG has existing pipeline facilities into which the new pipeline could connect. These locations are illustrated in **Figure 4-2a**.

The analysis for Section 2 concluded that one of the specific points along CR 539 would be the eastern endpoint for the Section 1 analysis. The existing Transco connection point in Chesterfield Township is the western endpoint for the Section 1 analysis. These locations are illustrated in **Figure 4-2b**.

The alternative routes were identified based upon review of aerial photographs, U.S. Geological Survey (USGS) maps, and assessment of land uses and avoidance areas through geographical information system (GIS) review. Five alternative routes were identified for Section 1 and four alternative routes were identified for Section 2.

Due to the extensive presence of preserved lands within the Project Study Area (e.g., Farmland Preservation in Section 1, NJ Pinelands in Section 2), few cross-country opportunities were identified. Areas to be disturbed would primarily include existing pavement and maintained/cleared, compacted roadway edge.

4.4.3 Evaluation of Alternative Routes and Determination of Selected Route

The alternative routes were compared by Section and evaluated to determine a Selected Route for each Section. Evaluation of the alternative routes included a combination of quantitative analysis and a qualitative review. The quantitative analysis included the use of weighted metrics to assess viability in accordance with the three perspectives - built environment, natural environment, and engineering considerations. The qualitative analysis included an assessment of visual concerns, community concerns, risk of schedule delay, special permit requirements, and construction, maintenance, and accessibility issues. The following sections review the results of both the Section 1 and Section 2 alternative routes evaluation.

4.5 Section 1 Alternatives Analysis

The following provides the alternative route descriptions, evaluation metrics, weighted metrics tables, quantitative discussion, qualitative review, and Selected Route determination for Section 1. The alternative routes identified for Section 1 are illustrated in **Figure 4-2a**.

4.5.1 Route Descriptions

All routes within Section 1 begin in Chesterfield Township at the Transco compressor station connection point, and generally extend in an easterly/southeasterly direction to the Pinelands Area boundary adjacent to CR 539. As identified in the Section 2 analysis (performed first, chronologically), the eastern connection points for these routes were located along a section of CR 539, which borders the western edge of the Pinelands Area Boundary (as per NJSA13:18a-11(a) (State designated Pinelands Area)), and extend eastward to the existing NJNG facilities in Manchester Township. Specifically, the alternative routes are as follows:

4.5.1.1 Route A

Route A is approximately 17.1 miles (~90,300 feet) in length.

- The route starts in an open field that is the planned site of a new gas compressor station. The route option extends southeast within the public road right-of-way (ROW) of Bordentown-Chesterfield Road (County Road 528 – CR 528) for 0.9 miles. This portion of public road ROW is bordered primarily by residential properties. This route segment intersects a mapped NJDEP SWQS stream, although the route remains within public road ROW.
- At this point, the route option turns northeast within the ROW of Old York Road for 0.9 miles. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects a mapped NJDEP SWQS stream, although the route remains within public road ROW.
- The route option turns east within the ROW of Margerum Road for 1.0 miles. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program.
- The route option turns northeast within the ROW of Wain Road for 0.4 miles. This portion of public road ROW is bordered primarily by agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects a mapped NJDEP SWQS stream, although the route remains within public road ROW.
- The route option turns east within the ROW of Crosswicks-Ellisdale Road for 2.3 miles and extends into the unincorporated community (hereinafter "town") of Ellisdale. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects a mapped NJDEP SWQS stream, although the route remains within public road ROW.
- In Ellisdale, the route option turns south within the ROW of Province Line Road and extends for 2.3 miles to the town of Arneytown. This public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The route option also extends adjacent to three historical properties along Province Line Road: Province Line Road Streetscape/Ellisdale Town, the Anthony Woodward House, and the Thomas Woodward House. This route segment intersects two mapped NJDEP SWQS streams, although the route remains within public road ROW.
- In Arneytown, the route option turns east within the ROW of Chesterfield-Arneytown Road (CR 664) for 0.1 mile. This portion of public road is bordered in close proximity by residential and commercial properties.
- The route continues east within the ROW of Hornerstown-Arneytown Road for 2.1 miles toward the town of Hornerstown. This public road is bordered by a mix

of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This portion of the route option extends adjacent to two historical properties: the Edward B. Woodward House and the Thomas Leonard House. This route segment also intersects three mapped NJDEP SWQS streams.

- At this point, the route option turns southeast/east within the ROW of Millstream Road/West Millstream Road for 1.7 miles. This public road is bordered primarily by residential and commercial properties, but also several agricultural lands, some of which are protected under the NJ Farmland Preservation Program. This route segment also intersects two mapped NJDEP SWQS streams and the Union Transportation rails-to-trails system.
- The route option turns southeast within the ROW of Pinehurst Road (CR 539) for 1.1 miles. This road ROW is bordered by residential and commercial properties. A portion of this route segment is adjacent to a historic property (Emson House (Albert W. Hopkins Goose Farm)). This route segment also intersects a mapped NJDEP SWQS stream.
- The route option then turns west/south off of the CR 539 ROW and extends over open fields and through forested areas for 0.7 mile.
- At this point, the route option travels south within the ROW of Fischer Road for 0.2 mile. This portion of public road is bordered by residential properties, open fields, and forested lands. This route segment intersects a mapped NJDEP SWQS stream.
- The route option then turns off the public road ROW and extends to the east/southeast for 1.4 miles across open fields and through forested lands. Portions of this segment are adjacent to agricultural lands protected under the NJ Farmland Preservation Program. Two mapped NJDEP SWQS streams and associated wetland and floodplain areas are directly intersected by this route segment.
- Turning to the east, the route option intersects with and parallels an existing JCP&L electric transmission line ROW for 0.3 mile. This portion of the route is bordered by forested areas and residential properties.
- The route option intersects with the Pinehurst Road (CR 539) ROW again and extends southeast for 1.7 miles to the Pinelands Area Boundary. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The end point for this section is the beginning of the Section 2 routes.

4.5.1.2 Route B

Route B is approximately 16.7 miles (~88,200 feet) in length.

- The route starts in an open field that is the planned site of a new gas compressor station. The route option extends southeast within the ROW of Bordentown-

Chesterfield Road (CR 528) for 2.4 miles into the town of Chesterfield. This portion of public road ROW is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects a mapped NJDEP SWQS stream.

- The route option turns off of the road ROW and extends east/southeast for 0.6 mile though agricultural fields and residential properties. Two historic properties within the Recklesstown Historic District (Village of Chesterfield) are directly intersected by the route in this segment.
- The route option then intersects with the ROW of Chesterfield-Arneytown Road (CR 664) and extends east for 1.8 miles within this public road. This portion of the route is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program.
- The route option turns off of this public ROW and extends for 0.4 mile though open fields and forested areas. A mapped NJDEP SWQS stream and associated wetland and floodplain areas are also directly intersected by this route segment.
- At this point, the route option enters back into the ROW of Chesterfield-Arneytown Road (CR 664) and extends southeast for 1.6 miles into the town of Arneytown. This portion of the route is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects three mapped NJDEP SWQS streams.
- The route continues east within the ROW of Hornerstown-Arneytown Road for 2.1 miles toward the town of Hornerstown. This public road is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This portion of the route option extends adjacent to two historical properties: the Edward B. Woodward House and the Thomas Leonard House. This route segment also intersects three mapped NJDEP SWQS streams.
- At this point, the route option turns southeast within the ROW of Millstream Road for 0.6 mile. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects the Union Transportation rails-to-trails system.
- The route option turns to the northeast within the ROW of Monmouth Road for 0.8 mile. This portion of road ROW is bordered by residential properties and commercial development. This route segment also intersects two mapped NJDEP SWQS streams.
- The route option then turns to the southeast within the ROW of Hornerstown Road for 0.5 mile. This portion of the road ROW is bordered by residential and commercial properties.

- The route then intersects with the ROW of Pinehurst Road (CR 539) and extends southeast for 1.5 miles. This portion of road ROW is bordered by residential and commercial properties. A portion of this route segment is adjacent to a historic property (Emson House (Albert W. Hopkins Goose Farm)). This route segment also intersects a mapped NJDEP SWQS stream.
- The route option turns south outside the public road ROW through the corner of a shopping center parcel for less than 0.1 mile. This segment traverses a landscaped area adjacent to the shopping center parking lot.
- The route then extends west within the ROW of Lakewood Road for 0.6 mile. This portion of road ROW is bordered by residential properties.
- At this point, the route option turns south within the ROW of Fischer Road for 0.8 mile. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects two mapped NJDEP SWQS streams.
- The route option turns east within the ROW of West Colliers Mill Road (CR 640) for 1.4 miles. This portion of public road ROW is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects a mapped NJDEP SWQS stream and crosses under the existing JCP&L electric transmission line ROW.
- The route option then turns southeast within the ROW of Pinehurst Road (CR 539) for 1.5 miles to the Pinelands Area Boundary. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The end point for this section is the beginning of the Section 2 routes.

4.5.1.3 Route C

Route C is approximately 15.7 miles (~82,900 feet) in length.

- The route starts in an open field that is the planned site of a new gas compressor station. The route option runs southeast within the ROW of Bordentown-Chesterfield Road (CR 528) and Chesterfield-Arneytown Road (CR 664) for 3.7 miles. This portion of road ROW extends through the town of Chesterfield and is bordered by residential, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The route travels within the road ROW adjacent to two listed NJ Historic Properties. This route segment also intersects a mapped NJDEP SWQS stream.
- The route option turns southeast within the ROW of Chesterfield-Jacobstown Road (CR 528) and Jacobstown-New Egypt Road (CR 528) for 6.0 miles. This portion of road ROW extends through the town of Jacobstown and into the town of New Egypt. This portion of public road ROW is bordered by a mix of

residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects several mapped NJDEP SWQS streams, including Crosswicks Creek.

- In the town of New Egypt, the route option turns north within the ROW of New Egypt-Allentown Road for 0.2 miles. This portion of road ROW is bordered by residential and commercial properties. Most of the properties in the town of New Egypt are listed as historic properties. While more than 60 historic properties are within 150 feet the route in this area, no historic properties are intersected by the route.
- The route option then turns east/northeast within the ROW of Fort Avenue and Lakewood Road (CR 528) for 2.2 miles. This portion of public road ROW is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects a mapped NJDEP SWQS stream.
- At this point, the route option travels south within the ROW of Fischer Road for 0.2 mile. This portion of public road is bordered by residential properties, open fields, and forested lands. This route segment intersects a mapped NJDEP SWQS stream.
- The route option then turns off the public road ROW and extends to the east/southeast for 1.4 miles across open fields and through forested lands. Portions of this segment are adjacent to agricultural lands protected under the NJ Farmland Preservation Program. Two mapped NJDEP SWQS streams and associated wetland and floodplain areas are directly intersected by this route segment.
- Turning to the east, the route option intersects with and parallels an existing JCP&L electric transmission line ROW for 0.3 mile. This portion of the route is bordered by forested areas and residential properties.
- The route option intersects with the Pinehurst Road (CR 539) ROW again and extends southeast for 1.7 miles to the Pinelands Area Boundary. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The end point for this section is the beginning of the Section 2 routes.

4.5.1.4 Route D

Route D is approximately 18.6 miles (~98,200 feet) in length.

- The route starts in an open field that is the planned site of a new gas compressor station. The route option extends northwest within the ROW of Bordentown-Chesterfield Road (CR 528) for 0.1 mile and then turns to the southwest to parallel an existing PSE&G electric transmission line ROW for 1.1 miles.

Wetland areas and forested areas are intersected by the route in the segment parallel to the existing transmission line ROW.

- At this point, the route option turns to the southeast within the ROW of Bordentown-Georgetown Road (CR 545) for 3.9 miles into the town of Georgetown. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects several mapped NJDEP SWQS streams.
- In the town of Georgetown, the route option intersects with the Wrightstown Road/Wrightstown-Georgetown Road (CR 545) ROW and the McGuire Access Highway (CR 680) ROW and extends to the southeast for 2.9 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option then exits the road ROW and turns to the east to parallel an existing JCP&L electric transmission line ROW for 8.9 miles. The route intersects several agricultural lands protected under the NJ Farmland Preservation Program. Forested areas, wetlands, and streams, including Crosswicks Creek are also intersected by the route segment that parallels the existing transmission line ROW. In addition, several threatened and endangered species' habitat areas noted by the NJDEP Landscape Project (Version 3.1) Species-based Habitat Mapping occur along this alignment. The route would cross under several public roads along this section.
- The route then intersects with the ROW of Pinehurst Road (CR 539) and extends south for 1.7 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The end point for this section is the beginning of the Section 2 routes.

4.5.1.5 Route E

Route E is approximately 18.4 miles (~97,200 feet) in length.

- The route starts in an open field that is the planned site of a new gas compressor station. The route option extends northwest within the ROW of Bordentown-Chesterfield Road (CR 528) for 0.1 mile and then turns to the southwest to parallel an existing PSE&G electric transmission line ROW for 1.1 miles. Wetland areas and forested areas are intersected by the route in the segment parallel to the existing transmission line ROW.
- At this point, the route option turns to the southeast within the ROW of Bordentown-Georgetown Road (CR 545) for 3.9 miles into the town of Georgetown. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands

are protected under the NJ Farmland Preservation Program. This route segment also intersects several mapped NJDEP SWQS streams.

- In the town of Georgetown, the route option intersects with the Wrightstown Road/Wrightstown-Georgetown Road (CR 545) ROW and the McGuire Access Highway (CR 680) ROW and extends to the southeast for 3.2 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns to the northeast within the ROW of Crowshaw Road (CR 666) for 2.1 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects several mapped NJDEP SWQS streams and runs adjacent to a short section of the Pinelands Area just north of the McGuire Air Force base.
- The route option then turns to the southeast within the ROW of Jacobstown-Cookstown Road (CR 665) for 1.1 miles into the town of Cookstown. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program.
- In the town of Cookstown, the route option turns south within the ROW of Main Street (CR 616) for 0.1 mile. This portion of the route is bordered by residential properties and commercial development. This route segment also intersects a mapped NJDEP SWQS stream.
- The route option turns quickly to the east within the ROW of Bunting Bridge Road for 1.8 miles. This public road is bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment also intersects two mapped NJDEP SWQS streams.
- The route option turns to the south within the ROW of Brindletown Road for 0.1 mile and then to the east within the ROW of Long Swamp Road for 3.9 miles. These public roads are bordered by a mix of residential properties and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program.
- The route option intersects with the ROW of Pinehurst Road (CR 539) and turns to the south for 1.0 mile. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. The end point for this section is the beginning of the Section 2 routes.

4.5.2 Evaluation Metrics

As described in the **Chapter 3.0** overview, the decision process for identifying the Selected Route involved quantitatively evaluating the advantages and disadvantages of the alternative routes, and then qualitatively assessing the alternatives for each section based on additional criteria. Initial steps in this process required defining the metrics to be used and then assigning values to each alternative route for each evaluation metric. These data were then summarized in tabular form organized by evaluation metrics for each of the alternative routes and further organized by the three perspectives (built environment, natural environment, and engineering considerations).

Evaluation metrics were used to factor detailed information on relative lengths, acres of easement, and particular circumstances into the selection process. Specific evaluation metrics include the number of homes within 150 feet of each side of the route, acres of wetland crossing, and number of road crossings. The metrics used for the evaluation of Section 1 are defined in **Table 4-1a.** Due to variations in the relevant metrics, the metrics table for Section 2 (**Table 4-2a**) is slightly different but the process of review was identical.

The constraint data for each Section were recorded on a variety of scales/units (e.g., acres of wetlands crossed and, number of houses within 150 feet). The resulting constraint data was then normalized to allow meaningful comparison of the alternative routes using the quantitative values. Normalizing the data allows the underlying characteristic of the data sets to be compared by removing the units (feet, acres) associated with the various measurements. Data normalization was achieved by first comparing a single constraint value for a given alternative route against the same constraint values of the other alternative routes. For example, the alternative routes with the "lowest" and "highest" potential wetland impacts were determined by comparing the range of values between the alternative routes. A normalization calculation was used to assign each alternative route a value based on a scale of 0 – 100. The value of 0 was assigned to the alternative route with the lowest potential impact and 100 was assigned to the alternative route with the highest potential impact; any other alternative routes were assigned a value in between 0 – 100 based on their relative potential impact when compared to the lowest and highest scoring routes. This same process was used to assign a value on the 0 – 100 scale for all the metrics being evaluated. **Table 4-1b** and **Table 4-2b** (located in **Section 4.6.3**) provide a tabular summary of the raw metrics and corresponding normalized values for the alternative routes in Section 1 and Section 2, respectively.

TABLE 4-1a: Metric Definitions – Section 1

Built Environment
NJ Historical Preservation Office: Historical Properties (within 150 feet): Identifies the number of historic structures or districts located within 150 feet of the alternative route (300 feet total).
School, Church, Cemetery, or Park Parcels (within 150 feet): Identifies the number of areas where the alternative route would be within 150 feet of these sensitive land uses (300 feet total).
Residences (within 150 feet): Residences located within 150 feet to the alternative route (300 feet total).
Number of Parcels Crossed: Identifies the number of individual parcels that intersect the centerline of the alternative route.
Commercial Buildings (within 150 feet): Identifies the number of commercial structures within 150 feet of the alternative route (300 feet total).
Industrial Buildings (within 150 feet): Identifies the number of industrial structures within 150 feet of the alternative route (300 feet total).
Length within State, County, or Agricultural Conserved Lands (miles): Length of alternative route (in miles) within the boundary of state, or county, or Preserved Farmland.
Natural Environment
NJDEP 2007 Land-use Land-cover Forests: Acres of forest within 50 feet of segments outside public road ROW potentially impacted by the proposed alternative route (100 feet total).
SWQS (NJDEP) Stream Crossings: Number of streams crossed by the proposed alternative route. NJDEP Surface Water Quality Standards (SWQS) Streams were used for this analysis.
NJDEP 2007 Land-use Land-cover Wetlands: Acres of potential wetlands within 50 feet of segments outside public road ROW crossed by the proposed alternative route (100 feet total).
FEMA Q3 Flood Zones: Acres of FEMA identified flood zones within 50 feet of segments outside public road ROW that would be crossed by the proposed alternative route (100 feet total).
NJDEP Landscape Project 3.1 Habitat Rank 3-5: Acres of potential state threatened (Rank 3), state endangered (Rank 4), or federally listed (Rank 5) habitat within 50 feet of segments outside public road ROW that would be crossed by the alternative route (100 feet total).
Engineering Variables
Miles within Existing Roadway Right-of-Way: Length of the alternative route located within an existing roadway ROW. These areas would have fewer impacts compared to developing adjacent to the roadway.
Miles Paralleling Existing Transmission Line ROW (Cathodic Protection): Length of the alternative route parallel to an existing transmission line ROW. These areas would involve additional cathodic protection measures due to the adjacent electrical system.
Number of Bridge Crossings: Number of times the proposed alternative route crosses a bridge. These areas would have engineering constraints that may require exterior pipes or directional drilling
Number of Major Utility Crossings: Number of existing major utilities that the alternative route would cross over or under. These areas would have engineering constraints that may involve additional coordination with other utilities.
Length of Pipeline in Acid Soils (miles): Length of alignment that would be located in areas consisting of acidic soils. These areas would increase engineering concerns regarding corrosive forces on the pipes.

Note: For this evaluation, the proposed routes were drawn based on aerial mapping and are not surveyed lines. The project is expected to have a 100ft permanent easement (50ft each side of centerline) outside of roadway segments. If the proposed pipe is within an existing roadway ROW, the project is not expected to disturb areas outside of the roadway ROW. A 100ft buffer was created for segments that are outside of roadway ROW and used to evaluate the parameters that do not specify a buffer distance. A 300ft buffer based on the route centerlines (150ft each side) was created and used to determine intersections as described for each parameter above that specifies review within 150ft.

TABLE 4-1b: Tabular Summary of Section 1 Alternative Routes

	MATRIX/CORRIDOR	Route A	Route B	Route C	Route D	Route E
BUILT ENVIRONMENT	**NJ Historical Preservation Office: Historical Properties (within 150 feet of centerline)**	8	15	84	1	1
	Normalized	8	17	100	0	0
	School, Church, Cemetery, or Park Parcels (within 150 feet of centerline)	9	8	9	2	3
	Normalized	100	86	100	0	14
	Residences (within 150 feet of centerline)	270	227	403	92	259
	Normalized	57	43	100	0	54
	Number of Parcels Crossed	29	9	20	50	7
	Normalized	51	5	30	100	0
	Commercial Buildings (within 150 feet)	9	19	58	12	15
	Normalized	0	20	100	6	12
	Industrial Buildings (within 150 feet)	0	0	0	0	0
	Normalized	0	0	0	0	0
	Length within State, County, or Agricultural Conserved Lands (miles)	0.48	0.00	0.33	5.10	0.00
	Normalized	9	0	6	100	0
[illegible]	[illegible]	16.67	0.75	9.74	5.72	0.76
	Normalized	100	0	56	31	0
	[illegible]	15	14	10	28	17
	Normalized	28	22	0	100	39
	[illegible]	0.76	0.26	0.76	38.46	5.42
	Normalized	1	0	1	100	14
	[illegible]	1.97	0.54	1.97	6.88	0.00
	Normalized	29	8	29	100	0
	[illegible]	0.00	0.00	0.00	43.33	0.00
	Normalized	0	0	0	100	0
ENGINEERING	**Miles within Existing Roadway ROW**	14.61	15.70	13.94	8.62	17.36
	Normalized	69	81	61	0	100
	Miles Paralleling Existing Transmission Line ROW (C-Protection)	0.30	0.00	0.30	9.60	1.05
	Normalized	3	0	3	100	11
	Number of Bridge Crossings	2	2	3	4	7
	Normalized	0	0	20	40	100
	Number of Major Utility Crossings	1	1	1	1	1
	Normalized	0	0	0	0	0
	Length of Pipeline in Acid Soils (miles)	7.10	7.00	5.39	9.59	11.50
	Normalized	28	26	0	69	100

TABLE 4-1c: Weighted Metrics and Weighted Totals for Section 1 Alternative Routes

MATRIX/CORRIDOR	Weight	Route A	Route B	Route C	Route D	Route E
BUILT	**37.5%**					
NJ Historical Preservation Office: Historical Properties (within 150 feet of centerline)	**14.0%**	8	17	100	0	0
Weighted		1.12	2.38	14.00	0.00	0.00
School, Church, Cemetery, or Park Parcels (within 150 feet of centerline)	**14.0%**	100	86	100	0	14
Weighted		14.00	12.04	14.00	0.00	1.96
Residences (within 150 feet of centerline)	**30.0%**	57	43	100	0	54
Weighted		17.10	12.90	30.00	0.00	16.20
Number of Parcels Crossed (If route is within public road right-of-way, do not count adjacent parcels)	**15.0%**	51	5	30	100	0
Weighted		7.65	0.75	4.50	15.00	0.00
Commercial Buildings (within 150 feet)	**5.0%**	0	20	100	6	12
Weighted		0.00	1.00	5.00	0.30	0.60
Industrial Buildings (within 150 feet)	**2.0%**	0	0	0	0	0
Weighted		0	0	0	0	0
Length within State, County, or Agricultural Conserved Lands (miles)	**20.0%**	9	0	6	100	0
Weighted		1.80	0.00	1.20	20.00	0.00
TOTAL	**100.0%**	41.67	29.07	68.70	35.30	18.76
WEIGHTED TOTAL		15.63	10.90	25.76	13.24	7.04
NATURAL	**37.5%**					
NJDEP 2007 Land-use Land-cover Forests (acres) (Within 100 feet of segments outside public road ROW)	**15.0%**	100	0	56	31	0
Weighted		15.00	0.00	8.40	4.65	0.00
SWQS (NJDEP) Stream Crossings (#)	**25.0%**	28	22	0	100	39
Weighted		7.00	5.50	0.00	25.00	9.75
NJDEP 2007 Land-use Land-cover Wetlands (acres) (Within 100 feet of segments outside public road ROW)	**25.0%**	1	0	1	100	14
Weighted		0.25	0.00	0.25	25.00	3.50
FEMA Q3 Flood Zones (acres) (Within 100 feet of segments outside public road ROW)	**10.0%**	29	8	29	100	0
Weighted		2.90	0.80	2.90	10.00	0.00
NJDEP Landscape Project 3.1 Habitat Rank 3-5 (acres) (Within 100 feet of segments outside public road ROW)	**25.0%**	0	0	0	100	0
Weighted		0.00	0.00	0.00	25.00	0.00
TOTAL	**100.0%**	25.15	6.30	11.55	89.65	13.25
WEIGHTED TOTAL		9.43	2.36	4.33	33.62	4.97
ENGINEERING	**25.0%**					
Miles within Existing Roadway ROW	**35.0%**	69	81	61	0	100
Weighted		24.15	28.35	21.35	0.00	35.00
Miles Paralleling Existing Transmission Line ROW (C-Protection)	**15.0%**	3	0	3	100	11
Weighted		0.45	0.00	0.45	15.00	1.65
Number of Bridge Crossings	**25.0%**	0	0	20	40	100
Weighted		0.00	0.00	5.00	10.00	25.00
Number of Major Utility Crossings	**5.0%**	0	0	0	0	0
Weighted		0.00	0.00	0.00	0.00	0.00
Length of Pipeline in Acid Soils (miles)	**20.0%**	28	26	0	69	100
Weighted		5.60	5.20	0.00	13.80	20.00
TOTAL	**100.0%**	30.20	33.55	26.80	38.80	81.65
WEIGHTED TOTAL		7.55	8.39	6.70	9.70	20.41
SUM OF WEIGHTED TOTAL		**32.61**	**21.65**	**36.79**	**56.56**	**32.42**

4.5.3 Weighting Procedures

The normalized metric values derived from **Table 4-1b** were further adjusted through a two-tiered weighting process shown in **Table 4-1c** (located in Section **4.5.2**). For the first step in the weighting process, a relative weight (percentage) was assigned to each specific metric. This weighting allows features requiring the most consideration (either protection or focus) to afford a higher relative influence for the ranking and scoring process. Relative weights for all the metrics within each perspective category must add up to 100%. The total of the weighted metrics within each perspective is summarized and illustrated on the line titled "Total" at the bottom of the perspective.

The relative weights assigned to the built environment metrics were based on the premise that proximity to residences was the least preferred alignment scenario, thus this metric was assigned the highest weight (30%). This premise was emphasized during the township discussion NJNG held. Following this same logic of avoiding the most sensitive built environment areas, length within conserved lands, including farmland preservation areas, was assigned a 20% weight and number of parcels crossed was assigned a 15% weight. Since most of the alternative route alignments are located within road ROWs, the number of parcels crossed provides a level of scale of the potential residential properties that may be affected by each of the alternative routes. Other built environment concern areas include historic buildings and districts, schools, churches, and cemeteries; these features were each assigned a moderately high weight (14%). Commercial and industrial buildings are built environment features that typically require the least avoidance compared to the others noted previously and were therefore assigned lower weights, 5% and 2% respectively.

The relative weights assigned to the natural environment metrics were also based on minimization of impacts to the most sensitive features. Development of the pipeline ROW may involve clearing and/or trenching through wetlands and streams. In many cases, these habitat areas are also associated with the T&E species habitat areas identified in the NJ Landscapes Project 3.1 database. Due to the potential effects to these resources that the alignments may have, each of these metrics was assigned a 25% weight. Relative to the length of the alignments, few areas of upland forest may be impacted by the development of project, thus this natural resource was provided a lower weight (15%). The effects to flood hazard areas (i.e., floodplains) are anticipated to be minimal because the project will not affect the hydrological capacities of these regulated areas. Length within flood hazard areas was provided the lowest weight (10%).

The relative weights for the engineering considerations were based on the premise that certain alignment scenarios may be more problematic, such as those that involve additional and more complex engineering solutions, and those that have the potential to complicate long term maintenance and operation. Although installation of the pipeline within the road ROW is an option that provides avoidance of impacts to adjacent residnetial properties, the engineering involved in this scenario is considerably more complex due to the existing utility infrastructure, constricted workspace, need for municipal coordination, and traffic control requirements. For these reasons, the length within a road ROW was assigned the highest engineering weight (35%). Another engineering challenge area is the stream crossings that are associated with bridges.

Horizontal directional drilling (HDD) techniques are more easily applied to stream crossings conducted in relatively undeveloped areas, but are considerably more difficult if the pipeline is required to stay within the road ROW. In these scenarios, additional engineering coordination will be required to directionally drill under the bridge. For these reasons, number of bridge crossings was assigned a 25% weight. Sections of the alignments also traverse though certain soils that have a high acid content that may affect the strength of the pipeline material. For this reason, length within areas that consist of potential acidic soils was assigned a 20% weight. Similarly, paralleling existing transmission line ROWs also involves engineering considerations based on the need for cathodic protection as the electric line may have negative effects on the stability of the pipeline. Although paralleling existing utility ROWS is also often considered a beneficial practice due to the potential minimization of impacts to natural resources and potential use of existing access roads, the length of the alignment paralleling a transmission line ROW was considered a potential negative impact due to the cathodic protection and therefore assigned a moderate impact weight (15%). The last engineering consideration assessed is the number of major utilities (e.g., gas or water mains and transmission lines) that may be intersected by the proposed alternatives. In these scenarios, coordination with the owner of the intersected utility will be required to determine the best course of action. The number of utilities crossed was assigned a moderately low weight (5%) because this scenario has a more definitive solution and few were encountered in the project study area.

In the final weighting process shown in **Table 4-1c**, each "Total" value was then applied against the assigned weight for its category (37.5% for the natural environment and built environment and 25% engineering considerations). For this project, these weights vary based on the premise that the complex intermix of man-made and natural features would be more influential in siting the necessary alignment relative to the engineering concerns. The weighted metric total is provided on the line titled "Weighted Total."

The Weighted Total values for the entire process are summed at the bottom of **Table 4-1c** on the line titled "Sum of Weighted Total." The Sum of Weighted Total result effectively shows which of the routes has the lowest cumulative impact (i.e., a low number is preferred) to the built and natural environment while being technically feasible to construct from an engineering perspective.

4.5.4 Quantitative Results

Review of the cumulative values indicate that **Route B (21.65)** would result in the least impacts, the **Route A (32.61)** and **Route E (32.42)** alternatives would have more impacts, and the **Route C (36.79)** and **Route D (56.56)** alternatives would incur the most impacts.

4.5.4.1 Built Environment

Values for the built environment metrics are the highest for **Route C (25.76)**, less for **Route A (15.63), Route D (13.24)**, and **Route B (10.90)**, and lowest for **Route E (7.04)**.

The factors affecting **Route C** included being in proximity to the most residences (403), schools and churches (9), commercial buildings (58), and historical properties/areas (84).

These values are high due to **Route C's** alignment through several larger towns including Chesterfield (Historic District), Jacobstown, and New Egypt (Historic District). **Route A** also scored relatively high due to the number of residences (270), schools and churches (9), and historic properties/areas (8) in close proximity to the alignment, but also due to a high number of parcels that would be crossed (29). Although **Route D** would involve the fewest residences (92), this route scored moderately high due to crossing the most parcels (50) and spanning the longest length of conserved lands (5.10 miles). **Route B's** value was affected by the relatively low number of residences within close proximity (227) and low number of parcels crossed (9). Despite having the a high number of residences along the alignment (259), the score for **Route E** was the lowest due to crossing the fewest parcels (7) and passing near a low number of historic properties/areas (1) and schools and churches (3).

4.5.4.2 Natural Environment

Values for the natural environment metrics are the highest for the **Route D (33.62)**, less for **Route A (9.43)**, and relatively low for **Route E (4.97)**, **Route C (4.33)**, and lowest for **Route B (2.36)**.

Factors affecting **Route D** include crossing the most streams (28), most wetlands (38.46), most floodplains (6.88), and most Landscape-identified T&E habitat areas (43.33). **Route A's** score was affected by having the most potential forest impacts (16.67), a high number of stream crossings (15), and the second highest area of floodplain crossings (1.97). The value for **Route E** was low due the lower forest (0.76) and floodplain (0) impacts. Although **Route C** has the second highest possible forest impacts (9.74), the route would have the fewest stream crossings (10) and a low wetland impact (0.76). The lowest score was for **Route B**, which would involve the lowest forest impact (0.75), the lowest wetland impact (0.26), low floodplain impacts (0.54), and minimal T&E habitat impacts.

4.5.4.3 Engineering Considerations

Values for the engineering considerations metrics are highest for **Route E (20.41)**, less for **Route D (9.70), Route B (8.39),** and **Route A (7.55)**, and lowest for **Route C (6.70).**

The factors affecting **Route E** include a longer length within a road ROW (17.36), the most bridge crossings (7), the longest length within areas of acidic soils (11.50), and some length within an existing transmission line ROW (1.05). Although **Route D** would have the shortest length within a road ROW (8.62), it scored high due to its longer length within an existing transmission line ROW (9.60), moderately long length within acidic soil areas (9.59), and moderately high number of bridge crossings (4). The value for **Route B** was affected by the relatively long length within a road ROW (15.70) and across areas with acidic soils (7.00). **Route A** would involve the fewest bridge crossings (2), but would be within the road ROW for a relatively long length (14.61), cross a modest length of acidic soil areas (7.10), and would involve some transmission line ROW areas (0.30). **Route C's** score was the lowest due to having the second shortest length within a road ROW (13.94), a low number of bridge crossings (3), and the least length within areas of acidic soils (5.39).

4.5.5 Qualitative Analysis

The next step in the evaluation process was to apply qualitative judgment to rank the alternative routes based on several important considerations, such as visual concerns, community concerns, schedule delay risk, special permit issues and construction and maintenance accessibility.

Each of these qualitative criteria was assigned a weight based on its significance within the scope of the project as illustrated on **Table 4-1d**. Each alternative route was then analyzed based on these criteria, ranking each on a 1-5 scale, with a rank of 1 indicating a low impact and a rank of 5 indicating a high impact. A detailed discussion of the considerations related to each of the five criteria is provided below.

TABLE 4-1d: Analysis of Qualitative Concerns - Section 1 Alternative Routes

Criteria	Weights	Route A	Route B	Route C	Route D	Route E
VISUAL CONCERNS		3	3	5	1	3
Weighted		0.15	0.15	0.25	0.05	0.15
COMMUNITY CONCERNS		4	4	5	3	4
Weighted		0.60	0.60	0.75	0.45	0.60
SPECIAL PERMIT ISSUES		3	1	2	5	3
Weighted		0.75	0.25	0.50	1.25	0.75
CONSTRUCTION/MAINTENANCE ACCESSIBILITY		2	2	2	4	3
Weighted		0.60	0.60	0.60	1.20	0.90
SCHEDULE DELAY RISK		3	2	3	5	4
Weighted		0.75	0.50	0.75	1.25	1.00
TOTAL						

4.5.5.1 Visual Concerns

Since the project involves the development of an underground gas pipeline, permanent visual affects to the local community are expected to be minor and would typically only involve aboveground permanent infrastructure such as valve operators which will be located aboveground approximately every five miles. Temporary visual concerns during construction, however, may include areas of vegetation clearing and the presence of construction equipment, stock pile areas, and pipe laydown areas.

Route D was assigned the lowest visual impact score (1) because this route is located in relatively rural areas that consist of stretches of roadways bordered by agricultural uses or other undeveloped lands. This route also has the fewest receptors that may be sensitive to visual changes, such as schools, parks, cemeteries, and residences, and are therefore less likely to acknowledge any visual impacts. **Route A, Route B**, and **Route E** pass through several larger towns, including Chesterfield, Georgetown, Ellisdale, Arneytown, Hornerstown, and Cookstown, which would involve an increase in potential visual receptors. For this reason, these three routes were assigned a moderate visual impact score (3). The highest visual score (5), was assigned to **Route C**, which would pass

through the largest towns (Chesterfield, Jacobstown, and New Egypt) and have the most potential visual impact on the adjacent residences, schools, and other social areas. **Route C** would also pass near or through the most historic properties and districts, which may result in the State Historic Preservation Office requiring visual impact assessments to confirm the project would not have any effect on these cultural resources.

4.5.5.2 Additional Community Concerns

Community concerns associated with the construction of a new gas pipeline may occur over the course of the project development. Initial concerns may be raised by the local municipalities through which the proposed pipeline routes may traverse. Concerns raised by municipal leaders may focus on topics such as infrastructure coordination, traffic control, avoidance of local preserved lands, safety items, and issues raised by the local citizens. Since most of these routes involve installation of the new pipeline within the ROW of the existing roadway network, relatively few areas would be located in private lands. Such easement rights involve access agreements for the utility company to maintain and service the new facilities, which may lead to concerns regarding inadvertent damages to yards or crop fields. During construction, activities within the roadways may result in additional concerns from local residents and shop owners regarding traffic and noise. Potential long-term community considerations also include the perceived safety concern that may arise over the presence of a gas pipeline in close proximity to residences and other sensitive receptors such as schools, churches, and other social areas.

While the Project Study Area is generally highly rural l in nature, there are areas of more concentrated population, primarily those noted in the visual concerns section. Based on these concepts, **Route D** was assigned a moderate community concern value (3) as this route would extend through one small town (Georgetown), use the most rural roads, use more open fields, and be in proximity to the fewest people. **Route A, Route B,** and **Route E** were assigned moderately high values (4) as these routes would extend through some larger towns, use more heavily travelled county roads, and be in proximity to more people. **Route C** was assigned the highest community concern value (5) due to the alignment passing through the most towns, being along the most county roads, and in proximity to the most people.

4.5.5.3 Special Permit Requirements

There are various types of permits that may be required for developing a new underground natural gas pipeline alignment. For example, in the State of New Jersey, freshwater wetlands, State open waters and floodplains are regulated by the NJDEP. Within the NJ Pinelands, the NJ Pinelands Commission regulates compliance with the CMP. Wetland impacts are authorized through NJ Pinelands Commission approval mechanisms. Therefore, impacts to sensitive natural resources would likely require permits from the NJ Pinelands Commission and NJDEP. Similarly, additional state coordination would be required for activities within specified parks and preserved lands that are associated with Wildlife Management Areas, including the Manchester and Colliers Mills Wildlife Management Areas. Additional coordination may also be required for other forms of environmental impacts (e.g., T&E species habitat) or cultural resource impacts. Furthermore, permits may be required for social safety considerations such as activities associated with drilling under highways or railroads. Specific parcels

which are designated as Preserved Farmland through the State Agriculture Development Commission are preserved such that only farming activities are permitted to occur on those lands.

Route D was assigned the highest special permit value (5) as this alignment would cross the most streams, most wetlands, most floodplain areas, and most T&E habitat areas. The alignment of **Route D** would also cross a considerable length of Preserved Farmland, which is not permissible as noted above, and therefore effectively represents a fatal flaw for this route. A moderate permit value (3) was assigned to **Route A** due to the extent of forest impacts and relatively high number of stream crossings. **Route E** was also assigned a moderate permit value (3) due to being within a short section of the Pinelands Area and having a relatively high number of stream crossings. A moderately low permit value (2) was assigned to **Route C** due to the modest extent of forest impact and low number of stream crossings. The lowest permit value (1) was assigned to **Route B** as this alignment would cumulatively involve the fewest impacts to the natural resources and no impacts to preserved lands.

4.5.5.3.1 Summary of Anticipated Permits

Table 4-1e presents a list of the anticipated permits which would be required in order to authorize the proposed activities:

TABLE 4-1e: Anticipated Permits – Section 1

Permit Name	Implementing Regulations	Regulated Area	Issuing Authority
Freshwater Wetlands General Permit (GP) or Individual Permit (IP)	NJ Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A)	Wetlands and wetland transition areas	NJDEP, Division of Land Use Regulation
Flood Hazard Area Control Act Permit	NJ Flood Hazard Area Control Act Rules (N.J.A.C. 7:13)	Flood Hazard Areas and Riparian Zones of Regulated Waters	NJDEP, Division of Land Use Regulation
Soil Erosion and Sediment Control Plan Certification	NJ Soil Erosion and Sediment Control Act	Projects with >5,000 sf of earth disturbance	Burlington, Freehold, and Ocean County Soil Conservation Districts

4.5.5.4 Construction, Maintenance, and Accessibility

Variables involved in constructing gas pipelines, conducting mandatory routine maintenance of the facilities, and providing appropriate access to all the required areas were considered. This includes the initial need to coordinate with municipal agents and landowners, clear vegetation and other obstructions, provide for an acceptable construction work area, and address traffic control requirements. Long-term access will also need to be coordinated with municipal agents and landowners.

Each of the alternative routes in Section 1 are co-located along frequently travelled local and county roads for a considerable portion of their alignment; therefore all five will have some level of construction, maintenance, and accessibility constraints. **Route D** was

assigned a moderately high accessibility value (4) due to being located for long stretches in undeveloped areas away from local roads, which may increase the complexity for accessing these sites. A moderate accessibility value (3) was assigned to **Route E** due to being the longest route to construct and due to involving more township coordination. **Route A, Route B**, and **Route C** were each assigned a moderately low accessibility value (2) due to their relatively shorter lengths, fewer townships crossed, and limited length on undeveloped lands.

4.5.5.5 Risk of Schedule Delay

Risk of schedule delay is directly related to the other qualitative criteria evaluated. For example, negative community reaction, complicated ROW acquisition, additional field studies for environmental permit clearance, and construction complexity can result in delayed schedules. Many of the potential reasons for schedule delays along each of the alternative routes can be identified in advance, but some reasons for delay cannot be known in advance and may not be realized until much later in the process.

The factors presenting the highest risk of schedule delay for all five Section 1 alternative routes are the potentially negative community reactions and complex permitting processes. Based on the qualitative review conducted for this project, **Route D** was assigned a high schedule delay value (5) due to the potential need to coordinate easements across Preserved Farmland tracts, coordinate the most landowner agreements, and overall extensive permitting due to the potential level of impacts to natural resources. A moderately high schedule delay value (4) was assigned to **Route E** due to the coordination that would be required for the section passing through the Pinelands Area and additional township coordinations. **Route A** and **Route C** were assigned a moderate delay value (3) due to the level of permit coordination required (**Route A**) and the level of potential community reaction (**Route C**). **Route B** was assigned a moderately low schedule delay value (2) as this alternative would involve a considerable level of community opposition but not involve an extensive level of permitting.

4.5.6 Conclusion of Section 1 Selected Route

The results of the *quantitative assessment* of the Alternative Routes, discussed in detail in **Section 4.5.4** and illustrated in **Table 4-1b and Table 4-1c,** resulted in **Route B** having the least potential impact relative to the other four alternatives.

The results of the *qualitative assessment* of the Alternative Routes, discussed in detail in **Section 4.5.5** and illustrated in **Table 4-1d** also resulted in **Route B** having relatively limited concerns and permitting requirements compared to the other four alternatives.

Based on this analysis, **Route B** was deemed the Selected Route for Section 1 of the Southern Reliability Link Project.

Route B Summary

In the Evaluation Criteria and Weighted Rankings analysis, **Route B** has the second lowest impact to the built environment, the lowest impact to the environment, and the lowest engineering considerations. Qualitatively, **Route B** would involve moderate levels of visual concerns and community concerns, but would be less difficult to permit and construct than the other alternatives.

4.6 Section 2 Alternatives Analysis

The following provides the alternative route descriptions and a review of the factors associated with the Selected Route determination for Section 2. The alternative routes identified for Section 2 are illustrated in **Figure 4-2b**. Since Section 2 will be extending across the Pinelands Area, the metrics for Section 2 have been modified to include items specific to the requirements of the NJ Pinelands Commission. The land use and development intensities applied in the specific Pinelands Management Areas restrict the development of "public service infrastructure," in this case, a natural gas transmission pipeline. The NJ Pinelands Commission issues two types of standard approvals for development projects proposed within the NJ Pinelands: Certificate of Filing and Public Development Approval. In order to obtain either of these approvals, proposed activities must meet the Land Use (Subchapter 5) and Development Standards (Subchapter 6) of the NJ Pinelands Comprehensive Management Plan (CMP) at N.J.A.C. 7:50.

4.6.1 Route Descriptions

The Section 2 analysis was performed first, chronologically. The eastern terminus of all alternative routes for Section 2 is NJNG's existing gas transmission system which will allow connection to the proposed SRL transmission line.

4.6.1.1 Route A

Route A is approximately 14.3 miles (~75,200 feet) in length.

- The route option extends south inside the JB MDL boundary within the ROW of Pinehurst Road (CR 539) for 2.3 miles. This entire segment is bordered by forested areas. This segment is within the Federal or Military Facility Pinelands Management Area, where linear utility construction is not prohibited.
- The route option turns southeast within the ROW of Whiting-New Egypt Road (CR 539) for 4.6 miles. A New Jersey National Guard facility is located to the east of Whiting-New Egypt Road south of the intersection with Pinehurst Road (CR 539). The northern portion of Whiting-New Egypt Road extends through the Federal or Military Facility Pinelands Management Area where linear utility construction is acceptable. From its intersection with a military base access road (South Boundary Road) and extending south to State Highway 70, Whiting-New Egypt Road extends through the Pinelands Preservation Area District, where linear utility construction is prohibited. The Manchester Wildlife Management Area also borders this stretch of road ROW. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option then turns northeast within the ROW of State Highway 70 and continues for 6.0 miles. Two Pinelands Management Areas where linear utility construction is prohibited (Forest Area and Preservation Area District) bound the road ROW to the north and south for a majority of this segment. The area adjacent to State Highway 70 is largely bordered by forested areas within this route segment. The route continues east on State Highway 70 to the town of Lakehurst, which is within the Pinelands Town Pinelands Management Area. Linear utility construction is acceptable in this management area. The road in Lakehurst is bordered by a mix of

residential properties and commercial development. This route segment also intersects several mapped NJDEP SWQS streams.

- The route option turns northeast within the ROW of Center Street/Ridgeway Road for 0.1 miles. This route segment borders commercial properties and crosses a bridge over Manapaqua Brook. The eastern side of the road is bordered by forested area. This segment is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area.
- The route option turns southeast outside of public road ROW for 1.0 mile where it extends through a commercial property and crosses a Conrail railroad. The segment west of the railroad is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area. The route then runs through a Manchester Township property along Lowell Avenue and enters a shopping plaza property, where portions of forested areas and wetlands are intersected by the route segment. In addition, the NJDEP Landscape Project (Version 3.1) mapping identifies T&E species habitat along this portion of the alignment. The route continues east parallel to the State Highway 70 ROW, but within the shopping plaza parcel.
- The route option turns to the southeast for 0.3 mile, crossing under State Route 70, paralleling this highway to Colonial Drive, and then extending south along the edge of this local road. The route ends at the NJNG infrastructure connection point along Colonial Drive.

4.6.1.2 Route B

Route B is approximately 15.3 miles (~80,700 feet) in length.

- The route option extends south inside the JB MDL boundary within the ROW of Pinehurst Road (CR 539) for 2.3 miles. This entire segment is bordered by forested areas. This segment is within the Federal or Military Facility Pinelands Management Area, where linear utility construction is acceptable.
- The route option continues south within the ROW of Pinehurst Road for an additional 4.2 miles. This portion of the route is bordered by forested area and crosses several mapped NJDEP SWQS streams. Live fire military training areas occur to the west of this route segment. This segment is within the Federal or Military Facility Pinelands Management Area, where linear utility construction is acceptable.
- The route option then turns northeast within the ROW of State Highway 70 and continues for 7.4 miles. The first 0.5 mile of this segment is within the Federal or Military Facility Pinelands Management Area. Two Pinelands Management Areas where linear utility construction is prohibited (Forest Area and Preservation Area District) bound the road ROW to the north and south for a majority of this segment. The area adjacent to State Highway 70 is largely bordered by forested areas within this route segment. The route continues within the State Highway 70 ROW to the town of Lakehurst, which is within the Pinelands Town Pinelands Management Area. Linear utility construction is acceptable in the Pinelands Town. The road in Lakehurst is bordered by a mix of residential properties and commercial

development. This route segment also intersects several mapped NJDEP SWQS streams.

- The route option turns northeast within the ROW of Center Street/Ridgeway Road for 0.1 miles. This route segment borders commercial properties and crosses a bridge over Manapaqua Brook. The eastern side of the road is bordered by forested area. This segment is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area.
- The route option turns southeast outside of public road ROW for 1.0 mile where it extends through a commercial property and crosses a Conrail railroad. The segment west of the railroad is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area. The route then runs through a Manchester Township property along Lowell Avenue and enters a shopping plaza property, where portions of forested areas and wetlands are intersected by the route segment. In addition, the NJDEP Landscape Project (Version 3.1) mapping identifies T&E species habitat along this portion of the alignment. The route continues east parallel to the State Highway 70 ROW, but within the shopping plaza parcel.
- The route option turns to the southeast for 0.3 mile, crossing under State Route 70, paralleling this highway to Colonial Drive, and then extending south along the edge of this local road. The route ends at the NJNG infrastructure connection point along Colonial Drive.

4.6.1.3 Route C

Route C is approximately 21.7 miles (~114,700 feet) in length.

- The route option turns north within the ROW of Pinehurst Road (CR 539) for 2.9 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands; some of the agricultural lands are protected under the NJ Farmland Preservation Program. This route segment intersects a mapped NJDEP SWQS stream and crosses under the existing JCP&L electric transmission line ROW. This segment is bordered to the east by the Rural Development Area and Forest Area Pinelands Management Areas. Linear utility construction is prohibited within the Forest Area.
- The route option makes a sharp turn east at the intersection with West Veterans Highway (CR 528) and continues within the ROW of this road for 5.2 miles into the town of Cassville. This segment of road is bordered to the north and south by forested areas that are part of Colliers Mills Wildlife Management Area. In addition, this public road is bordered by residential properties. Also, two Pinelands Management Areas where linear utility construction is prohibited (Forest Area and Preservation Area District) bound the road ROW to the north and south within this segment. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns east/northeast, but continues within the ROW of West Veterans Highway (CR 528) for 2.5 miles. This public road is bordered by a mix of residential properties and commercial development. A recreational complex is located south of this route near the intersection of CR 528 and Don Connor

Boulevard. Portions of this segment are bounded to the south by a Pinelands Management Area where linear utility construction is prohibited (Forest Area). This route segment also intersects two mapped NJDEP SWQS streams, including Toms River.

- The route option turns southeast within the ROW of East Veterans Highway (CR 528) for 2.9 miles. This public road is bordered by a mix of residential properties, commercial development, agricultural lands, and a park including baseball fields. Portions of this segment are bounded to the south by a Pinelands Management Area where linear utility construction is prohibited (Forest Area).
- The route option turns southeast/northeast within the ROW of Grawtown Road for 2.0 miles. This public road is bordered by residential properties and intersects an existing JCP&L electric transmission line ROW. This route segment also intersects two mapped NJDEP SWQS streams. This segment is bordered to the north and south by the Rural Development Area and Regional Growth Area Pinelands Management Areas. Linear utility construction is acceptable within these areas.
- The route option turns east within the ROW of Whitesville Road for 0.7 miles into the town of Whitesville. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands. This segment is bordered to the north and south by the Rural Development Area and Regional Growth Area Pinelands Management Areas. Linear utility construction is acceptable within these areas.
- The route option turns south within the ROW of South Hope Chapel Road for 4.3 miles. This public road is bordered by a mix of residential properties, commercial development, and agricultural lands. Specifically, this route segment runs adjacent to a golf course country club, dense residential townhome communities, and an entrance to the JB MDL. This route segment also intersects two mapped NJDEP SWQS streams, including Toms River, and an existing JCP&L electric transmission line ROW. This segment is bordered to the east and west by the Rural Development Area, Regional Growth Area, and Federal or Military Facility Pinelands Management Areas. Linear utility construction is acceptable within these areas.
- The route option turns southeast outside of public road ROW for 1.0 mile where it extends through a commercial property and crosses a Conrail railroad. The segment west of the railroad is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area. The route then runs through a Manchester Township property along Lowell Avenue and enters a shopping plaza property, where portions of forested areas and wetlands are intersected by the route segment. In addition, the NJDEP Landscape Project (Version 3.1) mapping identifies T&E species habitat along this portion of the alignment. The route continues east parallel to the State Highway 70 ROW, but within the shopping plaza parcel.
- The route option turns to the southeast for 0.3 mile, crossing under State Route 70, paralleling this highway to Colonial Drive, and then extending south along the edge of this local road. The route ends at the NJNG infrastructure connection point along Colonial Drive.

4.6.1.4 Route D

Route D is approximately 11.7 miles (~61,700 feet) in length.

- The route option extends south inside the JB MDL boundary within the ROW of Pinehurst Road (CR 539) for 2.3 miles. This entire segment is bordered by forested areas. This segment is within the Federal or Military Facility Pinelands Management Area, where linear utility construction is acceptable.
- The route option turns southeast within the ROW of Whiting-New Egypt Road (CR 539) for 1.5 miles. A New Jersey National Guard facility is located to the east of Whiting-New Egypt Road south of the intersection with Pinehurst Road (CR 539). This route segment also intersects a mapped NJDEP SWQS stream. This segment is also within the Federal or Military Facility Pinelands Management Area.
- The route option turns northeast within the ROW of South Boundary Road, a military base access road, for 2.7 miles. This segment is also within the Federal or Military Facility Pinelands Management Area, where linear utility construction is acceptable. Manchester Wildlife Management Area occurs south of this portion of the route, although the route remains within the military base parcel boundary and does not directly intersect the state land. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns northeast outside of road ROW and adjacent to an existing unused concrete runway for 1.5 miles. The area adjacent to the concrete runway is maintained lawn and cleared area. This segment is within the Federal or Military Facility Pinelands Management Area. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns southeast within the ROW of Lakehurst Naval Air Center Road, a military base access road, for 2.2 miles. The road ROW is bordered by forested area and military facility areas, including cleared fields and paved areas. This segment is within the Federal or Military Facility Pinelands Management Area. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns southeast outside of road ROW for 0.2 miles. A forested area is intersected by the route segment. In addition, the NJDEP Landscape Project (Version 3.1) mapping identifies T&E species habitat along this portion of the alignment. This segment is within the Federal or Military Facility Pinelands Management Area, where linear utility construction is acceptable. This route segment also intersects several mapped NJDEP SWQS streams.
- The route option turns southeast within the ROW of Ridgeway Road/Lakehurst Whitesville Road for less than 0.1 mile. This segment is within the Regional Growth Area Pinelands Management Area, where linear utility construction is acceptable.
- The route option turns southeast outside of public road ROW for 1.0 mile where it extends through a commercial property and crosses a Conrail railroad. The segment west of the railroad is within the Regional Growth Area Pinelands Management Area. Linear utility construction is acceptable within this area. The route then runs through

a Manchester Township property along Lowell Avenue and enters a shopping plaza property, where portions of forested areas and wetlands are intersected by the route segment. In addition, the NJDEP Landscape Project (Version 3.1) mapping identifies T&E species habitat along this portion of the alignment. The route continues east parallel to the State Highway 70 ROW, but within the shopping plaza parcel.

- The route option turns to the southeast for 0.3 mile, crossing under State Route 70, paralleling this highway to Colonial Drive, and then extending south along the edge of this local road. The route ends at the NJNG infrastructure connection point along Colonial Drive.

4.6.2 Evaluation Metrics

The evaluation metrics for Section 2 are based on the same principles as those used to identify the metrics used for the Section 1 analysis, which are listed in **Table 4-1a**. As discussed in **Section 4.5.2** of this report, Section 2 was evaluated as its own sub-section due to the regulatory implications of the Pinelands CMP. Evaluation metrics for Section 2 are listed in **Table 4-2a**.

TABLE 4-2a: Metric Definitions – Section 2

Built Environment
NJ Historical Preservation Office: Historical Properties (within 150 feet): Identifies the number of historic structures or districts located within 150 feet of the alternative route (300 feet total).
School, Church, Cemetery, or Park Parcels (within 150 feet): Identifies the number of areas where the alternative route would be within 150 feet of these sensitive land uses (300 feet total).
Residences (within 150 feet): Residences located within 150 feet to the alternative route (300 feet total).
Number of Parcels Crossed: Identifies the number of individual parcels that intersect the centerline of the alternative route.
Commercial Buildings (within 150 feet): Identifies the number of commercial structures within 150 feet of the alternative route (300 feet total).
Industrial Buildings (within 150 feet): Identifies the number of industrial structures within 150 feet of the alternative route (300 feet total).
Natural Environment
NJDEP 2007 Land-use Land-cover Forests: Acres of forest within 50 feet of segments outside public road ROW potentially impacted by the proposed alternative route (100 feet total).
SWQS (NJDEP) Stream Crossings: Number of streams crossed by the proposed alternative route. NJDEP Surface Water Quality Standards (SWQS) Streams were used for this analysis.
NJDEP 2007 Land-use Land-cover Wetlands: Acres of potential wetlands within 50 feet of segments outside public road ROW crossed by the proposed alternative route (100 feet total).
Length Within Pinelands Management Area Where Linear Utility Construction is Prohibited: Lengths of route segments that either share a boundary with, or intersect Pinelands Management Areas where linear utility development is prohibited per N.J.A.C. 7:50 (Pinelands Management Area = Forest Area or Preservation Area District)
NJDEP Landscape Project 3.1 Habitat Rank 3-5: Acres of potential state threatened (Rank 3), state endangered (Rank 4), or federally listed (Rank 5) habitat within 50 feet of segments outside public road ROW that would be crossed by the alternative route (100 feet total).
Engineering Variables
Miles within Existing Roadway Right-of-Way: Length of the alternative route located within an existing roadway ROW. These areas would have fewer impacts compared to developing adjacent to the roadway.
Number of Bridge Crossings: Number of times the proposed alternative route crosses a bridge. These areas would have engineering constraints that may require exterior pipes or directional drilling.
Length of Pipeline in Acid Soils (miles): Length of alignment that would be located in areas consisting of acidic soils. These areas would increase engineering concerns regarding corrosive forces on the pipes.

4.6.3 Weighting Procedures and Modifications

The normalization processes discussed in **Section 4.6.2** were similarly used for the analysis of the Section 2 metrics. Changes were made to the relative weights of the Section 2 metrics due to the addition of new variables (i.e., Length within Pinelands Management Area) and the elimination of others (i.e., Miles Paralleling Existing Transmission Line).

The relative weights for the Section 2 metrics were adjusted to account for changes in the variables reviewed. For example, conserved lands, including farmland preservation

areas, were relevant in Section 1, but these resources are not crossed in Section 2, thus the metric was removed. Following the logic presented in Section 1, the relative weights assigned to the built environment metrics were based on the premise that proximity to residences was the least preferred scenario, thus this metric was assigned the highest weight (35%). Other built environment concern areas include historic buildings and districts, schools, churches, and cemeteries; these features were each assigned a moderately high weight (17.5%). Since most of the alternative route alignments are located within road ROWS, the number of parcels crossed provides a level of scale of the potential residential properties that may be affected by each of the alternative routes. The number of parcels crossed was assigned a 15% weight. Commercial and industrial buildings are built environment features that require the least avoidance and were therefore assigned lower weights, 10% and 5% respectively.

The relative weights assigned to the natural environment metrics were also adjusted due to the removal of flood hazard areas (since all stream crossing can be horizontally directionally drill for this section) and the addition of the NJ Pinelands Management Areas as review variables. Based on the ecological sensitivity and regulated restrictiveness of specific NJ Pinelands Management Areas (e.g., Preservation Area, Forest Area), the length of proposed alignment within these areas was assigned the highest weight (35%). Further, due to the presence of extensive concentrations of NJ Landscapes Project 3.1 identified T&E species habitat areas, this metric was assigned the next highest weight (20%), with forested lands and stream crossings being assigned moderately lower weights (17.5%). Wetlands were assigned the lowest weight (10%) as the potential effects to these resources can be minimized through the use of directional drilling techniques.

Specific metrics reviewed under the engineering considerations perspective for Section 1 were removed as they would not be relevant in the Section 2 scenario (e.g., Paralleling Existing Transmission Lines, Major Utilities Crossed). As such, the weights for the remaining metrics were adjusted based on their relevance in Section 2. These changes include increasing the weight for length within a road ROW (50%), the weight for number of bridge crossings (30%), and weight for length within acidic soils (20%).

In the second weighting process shown in **Table 4-2c**, each "Total" value was applied against the assigned weight for its category (35% for the built environment and the natural environment and 30% for engineering considerations). These weights were adjusted for Section 2 to reflect the increase in potential engineering complexity that may be realized in the development of the pipeline in order to minimize impacts to the natural and built environments. The weighted metric total is provided on the line titled "Weighted Total."

TABLE 4-2b: Tabular Summary of Section 2 Alternative Routes

	MATRIX/CORRIDOR	Route A	Route B	Route C	Route D
BUILT ENVIRONMENT	NJ Historical Preservation Office: Historical Properties(within 150 feet of centerline)	8	8	6	1
	Normalized	100	100	71	0
	School, Church, Cemetery, Park Parcels (within 150 feet of centerline)	1	1	8	0
	Normalized	13	13	100	0
	Residences (within 150 feet of centerline)	29	26	314	0
	Normalized	9	8	100	0
	Number of Parcels Crossed	5	5	5	6
	Normalized	0	0	0	100
	Commercial Buildings (within 150 feet)	34	38	46	6
	Normalized	70	80	100	0
	Industrial Buildings (within 150 feet)	0	1	3	0
	Normalized	0	33	100	0
		8.84	8.84	8.84	10.92
	Normalized	0	0	0	100
		8	8	10	10
	Normalized	0	0	100	100
		0.08	0.08	0.08	0.08
	Normalized	0	0	0	0
		7.92	5.72	4.82	0.00
	Normalized	100	72	61	0
		8.90	8.90	8.90	10.98
	Normalized	0	0	0	100
ENGINEERING	Miles within Existing Roadway ROW	13.02	14.07	20.49	8.78
	Normalized	36	45	100	0
	Number of Bridge Crossings	4	3	5	3
	Normalized	50	0	100	0
	Length of Pipeline in Acid Soils (miles)	0.03	0.03	7.03	0.03
	Normalized	0	0	100	0

TABLE 4-2c: Weighted Metrics and Weighted Totals for Section 2 Alternative Routes

MATRIX/CORRIDOR		Route A	Route B	Route C	Route D
BUILT	**35.0%**				
NJ Historical Preservation Office: Historical Properties (within 150 feet of centerline)	**17.5%**	100	100	71	0
Weighted		17.50	17.50	12.43	0.00
School, Church, Cemetery, Park Parcels (within 150 feet of centerline)	**17.5%**	13	13	100	0
Weighted		2.28	2.28	17.50	0.00
Residences (within 150 feet of centerline)	**35.0%**	9	8	100	0
Weighted		3.15	2.80	35.00	0.00
Number of Parcels Crossed (If route is within public road right-of-way, do not count adjacent parcels)	**15.0%**	0	0	0	100
Weighted		0.00	0.00	0.00	15.00
Commercial Buildings (within 150 feet)	**10.0%**	70	80	100	0
Weighted		7.00	8.00	10.00	0.00
Industrial Buildings (within 150 feet)	**5.0%**	0	33	100	0
Weighted		0.00	1.65	5.00	0.00
TOTAL	**100.0%**	29.93	32.23	79.93	15.00
WEIGHTED TOTAL		10.47	11.28	27.97	5.25
NATURAL	**35.0%**				
NJDEP 2007 Land-use Land-cover Forests (acres) (Within 100 feet of segments outside public road ROW)	**17.5%**	0	0	0	100
Weighted		0.00	0.00	0.00	17.50
SWQS (NJDEP) Stream Crossings (#)	**17.5%**	0	0	100	100
Weighted		0.00	0.00	17.50	17.50
NJDEP 2007 Land-use Land-cover Wetlands (acres) (Within 100 feet of segments outside public road ROW)	**10.0%**	0.00	0.00	0.00	0.00
Weighted		0.00	0.00	0.00	0.00
Length within Pinelands Management Area where Linear Utility Construction is Prohibited (miles)	**35.0%**	100	72	61	0
Weighted		35.00	25.20	21.35	0.00
NJDEP Landscape Project 3.1 Habitat Rank 3-5 (acres) (Within 100 feet of segments outside public road ROW)	**20.0%**	0	0	0	100
Weighted		0.00	0.00	0.00	20.00
TOTAL	**100.0%**	35.00	25.20	38.85	55.00
WEIGHTED TOTAL		12.25	8.82	13.60	19.25
ENGINEERING	**30.0%**				
Miles within Existing Roadway ROW	**50.0%**	36	45	100	0
Weighted		18.00	22.50	50.00	0.00
Number of Bridge Crossings	**30.0%**	50	0	100	0
Weighted		15.00	0.00	30.00	0.00
Length of Pipeline in Acid Soils (miles)	**20.0%**	0	0	100	0
Weighted		0.00	0.00	20.00	0.00
TOTAL	**100.0%**	33.00	22.50	100.00	0.00
WEIGHTED TOTAL		9.90	6.75	30.00	0.00
SUM OF WEIGHTED TOTAL		**32.62**	**26.85**	**71.57**	**24.50**

4.6.4 Quantitative Results

The results of the quantitative analysis indicate that the **Route A (32.62)**, **Route B (26.85)** and **Route D (24.50)** alternatives would produce considerably less impacts relative to the **Route C (71.57)** alternative.

4.6.4.1 Built Environment

Values for the built environment metrics are the highest for **Route C (27.97)**, less for **Route A (10.47)** and **Route B (11.28)**, and lowest for **Route D (5.25)**.

The factors affecting **Route C** included being in proximity to the most residences (314), commercial or industrial buildings, as well as the highest number of schools and churches (8). The values for **Route A** and **Route B** are generally the same due to portions of these alignments being co-located. These two routes would be in close proximity to a similar number of residences (29 and 26 respectively), the most historical sites (8), and cross the same number of parcels (5). **Route D** would be near one historic site, but would not be close to any residences, schools, or churches. **Route D's** value was affected by being within the most parcels (6), most of which are associated with the Joint Base McGuire-Dix-Lakehurst (JB MDL) facility.

4.6.4.2 Natural Environment

Values for the natural environment metrics are the highest for **Route D (19.25)**, less for **Route A (12.25)** and **Route C (13. 60)**, and lowest for **Route B (8.82)**.

Route D's score was affected by the relatively higher impacts to forest areas and potential T&E species habitat, as well as number of stream crossings. The **Route D** alternative contains approximately 2-acres more forest and T&E habitat impacts relative to the other alternatives, but it should be noted that these resources coincide at the same geographical location. In terms of stream crossings, **Route D** would involve two additional crossings compared to the other alternatives. Each of these variables is higher for **Route D** because the alignment identified by JB MDL traverses though portions of the facility that will not affect operations and consequently offered limited options for avoidance of existing natural features. The values for **Route A, B, and C** were primarily affected by their relative lengths through sections of the Pinelands Management areas where such development is not considered a permissible use. The **Route D** alternative is the only alternative with no length through these more restrictive Pinelands Management areas.

4.6.4.3 Engineering Considerations

Values for engineering metrics are highest for **Route C (30.00)**, followed by **Route A (9.90)** and **Route B (6.75)**, with **Route D (0.00)** having the lowest engineering score.

The factors affecting **Route C** include its longer length within a road ROW (20.49), higher number of bridge crossings (5), and longer length within acidic soils (7.03). Differences between **Route A** and **Route B** are relatively minimal and include **Route A** crossing one more bridge than **Route B** and **Route B** being approximately one mile longer than **Route A**. **Route D** would involve the shortest length within a road ROW, fewer bridge crossings, and a considerably limited length within acidic soils (0.03).

4.6.5 Qualitative Analysis

The next step in the evaluation process was to apply qualitative judgment to rank the alternative routes based on several important considerations, such as visual concerns, community concerns, schedule delay risk, special permit issues and construction and maintenance accessibility.

Each of these qualitative criteria was assigned a weight based on its significance within the scope of the project as illustrated on **Table 4-2d**. Each alternative route was then analyzed based on these criteria, ranking each on a 1-5 scale, with a rank of 1 indicating a low impact and a rank of 5 indicating a high impact. A detailed discussion of the considerations related to each of the criteria is provided below.

TABLE 4-2d: Analysis of Qualitative Concerns - Section 2 Alternative Routes

Criteria	Weights	Route A	Route B	Route C	Route D
VISUAL CONCERNS		1	1	3	1
Weighted		0.05	0.05	0.15	0.05
COMMUNITY CONCERNS		2	2	3	1
Weighted		0.10	0.10	0.15	0.05
SPECIAL PERMIT ISSUES		4	4	5	3
Weighted		1.20	1.20	1.50	0.90
CONSTRUCTION/MAINTENANCE ACCESSIBILITY		2	2	3	1
Weighted		0.70	0.70	1.05	0.35
SCHEDULE DELAY RISK		4	4	5	3
Weighted		1.00	1.00	1.25	0.75
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

4.6.5.1 Visual Concerns

Since the project involves the placement of an underground gas pipeline, permanent visual affects to the local community are expected to be minor (i.e., valve settings, pig launchers, and receivers). Temporary visual concerns during construction, however, include the clearing of vegetation and the presence of construction equipment.

Routes A, B, and D would predominantly be located within generally isolated sections of a military installation and along sparsely populated public roads. Therefore even during construction, these routes are likely to result in limited visual impacts. **Route C** would be located primarily in public road ROWs and would extend through several communities. This alternative would also cross portions of Toms River along West Veterans Highway (CR 528), which have been designated as a Special Scenic Corridor by the CMP at N.J.A.C. 7:50-6.105. Based on this evaluation, **Route C** was assigned a medium visual concerns value (3), while **Routes A, B, and D** were assigned low visual concern values (1).

4.6.5.2 Community Concerns

Proximity to high-density areas, as well as distances away from residences, was quantitatively considered in the analysis described in **Section 4.6.4**, and as such this consideration was assigned a lower weighting factor (5%) in the qualitative analysis.

This category considers factors which could raise community concerns including the safety perception of a natural gas transmission line in close proximity to sensitive receptors (i.e., residences, schools, and churches), disruption to local traffic, and effects to residential property.

Route C would be located in the longest length of public roadway and in proximity to the most residences and other sensitive receptors. **Route A** and **Route B** would be located within relatively long public roadways but in a more rural setting that consists of considerably less sensitive receptors. **Route D** would be located for a short distance in public roadways and involve the least sensitive receptors. For these reasons, **Route C** was assigned a moderate community value (3), **Route A** and **Route B** were assigned moderately low values (2), and **Route D** was assigned a low value (1).

4.6.5.3 Special Permit Requirements

This category considers the various types of permits that may be required for developing a new underground natural gas pipeline. Specific relevance for this section is the NJ Pinelands, which are managed by the NJ Pinelands Commission. Wetland impacts are authorized through Pinelands approval mechanisms. Therefore, impacts to sensitive natural resources would likely require permits from the NJ Pinelands Commission and NJDEP. Similarly, additional coordination would be required for activities within specified parks and preserved lands that are associated with the Wildlife Management Areas, including the Manchester and Colliers Mills Wildlife Management Areas. Additional coordination may also be required for other forms of environmental impacts (e.g., T&E species habitat) or cultural resource impacts.

Despite the quantitative results for higher potential impacts to some categories within the natural environment, the **Route D** alternative is the only alternative with no length through Pinelands Management areas where such development is excluded as a permissible use, and therefore is the only alternative which is eligible for standard authorization under the NJ Pinelands CMP at N.J.A.C. 7:50. Since the CMP is the overall planning document for the Pinelands Area and is based on protecting ecologically sensitive areas and concentrating development into particular geographic areas of the Pinelands National Reserve, only an alternative which is fully compliant with the CMP may be authorized.

Route D would have no effect on specific Pinelands Management areas, but would require some level of special permit requirements based on its potential impacts to natural features and habitats. As such, this alternative was assigned a moderate permitting value (3). **Route A** and **Route B** were assigned moderately high permitting values (4) due to their alignment though restrictive Pinelands Management areas. **Route C** was assigned the highest permitting value (5) due to being in restrictive Pinelands Management areas and in areas associated with the Colliers Mills Wildlife Management Area.

4.6.5.3.1 Summary of Anticipated Permits

Table 4-2e presents a list of the anticipated permits which would be required in order to authorize proposed activities:

TABLE 4-2e: Anticipated Permits – Section 2

Permit Name	Implementing Regulations	Regulated Area	Issuing Authority
Certificate of Filing	NJ Pinelands Comprehensive Management Plan (N.J.A.C. 7:50)	Development within the jurisdictional NJ Pinelands Area	NJ Pinelands Commission
Freshwater Wetlands General Permit (GP) or Individual Permit (IP)	NJ Pinelands Comprehensive Management Plan (N.J.A.C. 7:50) & NJ Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A)	Wetlands and wetland buffers (transition areas)	NJ Pinelands Commission (GP & IP) & NJDEP, Division of Land Use Regulation (IP)
Flood Hazard Area Control Act Permit	NJ Flood Hazard Area Control Act Rules (N.J.A.C. 7:13)	Flood Hazard Areas and Riparian Zones of Regulated Waters	NJDEP, Division of Land Use Regulation
CAFRA Individual Permit	Coastal Area Facilities Review Act and NJ Coastal Permit Program Rules (N.J.A.C. 7:7) and NJ Coastal Zone Management Rules (N.J.A.C. 7:7E)	Alignment within the CAFRA Zone	NJDEP, Division of Land Use Regulation
Certificate of Appropriateness	NJ Pinelands Comprehensive Management Plan (N.J.A.C. 7:50)	Significant historic/archaeological or cultural resources identified pursuant to the Cultural Resource Management Plan	NJ Pinelands Commission

4.6.5.4 Construction, Maintenance , and Accessibility

Variables involved in constructing gas pipelines, conducting mandatory routine maintenance of the facilities and providing appropriate access to all the required areas were considered. This includes the need to clear vegetation and other obstructions, noise, as well as traffic control requirements.

All alternative routes in Section 2 are co-located along local roads for at least a portion of their alignment, and therefore all four will have some level of construction, maintenance and accessibility constraints. **Route C** would involve the most difficult construction scenario due to the length in public roadway and the density of development along the alignment. These factors may also complicate accessibility and maintenance of the pipeline in the future. For these reasons, **Route C** was assigned a moderate construction value (3). Construction of **Route A** or **Route B** would involve less travelled rural roads and less accessibility and maintenance constrains and were therefore assigned moderately low values (2). **Route D** would involve the least public roads and be predominantly

located within the boundaries of JB MDL, were accessibility and maintenance requirements would not be an issue. **Route D** was assigned a low value (1).

4.6.5.5 Risk of Schedule Delay

Risk of schedule delay is directly related to the other qualitative criteria evaluated. For example, negative community reaction, complicated ROW acquisition, additional field studies for environmental permit clearance and construction complexity can result in delayed schedules. Many of the potential reasons for schedule delays along each of the alternative routes can be identified in advance, but some reasons for delay cannot be known in advance and may not be realized until much later in the process.

The factors presenting the highest risk of schedule delay for all four Section 2 alternative routes are the potentially complex permitting processes. **Route C** would be the most difficult to permit, most difficult to construct, and would incur the most potential negative social reactions, thus this alternative was assigned a high risk value (5). **Route A** and **Route B** would be less difficult to construct and may be less socially contested, but would be very difficult to permit, thus these routes were assigned moderately high values (4). Although it will still require various permits, **Route D** was assigned a medium value (3), because it is potentially compliant with existing Pinelands Area regulations, less difficult to construct, and will have the least opposition.

4.6.6 Conclusion of Section 2 Selected Route

The results of the *quantitative assessment* of the Alternative Routes, discussed in detail in **Section 4.6.4** and illustrated in **Table 4-2b and Table 4-2c,** resulted in **Route D** having the least potential impact relative to the other three alternatives.

The results of the *qualitative assessment* of the Alternative Routes, discussed in detail in **Section 4.6.5** and illustrated in **Table 4-2d** also resulted in **Route D** having relatively limited concerns and permitting requirements compared to the other three alternatives.

Based on this analysis, **Route D** was deemed the Selected Route for Section 2 of the Southern Reliability Link Project.

Route D Summary

In evaluating the alternative routes, **Route D** is the only alternative which is able to fully comply with the Land Use standards of the CMP (since all of the Pinelands Management Areas crossed by this route allow for the development of public service infrastructure); therefore, although potential impacts may be slightly higher in other aspects of the natural environment, the qualitative analysis demonstrates that **Route D** crosses less ecologically sensitive areas as measured by the Pinelands Management Areas. **Route D** also has the least amount of potential impacts to the social environment and the least amount of associated engineering constraints. For these reasons, **Route D** emerges as the selected route for Section 2.

5.0 SUMMARY AND CONCLUSIONS

5.1 Summary and Conclusions

This NJNG siting study was conducted to identify the alignment that would result in the least amount of impact to the built and natural environments, while satisfying the need to construct the new natural gas transmission line. The methodology identified major constraints in the general study area and used a quantitative and qualitative evaluation process to generate and compare alternative routes. The goal of the study was to select a route that avoids or minimizes adverse impacts to the natural, cultural, and social environments to the maximum extent practical, while still maintaining the economic viability and technical feasibility of the project.

The methodology was used to identify Alternative Routes that connect specific supply and connection points in Burlington and Ocean Counties. The routes were generated within a predetermined Project Study Area based on the quantitative evaluation of the spatial data in the area. The evaluation was conducted from three primary perspectives: a) protection of the built environment, b) protection of the natural environment, and c) engineering considerations. The quantitative evaluation was supplemented by qualitative assessments and reviewed by a team of technical experts.

Five alternative routes were identified in Section 1 of the Project, and four alternative routes were identified in Section 2 of the Project. The results of the quantitative and qualitative analyses conducted for this siting study indicate that Alternative Route B of Section 1, combined with Alternative Route D of Section 2 is the Selected Route for the Southern Reliability Link Project (**Figure 4-3**).

6.0 REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deep-water Habitats of the United States. USF&WS. Washington, DC. FWS/OBS-79/31. December. 131p.

National Wilderness Preservation System (NWPS). 2009. *List/Map of Wilderness Areas.* http://www.wilderness.net/index.cfm?fuse=NWPS&sec=static

New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). Land Use/Land Cover dataset Publication Date: 20100712.

New Jersey Department of Environmental Protection (NJDEP) Office of Natural Lands Management (ONLM). 2001. NJDEP Natural Heritage Priority Sites. http://www.state.nj.us/dep/gis/digidownload/zips/statewide/prisites.zip

New Jersey Department of Environmental Protection (NJDEP), Surface Water Quality Standards. N.J.A.C. 7:9B. Last Amended January 4, 2010.

New Jersey Department of Environmental Protection (NJDEP). NJ-GeoWeb. http://www.nj.gov/dep/gis/geowebsplash.htm.

New Jersey Department of Environmental Protection (NJDEP), Division of Fish and Wildlife. New Jersey's Endangered and Threatened Wildlife. http://www.state.nj.us/dep/fgw/tandespp.htm

New Jersey Landscape Project
http://www.state.nj.us/dep/fgw/ensp/landscape/lp_report_3_1.pdf

New Jersey Landscape Project Appendix II Species Area Occurrence Area Justifications: http://www.state.nj.us/dep/fgw/ensp/landscape/appendix_ii.pdf.

NJDEP. May 2013. Protocols for the establishment of exceptional resource value wetlands pursuant to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1) based on documentation of state or federal endangered or threatened species.

NJ Department of Environmental Protection (NJDEP), Office of Natural Lands Management (ONLM). 2009. *Natural Heritage Program Grid Maps: General Locations of Rare Plant Species and Ecological Communities.* http://www.state.nj.us/dep/gis/digidownload/zips/statewide/quadtemp.zip

New Jersey Department of Environmental Protection (NJDEP) Historic Preservation Office. New Jersey and National Registers of Historic Places. http://www.state.nj.us/dep/hpo/1identify/nrsr_lists.htm

New Jersey Geological Survey, 2006, Bedrock Geology of New Jersey (Scale 1:100,000), http://www.state.nj.us/dep/njgs/pricelst/njgsmaps.htm#gms

New Jersey Geological Survey, 2003, Physiographic Provinces of New Jersey, http://www.state.nj.us/dep/njgs/enviroed/infocirc/provinces.pdf, Accessed April 2011.

New Jersey Pinelands Commission, 1980, NJ Pinelands Comprehensive Management Plan. N.J.A.C. 7:50.

US Census Bureau, http://www.census.gov/.

US Department of Agriculture, Natural Resources Conservation Service. 2008. Soil Survey Geographic (SSURGO) database for Ocean County, NJ.

United States Environmental Protection Agency (USEPA) Superfund Sites. http://www.epa.gov/region2/cleanup/sites/njtoc_name.htm.

United States Environmental Protection Agency (USEPA) Region 2. 1994. Priority Wetlands for the State of New Jersey. United States Environmental Protection Agency, Region 2. March 1994.

United States Fish and Wildlife Service (USFWS). 2011. *National Wetland Inventory.* http://www.fws.gov/wetlands/.

United States Fish and Wildlife Service (USFWS). 2011. National Wild & Scenic Rivers System. http://www.rivers.gov/wildriverslist.html

United States Fish and Wildlife Service (USFWS). 2011. New Jersey's Endangered and Threatened Wildlife.
http://www.fws.gov/northeast/njfieldoffice/endangered/esfaq.html