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November 20, 2013

Via Hand Delivery

Ms. Betty McCauley
Administration/Docketing
Ohio Power Siting Board
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3793

Re: Vectren Energy Delivery of Ohio, Inc.
Case No. 13-1651-GA-BTX

Dear Ms. McCauley:

On November 15, 2013, Vectren Energy Delivery of Ohio, Inc. ("Vectren") filed an Amended Application in the above referenced docket. Unfortunately, the Amended Application Appendix 3-1, a Route Selection Study which was part of the filing was not the most up-to-date version.

Attached is the up-to-date version. The maps attached to Appendix 3-1 were correct, however, so only the narrative changed and it is the narrative part of the study that is being filed today.

I apologize for any inconvenience this may have caused. Please do not hesitate to contact me if you have any questions.

Sincerely,

Sally W. Bloomfield

Sally W. Bloomfield

Attachment

Cc: Ed Steele (w/Attachment)
Parties of Record (w/Attachment)

6861831v1

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Route Selection Study

Vectren Z-167 12" Natural Gas Pipeline Relocation Project around the Dayton International Airport

Project No. 13135

11/14/2013

This study has been prepared for Vectren Energy Delivery of Ohio, Inc. for inclusion with their application to the Ohio Power Siting Board for a Certificate of Environmental Compatibility and Public Need

Table of Contents

Acronyms

ESRI	Esri Inc., Redlands, CA
GIS	Geographic Information System
HCA	High Consequence Area
HDD	Horizontal Directional Drill
NRHP	National Register of Historic Places
ODNR	Ohio Department of Natural Resources
OGRIP	Ohio Geographically Referenced Information Program
OHI	Ohio Historic Inventory
OHPO	Ohio Historic Preservation Office
OPSB	Ohio Power Siting Board
OWI	Ohio Wetland Inventory
ROW	Right-of-Way
USDA/NRCS	United States Department of Agriculture, Natural Resources Conservation Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTI	Utility Technologies International Corporation

I. INTRODUCTION

This document presents the Route Selection Study conducted by Utility Technologies International Corporation (UTI) for Vectren on the proposed relocation of a 12" natural gas transmission pipeline around the Dayton International Airport located in Montgomery County, Ohio. It replaces the original study conducted in July 2013 with some minor revisions in the routes as recommended by the City of Union, the City of Dayton and the Dayton International Airport, to accommodate future planned growth around the airport.

The proposed project will replace the existing transmission supply line that currently goes through the center of the airport and is not readily accessible to conduct the required integrity management assessments on the pipeline. The proposed project will connect into the existing pipeline at Corporate Center Drive south of the airport, route around the airport to the west, avoiding the city of Vandalia, and reconnect to the pipeline at the northwestern corner of the airport. Due to the physical constraints of the Dayton International Airport, the city of Vandalia, Interstates 70 and 75, and existing nature preserves, the proposed routes overlap along the southern and western sections of the project, sharing more than twenty percent in common of the proposed right-of-way. The proposed pipeline routes range from 4.5 to 8.5 miles in length and are between 23 and 77 percent in common with the Preferred Route. A waiver from the provision for alternate routes not to exceed more than twenty-percent in common right-of-way (4906-05-04(A)) was requested and approved by the Ohio Power Siting Board on August 9, 2013.

The Route Selection Study identifies major constraints and uses an evaluation process to compare alternatives that avoid or minimize adverse effects to the environment and community. Evaluations and scoring include environmental, cultural, socioeconomic/land-use, and engineering/construction issues for the study.

II. PURPOSE AND OBJECTIVES

The purpose of this Route Selection Study is to assist in identifying routes that are best suited for the project and to comply with the regulatory filing requirements. The Route Selection Study serves as part of the application for a Certificate of Environmental Compatibility and Public Need to the Ohio Power Siting Board (OPSB) for the project and has been developed in accordance with the provisions of Ohio Administrative Code 4906-15-03 for natural gas transmission facilities.

The objective of the Route Selection Study is to identify suitable routes that minimize impacts on the ecology, sensitive land-uses, and cultural features to the greatest extent practical and increase public safety while maintaining economic and technical feasibility. The final result of this process is the identification of the Preferred and Alternate Routes for the OPSB application for a Certificate of Environmental Compatibility and Public Need.

III. ROUTE SELECTION

This Study involved the collection and evaluation of environmental, cultural, land-use, and engineering data in order to evaluate potential routes for the proposed relocation of the pipeline. The study area and potential pipeline routes were identified and subsequently scored and ranked to facilitate the selection of the Preferred and Alternate routes.

A. Route Selection Study Area Delineation

The study area for the route selection process is located in Montgomery County, Ohio. Delineation of the study area was based on a review of the United States Geologic Survey (USGS) maps, state and county road maps, aerial photographs, and visual observations of the area. Constraints such as the city of Vandalia, Dayton International Airport, transportation routes, major water bodies, nature preserves, and the location of the relatively fixed end points for tying into the natural gas pipeline played key roles in determining the study area dimensions and routing selections. The study area, shown in Figure 1, is limited geographically to the northeast corner of Montgomery County.

Residential areas to the southeast of the Dayton Airport were a major deciding factor with respect to the pipeline routing. Residences are concentrated along the eastern route beside the airport and were avoided, when possible, with the other viable candidate route segments. UTI investigated one route to the east of the airport to attempt to comply with the no more than twenty-percent in common provision. However, as the data shows it is not a top candidate for consideration.

B. Screening Attributes

The screening attributes, or features of the study area, were identified after the study area was delineated. Screening attributes represent possible constraints on the development of the natural gas pipeline. The attributes were classified as environmental, cultural, land-use, and engineering characteristics, all of which are part of the OPSB certification application requirements as well as other regulatory requirements.

UTI utilized ArcGIS (ESRI) software to evaluate the attributes identified within the relocation project area. Datasets, shapefiles, and imagery were obtained from multiple sources and included USGS 7.5-minute topographic maps (Tipp City and West Milton), aerial imagery (obtained from OGRIP), and GIS data resources available from the Ohio Department of Natural Resources (ODNR), the Ohio Historic Preservation Office (OHPO), United States Department of Agriculture Natural Resources Conservation Service (USDA/NRCS), the Montgomery County Auditor, and ESRI, Inc. Data sources were verified and updated based on a field reconnaissance conducted in June and July 2013.

A constraint map was prepared by acquiring ecological, cultural, land-use, and engineering data obtained from various sources. The constraint map was created using 2011 aerial imagery of the study area and is provided in Figure 2 at a scale of 1:36,000. Constraint maps at a larger scale (1:12,000) have also been provided as Figures 2a through 2g. Figure 2 depicts the individual route segments that were analyzed. A list of the candidate routes (comprised with their segments) is presented in Table 1. Raw constraint data for the ecological and cultural attributes is presented in Table 2 and Table 3 contains the raw constraint data for the land use and engineering attributes.

Table 1 - Candidate Routes

Route	Segments												Length (ft)	Length (miles)
A	E-1												23636	4.48
B		S-1		S-3	S-4	S-5				W-4			36965	7.00
C			S-2	S-3	S-4	S-5				W-4			39950	7.57
D		S-1		S-3	S-4	S-5			W-3			N-2	40902	7.75
E			S-2	S-3	S-4	S-5			W-3			N-2	43887	8.31
F		S-1		S-3	S-4			W-2			N-1	N-2	42246	8.00
G			S-2	S-3	S-4			W-2			N-1	N-2	45231	8.57
H		S-1		S-3			W-1				N-1	N-2	44192	8.37
I			S-2	S-3			W-1				N-1	N-2	47177	8.94

Table 2 - Raw data for Ecological and Cultural Attributes

Raw Data	Ecological					Cultural			
Route #	Length of route crossing wooded lots	# of wetlands within 1,000-ft	Percent hydric/partially hydric soils within 1000-ft	# of stream crossings	Recorded endangered or threatened species areas crossed by center line	NRHP sites within 1,000-ft	Known archaeological sites within 1,000-ft	Ohio Historical Inventory sites within 1,000-ft	Cemeteries within 1,000-ft
A	750	4	93	3	0	0	0	17	1
B	3445	8	81	4	0	0	1	4	0
C	2751	7	78	3	0	0	4	4	0
D	4036	8	81	5	0	0	1	2	0
E	3342	7	79	4	0	0	4	2	0
F	3854	14	77	5	0	0	1	2	1
G	3160	13	75	4	0	0	4	2	1
H	3734	13	69	5	0	0	1	2	2
I	3040	12	68	4	0	0	4	2	2

Table 3 - Raw Data for Land-Use and Engineering Attributes

Raw Data	Land-Use					Engineering					
Route #	# of buildings within 1,000-ft	# of properties crossed	Percent of Prime Farm Land with 1,000-ft	Sensitive land-uses within 1,000-ft	Institutional land-uses within 1,000-ft	# of road crossings	% of route not on City of Dayton property	% of route not adjacent to existing road ROW	Length of route	Percent High Consequence Area	# of HDD Crossings
A	586	0	14	4	4	21	79	0	23636	39	24
B	88	3	36	3	1	9	33	51	34881	21	12
C	202	3	40	4	1	9	51	36	37866	25	12
D	118	3	35	3	1	9	63	58	37886	3	12
E	232	3	39	4	1	9	78	43	40871	8	12
F	139	5	41	3	1	9	64	60	40214	3	12
G	253	5	45	4	1	9	78	43	43199	8	12
H	160	2	51	3	1	10	68	57	42160	2	13
I	274	2	54	4	1	10	81	44	45145	8	13

1. Ecological Attributes

A list of ecological attributes was developed with the intent that potential routes would avoid these areas to the greatest extent practical, and minimize impacts where avoidance was impractical. The following attributes were considered as environmental constraints in the siting process:

- Woodlots and areas requiring clearing within the right-of-way for the pipeline
- Ohio Wetland Inventory (OWI) Map – wetlands within 1,000-ft buffer around the center line of the proposed route were included in the data for the route. OWI maps are useful in providing a suggestion of where a wetland may be located based on the presence of hydrology. However, they are not definitive indicators of the presence of a wetland, and must be field checked to validate the mapped information.
- Hydric & Partially Hydric Soils – Hydric soils are formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part and are commonly associated with wetland areas and are strongly influenced by the presence of water. Hydric soils and wetlands are not the same thing, but hydric soils, along with wetland-adapted plants and the presence of water for some time during the year, is to be considered a wetland. Soils were evaluated within the 1,000-ft buffer around the proposed route.
- Perennial, intermittent, and ephemeral surface drainage crossings
- Recorded endangered, threatened, and protected species locations

Woodlots and surface drainages were identified based on available aerial photography, USGS topographic maps, and field surveys. OWI digital GIS coverage of the project area was superimposed on the project maps to determine potential wetland areas. Soils were evaluated using data from the USDA/NRCS web soil survey, Soil Survey of Montgomery County, Ohio (2004), and GIS data obtained from the USDA/NRCS. Endangered and threatened species communities were all equally weighted based on information obtained from the United States Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System as well as information received from the Ohio Department of Natural Resource's (ODNR) Natural Heritage Database.

2. Cultural Attributes

A list of cultural features was developed with the intent that potential routes would avoid these areas to the extent possible. Cultural features typically include documented historically and architecturally significant buildings, sites that have been excavated or are believed to contain artifacts, and tracts of land used for burial and private or public memorial. The significance of these attributes as a constraint is a result of the predominating institutions, beliefs, and customs that characterize a set of people. The following attributes were considered as cultural constraints in the siting process:

- Sites listed on the National Register of Historic Places (NRHP) – Sites that are listed on the NRHP include districts, buildings, structures and objects that are significant in American culture, engineering, architecture, and archeology. Information was obtained from a records search with the Ohio Historic Preservation Office (OHPO) in June 2013.

- Ohio Historic Inventory (OHI) buildings – the OHI is used to record basic information on architectural and historic properties in Ohio. Data was obtained from a records search through the OPHO in June 2013.
- Known archaeological sites – Documented archaeological data were obtained from a records search through the OHPO conducted in June 2013.
- Known cemeteries – Cemeteries were mapped with the aid of USGS topographic maps, road maps, ESRI GIS maps, and land-use field surveys.

Recorded NRHP, OHI, and known archaeological listings are maintained by the OHPO in electronic GIS databases via the OHPO web site. Information provided by OHPO was imported into ArcGIS and used for this study. Cemeteries were identified through a review of topographic and road maps, supplemented with land-use field surveys. No NRHP sites were identified within 1,000-ft of any of the routes.

3. Land-Use Attributes

A list of land-use features was developed with the intent that potential routes would avoid sensitive areas, while utilizing existing or planned facilities, to the greatest extent possible. The following land-use attributes were considered in the siting process:

- Building structures (e.g., single homes and residential subdivisions, trailer parks, apartments, businesses, industrial buildings, and hotels) within the 1,000-ft buffer around the pipeline route.
- Properties that were crossed or bisected by the pipeline route.
- Prime farm land within the 1,000-ft buffer around the pipeline route.
- Sensitive land-uses (e.g., parks, wildlife refuges, conservations areas, and golf courses) within the 1,000-ft buffer.
- Institutional land-uses (e.g., churches, schools, and hospitals) within the 1,000-ft buffer.

Building structures, sensitive land-uses and institutional land-uses within 1,000-ft of the routes were obtained via USGS topographic maps, aerial photography, property survey data, ESRI GIS data, and land-use field surveys. Parcel maps and aerial imagery were used to determine the number of properties crossed by the pipeline route. Prime farm land within 1,000-ft of the pipeline route was determined off soil survey data obtained through the USDA/NRCS.

4. Engineering Attributes

The list of engineering attributes was developed with the intention to avoid disruption to permanent transportation routes and right-of-way. Furthermore, it was sought to increase public safety to the pipeline, decrease engineering and right-of-way acquisition challenges and subsequent increases in construction costs. The following attributes were engineering considerations in the siting process:

- Road crossings – Data for road crossings were obtained from street maps and USGS topographic maps. The cost of construction for a pipeline increases significantly in relation to the amount of transportation routes that must be bored or crossed and mitigated.
- Percentage of the route that is not on the City of Dayton's property – utilizing property owned by the City of Dayton for the installation of the pipeline has multiple benefits:

- The relocation of the pipeline on the City of Dayton's property is mutually beneficial to both Vectren and the City due to the current location of the pipeline through the airport.
- The number of contacts that need to be made for the acquisition of the right-of-way is reduced.
- Impacts to private land owners are reduced.

- Percentage of the route that is not adjacent to road rights-of-way (ROW) – Generally, following existing ROW decreases construction costs and minimizes impacts to land owners.
- Total route length – The length of the route was scored with direct proportional significance as a constraint. As pipeline route length increased, the score increased as well.
- Percent of the route that falls within a probable High Consequence Area (HCA) per 49 CFR 192.903, method 2. Consequences of inadvertent releases from pipelines can vary greatly, depending on where the release occurs, and the commodity involved in the release. Releases from pipelines can adversely affect human health and safety, cause environmental degradation, and damage personal or commercial property. HCAs require additional focus, efforts, and analysis to ensure the integrity of the pipeline. Typically a pipeline corridor that contains fewer HCAs generally increases public safety.
- Number of Horizontal Directional Drills (HDD) – HDD methods are employed to reduce any environmental impacts associated with crossing streams and wetland areas. Additionally, HDD methods are used to reduce road restrictions when it is necessary for the pipeline to cross public roadways. HDD increases the construction costs significantly versus open trenching methods.

The number of road crossings, percentage of the route adjacent to existing ROW and the number of HDDs per route was determined based on available USGS topographic maps, aerial imagery, and the project area investigations. Route lengths were calculated using ArcGIS. The percentage of HCAs was determined using aerial imagery, land-use field surveys and potential impact circles using Equation 1.

Equation 1 – Potential Impact Radius

$$\textbf{Potential Impact Radius} = 0.69 * \sqrt{(p*d^2)}$$

Where:
p = maximum allowable operating pressure
d = diameter of the pipeline in inches

IV. IDENTIFICATION OF POTENTIAL CORRIDORS

After the constraint data were collected and plotted on the base map, the base map was reviewed to identify potential corridors for the project. The primary focus was to identify potential corridors that avoided, where practical, the identified constraints or to minimize potential impact where constraints could not be avoided.

Preferred routing options for the pipeline included a balance of the following:

- Routes within or adjacent to existing utility and/or transportation easements
- Routes that avoid residences, HCAs and potential disruption to the greatest extent possible
- Routes that avoid woodland, wetlands, and stream crossings

Using the constraint map, routes were selected that generally avoided sensitive areas. Where complete avoidance was not practical, the next best options were those where impacts could be minimized. The application of this methodology generally resulted in corridors that ran adjacent to or within existing road rights-of-way and along the boundary of agricultural fields for much of their lengths. Additionally, route placement was selected through the collaborative of effort between Vectren, the City of Union, the City of Dayton and the Dayton International Airport to avoid potential impacts with planned future development around the airport. Furthermore, the constraints associated with the airport and residential neighborhoods (in particular those to the south and east of the airport) limited the number of possible routes available. As such, many of the routes have multiple segments in common.

A. Route Segment Descriptions

Routes segments that were selected for comparison are shown in Figure 2. Detailed aerial imagery maps are provided in Appendix A. A discussion of each evaluated candidate route segment is provided in Table 4:

Table 4 - Route Descriptions

Route	Description
A Segment: E-1	**Route A** is approximately 4.48 miles long. The route starts at the south end of the Dayton International Airport near the intersection of Corporate Center Drive and West National Road. The pipeline heads east along W National Rd and turns north on North Dixie Drive, along the east edge of airport. The route turns west at Lightner Road and continues following the road until it ties back into the existing pipeline at the northwest corner of the airport. This route bisects through the highly populated area of Vandalia, Ohio and will impact several mature trees growing along the route. This route was included as an option to achieve the no more than twenty-percent in common provision and ranked 8^{th} out of the nine routes evaluated.

B Segments: S-1, S-3, S-4, S-5, and W-4	**Route B** is approximately 7 miles long. The route starts south of the airport on the south side Corporate Center Drive, turns and crosses the road heading northwest alongside a woodlot, then turns west, utilizing properties owned by the City of Dayton. The route parallels property lines and follows alongside woodlots and turns north after crossing an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and then northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road and parallels the north side of Dog Leg Road. The route crosses Dog leg Road continuing northeast until it comes close to the airport's security fence, where it is directed north toward Old Springfield Rd. The route then turns east, paralleling the south side of Old Springfield where it crosses Mill Creek and a large parking area. It then crosses to the north side of Old Springfield Road before the intersection with Peters Pike and is then directed east to cross Peters Pike. After the crossing the route is redirected north and then to the east, to follow on the south side of Macy Lane, where it ties back into the existing pipeline at the airport boundary. The route ranked the best out of the nine evaluated and is Preferred Route.
C Segments: S-2, S-3, S-4, S-5, and W-4	**Route C** is approximately 7.57 miles long. Route C differs from Route B with the first segment, S-2. The route starts south of the airport on Stonequarry Road where it will tie into the existing line that lies just east of the Vandalia Sports Complex. The route heads west past Morton Middle School and north along Peters Pike where it turns west and crosses the Dayton International Airport Access Road. The route continues heading west until it crosses the unnamed tributary to Stillwater River where it turns north, crossing West National Road. The route turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road and parallels the north side of Dog Leg Road. The route crosses Dog leg Road continuing northeast until it comes close to the airport's security fence, where it is directed north toward Old Springfield Rd. The route then turns east, paralleling the south side of Old Springfield where it crosses Mill Creek and a large parking area. It then crosses to the north side of Old Springfield Road before the intersection with Peters Pike and is then directed east to cross Peters Pike. After the crossing the route is redirected north and then to the east, to follow on the south side of Macy Lane, where it ties back into the existing pipeline at the airport boundary. The route ranked 4th out of the nine evaluated and is 78% in common with the Preferred Route, Route B.

D Segments: S-1, S-3, S-4, S-5, W-3, and N-2	**Route D** is approximately 7.75 miles long. The route starts south of the airport on the south side Corporate Center Drive, turns and crosses the road heading northwest alongside a woodlot, then turns west, utilizing properties owned by the City of Dayton. The route parallels property lines and follows alongside woodlots and turns north after crossing an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and then northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road and then jogs slightly to align with west side of Dog Leg Road, continues to follow Dog Leg Road north, crosses the road to the east side, then veers slightly more eastward into an agricultural field approximately one quarter mile before Old Springfield Rd to avoid a residential area. It crosses north of Old Springfield Rd and follows along the east side of a woodlot, turns east following parcel lines, crosses Mill Creek, follows along the south side of two woodlots and then turns north. The route crosses Brush Creek as it turns back toward the east along North Montgomery County Line Road and ties back into the existing pipeline at the northwest corner of the airport. The route ranked 2nd out of the nine evaluated and is the Alternate Route for the relocation of the pipeline. It is 71% in common with the Preferred Route, Route B.
E Segments: S-2, S-3, S-4, S-5, W-3, and N-2	**Route E** is approximately 8.31 miles long. Route E differs slightly from Route D with the first segment, S-2. The route starts south of the airport on Stonequarry Road where it will tie into the existing line that lies just east of the Vandalia Sports Complex. The route heads west past Morton Middle School and north along Peters Pike where it turns west and crosses the Dayton International Airport Access Road. The route continues heading west until it crosses the unnamed tributary to Stillwater River, where it turns north. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and then northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road and then jogs slightly to align with west side of Dog Leg Road, continues to follow Dog Leg Road north, crosses the road to the east side, then veers slightly more eastward into an agricultural field approximately one quarter mile before Old Springfield Rd to avoid a residential area. It crosses north of Old Springfield Rd and follows along the east side of a woodlot, turns east following parcel lines, crosses Mill Creek, follows along the south side of two woodlots and then turns north. The route crosses Brush Creek as it turns back toward the east along North Montgomery County Line Road and ties back into the existing pipeline at the northwest corner of the airport. The route ranked 6th out of the nine evaluated and is 53% in common with the Preferred Route, Route B.

F Segments: S-1, S-3, S-4, W-2, N-1, and N-2	**Route F** is approximately 8 miles long. The route begins at the south side of the airport on Corporate Center Drive, crosses north of the road, and heads westward utilizing properties owned by the City of Dayton. The route parallels property lines and follows alongside woodlots and turns north after crossing an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and then northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road. The route turns north, paralleling the east side of Jackson Road and a new section of road that is in the early stages of construction by the county. The route veers slightly to the east to avoid residential areas and concrete lined drainage channels and then turns east and north around a woodlot until it intersects with North Montgomery County Line Road. The route continues east along Montgomery County Line Road, crossing Mill Creek and Brush Creek, and ends where it ties back into the existing pipeline at the northwest corner of the airport. The route ranked 3rd out of the nine evaluated and is 50% in common with the Preferred Route, Route B.
G Segments: S-2, S-3, S-4, W-2, N-1, and N-2	**Route G** is approximately 8.57 miles long. Route G differs slightly from Route F with the first segment, S-2. The route starts south of the airport on Stonequarry Road where it will tie into the existing line that lies just east of the Vandalia Sports Complex. The route heads west past Morton Middle School and north along Peters Pike where it turns west and crosses the Dayton International Airport Access Road and continues heading west. The route turns north after crossing an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary and then northeast after emerging from the woodlot. The route crosses through two agricultural fields, crosses Jackson Road. The route turns north, paralleling the east side of Jackson Road and a new section of road that is in the early stages of construction by the county. The route veers slightly to the east to avoid residential areas and concrete lined drainage channels and then turns east and north around a woodlot until it intersects with North Montgomery County Line Road. The route continues east along Montgomery County Line Road, crossing Mill Creek and Brush Creek, and ends where it ties back into the existing pipeline at the northwest corner of the airport. The route ranked 7th out of the nine evaluated and is 34% in common with the Preferred Route, Route B.

H Segments: S-1, S-3, W-1, N-1, and N-2	**Route H** is approximately 8.37 miles long. The route begins at the south side of the airport on Corporate Center Drive, crosses north of the road, and heads westward utilizing properties owned by the City of Dayton. The route parallels property lines and follows alongside woodlots. It crosses an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary. Continuing north, paralleling property lines, the route diverts slightly to avoid a few residential houses. The route turns east when it intersects with North Montgomery County Line Road. After approximately a quarter mile the route diverts around a residential area and back on Montgomery County Line Road. The route continues east along Montgomery County Line Road, crossing Mill Creek and Brush Creek, and ends where it ties back into the existing pipeline at the northwest corner of the airport. The route ranked 5th out of the nine evaluated and is 41% in common with the Preferred Route, Route B.
I Segments: S-2, S-3, W-1, N-1, and N-2	**Route I** is approximately 8.94 miles long. Route I differs slightly from Route H with the first segment, S-2. The route starts south of the airport on Stonequarry Road, where it ties into the existing line that lies just east of the Vandalia Sports Complex. The route heads west past Morton Middle School and turns north along Peters Pike for approximately one and a half miles, where it turns west and crosses the Dayton International Airport Access Road. The route parallels property lines and follows alongside woodlots. It crosses an unnamed tributary to Stillwater River. The route crosses National Road and turns west after crossing the road and follows along the north side of road through a woodlot. It turns north at the parcel boundary. Continuing north, paralleling property lines, the route diverts slightly to avoid a few residential houses. The route turns east when it intersects with North Montgomery County Line Road. After approximately a quarter mile the route diverts around a residential area and back on Montgomery County Line Road. The route continues east along Montgomery County Line Road, crossing Mill Creek and Brush Creek, and ends where it ties back into the existing pipeline at the northwest corner of the airport. The route ranked last out of the nine evaluated and is 26% in common with the Preferred Route, Route B.

V. ROUTE SCORING

A. Route Scoring Rationale

The natural gas pipeline route selection process involves balancing the varying constraints identified in the study area. One way to compare the alternatives is to develop a ranking system based on attributes that are linked to the objectives of the route selection. This approach is a multi-objective decision analysis and has been used to assist in decisions routing other natural gas pipelines.

Based on a review of regulatory and other documents, UTI identified objectives of the route selection as involving the minimization of environmental, cultural, land-use, and engineering/construction impacts. Nineteen quantifiable attributes relating to these objectives were developed. Each attribute for every route was scored as described in the following sections. After the attribute table was completed, the objectives of the Route Selection Study were revisited and the route that most closely matched the objectives was selected as the best candidate.

Some studies have determined that it was necessary to apply weights to data associated with the constraints or categories as they relate to the project study area and the different aspects identified. In regards to the relocation of the transmission pipeline around the Dayton International Airport it was determined that all constraints and categories are equal and no weighting was applied. This was determined after careful consideration by subject matter experts within both Vectren and UTI of the nature of the project, sensitivity of the area to disruption by the scope of the project, and the characteristics of the study area.

Numerical scoring of the routes was conducted according to the following steps:

- *Step 1 Assembly of the "Raw" Route Data*: Nine (9) potential routes were identified. Scoring was completed for each of these potential routes. Where appropriate, attributes crossed by the proposed project centerline were measured. Wetlands, soil types, residences, cultural, archaeological, as well as institutional and other sensitive land-uses were considered within the 1,000-ft buffered corridor to reflect the potential impacts associated with the constraint. The other various constraints were calculated when the centerline of route intersected the constraint (e.g., streams, properties and road crossings).

- *Step 2: Data Normalization*: In order to assign scores to the data, the data was normalized so that each constraint could be directly compared according to the same, non-dimensional scale. The formula used to normalize each constraint in the Study was:

Equation 2 - Data Normalization

$$X_{i,\,0\ to\ 1} = \frac{X_i - X_{Min}}{X_{Max} - X_{Min}} * 100$$

Where:
X_i = Each data point i
X_{Min} = the minima among all the data points
X_{Max} = the maxima among all the data points
$X_{i,\,0\ to\ 1}$ = the data point i normalized between 0 and 1

Using the data range for each attribute to normalize the score has several advantages. One of these advantages is that all of the constraints were scored out of 100 possible points, and were therefore directly comparable and equally weighted. Another is that the relative distribution of the data within each constraint was maintained, eliminating the unnecessary grouping of the data as used in other methods of ranking.

- *Step 3: Scoring Constraints*: After the data was normalized, the scores for each of the constraints within each attribute (ecological, cultural, land-use, and engineering) were divided by the number of constraints within the attribute so that the total score from each attribute was out of 100 possible points. This method provides the ability to apply weights to constraints within an attribute if it is determined to be more significant than others without impacting the scores within the other categories. Based on the nature of the study area, weights were not applied to any of the constraints in this study. The lower the score for the attribute the better the overall route score.

- *Step 4: Totaling Attributes to Find Route Score*: The attribute groups for each route were totaled to provide a final score. The result is a scale with a best possible score of 0 and a worst possible score of 400.

B. Data Sources and Scoring

1. Ecological

Ecological data is provided in Table 5. The length of the route crossing wooded lots was calculated using ArcGIS, USGS topographic maps and aerial imagery and was visually verified during the field reconnaissance. Wetland data was collected from OWI and national hydrography datasets. The percentage of hydric and partially hydric soils was calculated using soil survey datasets obtained from the USDA/NRCS. Other environmental data was collected from publicly available sources including, ODNR and the US Fish and Wildlife Service (USFWS). All of the candidate routes (east and west) cross three streams which, after normalizing the data, changed their value to zero. Recorded endangered or threatened species were all treated equally between the routes.

Table 5 - Ecological data, score and rank

Ecological Normalized Data Totals								
Route #	Length (miles)	Length of route Crossing Wooded Lots	# of Wetlands within 1,000-ft	Percent Hydric/Partially Hydric Soils within 1000-ft	# of Stream Crossings	Recorded endangered or threatened species areas crossed by center line	**Total Ecological Score**	**Ecological Rank**
A	4.48	0	0	20	0	0	**20**	**1**
B	7.00	16	8	10	0	0	**34**	**5**
C	7.57	12	6	8	0	0	**26**	**2**
D	7.75	20	8	10	0	0	**38**	**8**
E	8.31	16	6	9	0	0	**31**	**4**
F	8.00	19	20	7	0	0	**46**	**9**
G	8.57	15	18	6	0	0	**38**	**7**
H	8.37	18	18	1	0	0	**37**	**6**
I	8.94	14	16	0	0	0	**30**	**3**

2. Cultural

Cultural data is provided in Table 6. Recorded NRHP, known archaeological sites, and OHI sites were obtained from OHPO. Cemeteries were identified through a review of topographic and road maps, supplemented by field land-use surveys. This information was imported into ArcGIS and analyzed. There were no NRHP sites within 1,000-feet of any of the candidate routes.

Table 6 - Cultural route data, score and rank

Cultural Normalized Data Totals							
Route #	Length (miles)	NRHP sites within 1,000-ft	Known Archaeological sites within 1,000-ft	OHI sites within 1,000-ft	Cemeteries within 1,000-ft	**Total Cultural Score**	**Cultural Rank**
A	4.48	0	0	25	13	**38**	**7**
B	7.00	0	6	3	0	**10**	**2**
C	7.57	0	25	3	0	**28**	**5**
D	7.75	0	6	0	0	**6**	**1**
E	8.31	0	25	0	0	**25**	**4**
F	8.00	0	6	0	13	**19**	**3**
G	8.57	0	25	0	13	**38**	**7**
H	8.37	0	6	0	25	**31**	**6**
I	8.94	0	25	0	25	**50**	**9**

3. Land-Use

The number of buildings, sensitive land-uses, and institutional land-uses were analyzed utilizing USGS topographic maps, aerial imagery, Ohio point of interest datasets, and field reconnaissance. Parcel data and aerial imagery were used to obtain the information for the properties crossed by the pipeline and USDA/NRCS soil survey data was used to obtain the data for the percentage of prime farm land within 1,000-feet of the pipeline. Information used to score and rank each candidate route based on the land-use attributes is provided in Table 7.

Table 7 - Land-Use route data, score and rank

Land-Use Normalized Data Totals								
Route #	Length (miles)	# of buildings within 1,000-ft	# of properties crossed	Percent of Prime Farm Land with 1,000-ft	Sensitive land-uses within 1,000-ft	Institutional land-uses within 1,000-ft	**Total Land-Use Score**	**Land-Use Rank**
A	4.48	20	0	0	20	20	**60**	**8**
B	7.00	0	12	11	0	0	**23**	**1**
C	7.57	5	12	13	20	0	**50**	**5**
D	7.75	1	12	11	0	0	**24**	**2**
E	8.31	6	12	13	20	0	**50**	**6**
F	8.00	2	20	14	0	0	**36**	**4**
G	8.57	7	20	16	20	0	**62**	**9**
H	8.37	3	8	19	0	0	**29**	**3**
I	8.94	7	8	20	20	0	**55**	**7**

4. Engineering

Road crossing data was collected from USGS topographic maps, aerial imagery, transportation datasets, county engineering maps, and field reconnaissance. Parcel maps and datasets were used to analyze the percent of the route that was not within the City of Dayton's property. Route lengths and percentages of the routes adjacent to existing road ROW were calculated using ArcGIS. Aerial imagery and potential impact circles were used to analyze the percent probable HCAs on the routes. Information obtained that was used to score and rank each candidate route based on the engineering attributes is provided in Table 8.

Table 8 - Engineering route data, score and rank

Engineering Normalized Data Totals									
Route #	Length (miles)	# of road crossings	% of route not on City of Dayton Property	% of route not adjacent to existing road ROW	Length of route	Percent Probable High Consequence Area	# of HDD Crossings	Total Engineering Score	Engineering Rank
A	4.48	17	16	0	0	17	17	**66**	**9**
B	7.00	0	0	14	9	8	0	**31**	**1**
C	7.57	0	6	10	12	10	0	**38**	**2**
D	7.75	0	10	16	12	0	0	**39**	**3**
E	8.31	0	16	12	14	2	0	**44**	**5**
F	8.00	0	11	17	13	0	0	**41**	**4**
G	8.57	0	16	12	15	2	0	**45**	**6**
H	8.37	1	12	16	15	0	1	**45**	**7**
I	8.94	1	17	12	17	2	1	**51**	**8**

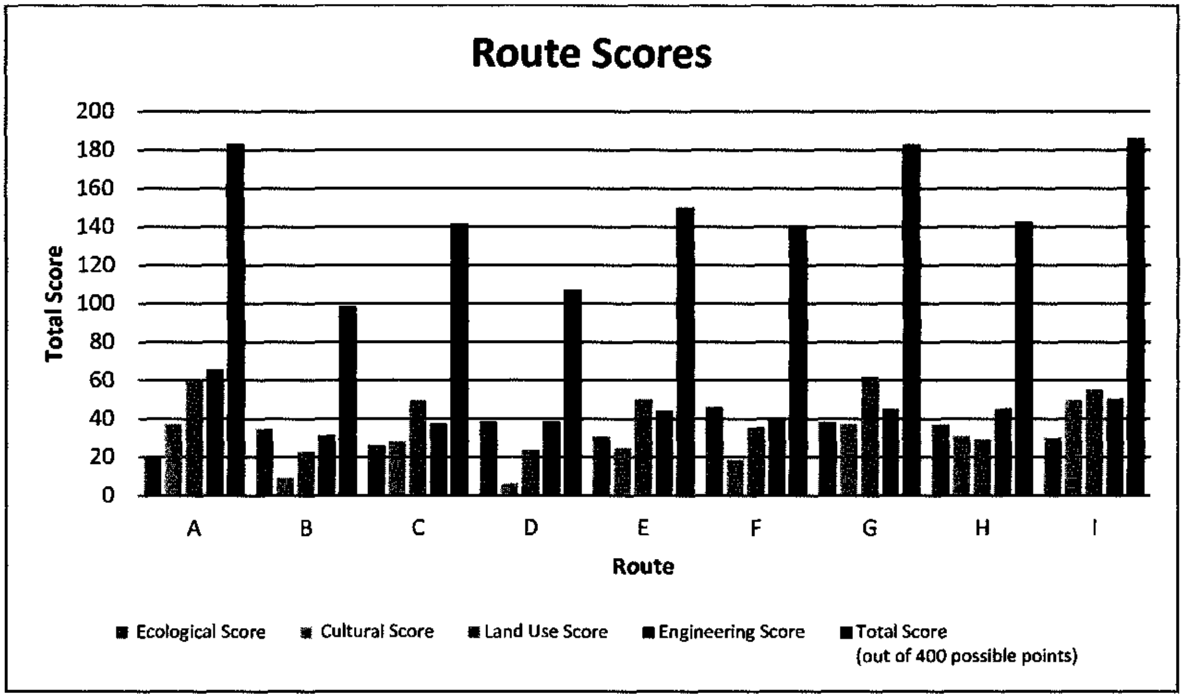
VI. DISCUSSION OF ROUTE SELECTION

The results of the Route Selection Study are provided in Table 9 and depicted as a bar chart on Figure 3. The Preferred route (Route B) had the lowest score at 99. The Alternate route (Route D) had the second lowest at 107. Both the Preferred and Alternate Routes scored more than thirty percent better than the next ranking routes (Routes F, C, and H).

Table 9 - Route selection study results

Route Totals			**Ecological**		**Cultural**		**Land-Use**		**Engineering**			
Route #	Segments	Length (miles)	Total Ecological Score	Ecological Rank	Total Cultural Score	Cultural Rank	Total Land-Use Score	Land-Use Rank	Total Engineering Score	Engineering Rank	**Total Score** (out of 400 possible points)	**Overall Rank**
A	E-1	4.48	20	1	38	7	60	8	66	9	**183**	**8**
B	S-1 S-3 S-4 S-5 W-4	7.00	34	5	10	2	23	1	31	1	**99**	**1**
C	S-2 S-3 S-4 S-5 W-4	7.57	26	2	28	5	50	5	38	2	**142**	**4**
D	S-1 S-3 S-4 S-5 W-3 N-2	7.75	38	8	6	1	24	2	39	3	**107**	**2**
E	S-2 S-3 S-4 S-5 W-3 N-2	8.31	31	4	25	4	50	6	44	5	**150**	**6**
F	S-1 S-3 S-4 W-2 N-1 N-2	8.00	46	9	19	3	36	4	41	4	**141**	**3**
G	S-2 S-3 S-4 W-2 N-1 N-2	8.57	38	7	38	7	62	9	45	6	**183**	**7**
H	S-1 S-3 W-1 N-1 N-2	8.37	37	6	31	6	29	3	45	7	**143**	**5**
I	S-2 S-3 W-1 N-1 N-2	8.94	30	3	50	9	55	7	51	8	**186**	**9**

Figure 3 - Route Score Chart



The route selection study scored each route based on ecological, cultural, land-use, and engineering impacts. Based on UTI's study, the Preferred Route (Route B), when compared with the Alternate Route (Route D), will result in a lower number of trees requiring clearing and has the least impact on private land owners by utilizing more of the City of Dayton's property. Although the Preferred Route contains a higher percentage of high consequence areas than the Alternate Route it is preferable over the Alternate Route because it avoids the areas where the City of Union and the Dayton International Airport have planned future growth.

Route F (ranked 3rd with 141 points), Route C, (ranked 4th with 142 points), and Route H (ranked 5th with 143 points) all scored more than forty-percent worse than Preferred Route, Route B, and thirty-percent worse than the Alternate Route, Route D. These routes ranked lower than the Preferred and Alternate Routes with the cultural, land use, and engineering aspects evaluated in the study.

Additionally, reports received from the Montgomery County Engineers on soil boring data in the area indicate the depth to bedrock along segment W-2 (and west) of the route is less than 18" in several locations. To meet Vectren's safety pipeline standards the transmission pipeline would need to be placed at a depth no less than 48" which would require more invasive techniques to be used on any of the routes utilizing the W-1 or W-2 segments (Routes F, G, H and I) and would create other socioeconomic issues during construction such as noise, dust, and potential blasting. Therefore, Routes B and D appear to be the best candidates for the Application to the Ohio Power Siting Board for the Certificate of Environmental Compatibility and Public Need.