

## **4.0 ALTERNATIVES**

As required by NEPA, we have evaluated several alternatives to the proposed Gulf Crossing Project to determine whether they would be technically and economically feasible and environmentally preferable to the proposed action. Our alternatives analysis includes alternatives proposed by the general public, as well as other federal and state resource agencies. It considers the environmental differences resulting from each alternative as well as the alternative's ability to meet the proposed Project's objectives.

We considered the No Action or Postponed Action Alternative, alternative energy sources, the effects of energy conservation, system alternatives, route alternatives, route variations, and aboveground facility site alternatives. We also considered the potential impacts to environmental resources and land uses in our alternatives analysis. We evaluated alternatives that would avoid or minimize impacts to environmental resources such as wetlands and waterbodies, land uses such as timber production, and federally and state-managed lands.

The following evaluation criteria were used to determine whether or not an alternative would be environmentally preferable:

- significant environmental advantage over the proposed Project;
- ability to meet the proposed Project objectives; and
- technical and economic feasibility and practicability.

### **4.1 NO ACTION AND POSTPONED ACTION ALTERNATIVE**

The FERC has three alternative courses of action in processing an application for a Certificate: (1) grant the Certificate with or without conditions, (2) deny the Certificate, or (3) postpone action pending further study.

Implementation of the No Action Alternative would require the Commission to deny the Companies a Certificate to construct, own, operate, and maintain the proposed Project. Without the issuance of a Certificate, the Companies would not be able to construct the proposed Project and therefore the environmental impacts identified in this EIS would be avoided. While the increasing demand for energy could be met by other projects or alternatives, it is purely speculative to predict the resulting effects and actions that could be taken by suppliers and users of natural gas. Denying authorization of the Project could also result in more expensive and less reliable natural gas supplies for the end user and/or greater reliance on alternative fossil fuels, such as coal or fuel oil. Increased use of alternative fossil fuels would likely result in greater emissions compared to natural gas. Alternatively, end users may implement conservation measures or projects that would result in impacts less than those described in this EIS. Unfortunately, the range of possibilities are numerous and difficult to predict. However, as discussed in Section 1.1, nationwide consumption of natural gas is projected to increase by more than 18 percent by 2030 (EIA 2007). Much of this growth in demand is projected to occur before 2020, with much of the demand produced by electric generators (EIA 2007). Onshore production of natural gas from unconventional sources (e.g., shale, tight sands, and coal bed methane) is expected to be a major contributor to future domestic natural gas supplies. The proposed Project would supply up to 1.73 Bcf/d of natural gas from the unconventional gas reserves such as the Barnett Shale, Bossier Sand, and Caney Woodford Shale fields. Since the objectives of the proposed Project would not be met by implementing the No Action Alternative and the effects of other customer-driven projects are unknown, we believe that this alternative is not preferable to the proposed action.

Implementation of the Postponed Action Alternative would require the Commission to delay its determination on whether or not to grant the Companies a Certificate. Postponing the Commission's action on this application would at a minimum delay and has the potential to change the environmental impacts described in this final EIS. Based on the information provided in the Companies' application, their subsequent filings, responses to environmental information requests, and our analysis of this information and consultations with other responsible state and federal resource agencies, we believe that use of the Postponed Action Alternative is not necessary at this time. We believe that delaying the effects described in this final EIS would not significantly change these effects. Therefore, we believe that this alternative is not preferable to the proposed action.

### **Alternative Energy Sources**

Several alternative energy sources to natural gas currently exist, such as petroleum and coal-based energy, nuclear power, hydropower, and other energy sources, including renewable energy technologies. Petroleum and coal-based energy are commonly used and found throughout the United States; however, relative to natural gas, the use of petroleum or coal-based energy would result in greatly increased emissions of criteria pollutants, hazardous air pollutants, as well as greenhouse gases such as NO<sub>2</sub> and CO<sub>2</sub>. The increased emission of these pollutants would result in reductions to air quality. The use of coal or petroleum based energy would not meet the proposed Project's objectives and would not likely result in a significant reduction of environmental impacts; therefore we believe that the use of this energy source is not preferable to the proposed action.

Several incentive and partnership programs aimed at promoting increased nuclear power generation infrastructure in the United States have recently been developed to promote fossil fuel alternatives for power generation (OMB2007, EIA 2007). Under the Global Energy Nuclear Partnership and Nuclear Power 2010 programs, the US Department of Energy aims to create a public-private partnership that would result in the construction and operation of a new nuclear power generating facility by 2014. With projected new nuclear generating facilities and upgrades to existing nuclear infrastructure, nuclear power generation is expected to grow 15 percent between 2005 and 2030 (EIA 2007). Despite this growth in nuclear power generation, the Energy Information Administration projects that nuclear power will account for only about 15 percent of total U.S. generating capacity by 2030 (EIA 2007). Additionally, regulatory requirements, cost considerations, and public concerns make it unlikely that new nuclear power plants would be sited and developed to serve the targeted markets within a timeframe that would meet the objectives of the proposed Project. Therefore, we believe use of this energy source is not preferable to the proposed action.

Though efficiency upgrades at existing hydropower facilities are expected to produce incremental additions of power in the coming years, it is unlikely that new and/or significant sources of hydropower would be a reliable alternative to the proposed Project. Non-tidal hydropower electricity generation is expected to remain steady through 2030 (EIA 2007), and thus would not be preferable to the proposed action.

Federal, state, and local incentives and continuing research and market forces will likely contribute to an increase in the availability and cost effectiveness of non-hydropower renewable energy sources such as wind, solar, tidal, geothermal, and biomass. Several federal policies and energy initiatives, such as the Advanced Energy Initiative, Renewable Energy Production Initiative, and the Energy Policy Act of 2005, provide tax incentives, loans, and grants to promote the advancement of solar, wind, and biofuel energy production (EIA 2007, EIA 2007b, USDOE 2007, USDOE 2006, NCSU 2007). Further, local utility rebate and loan programs in conjunction with numerous state and local tax incentives and research initiatives have increased the availability and cost-effectiveness of renewable power for local consumers (NCSU 2007).

Fifteen states reported increased wind power generation in 2006 (EIA 2007c). The average annual expansion rate for the wind industry has averaged 28 percent between 2001 and 2005 (EIA 2007b). Wind farms are currently operating in 27 states, including some of those states that comprise the Project's target markets, indicating that wind power is becoming more geographically diverse (EIA 2007b). Increased wind power production in these states helped wind power generation to increase by 45 percent (more than any other renewable generation source) in 2006. Due to the rapid increase in wind power generation, this renewable power source accounted for approximately 4 percent of all renewable power generation in 2006 (EIA 2007b, EIA 2007c).

Biomass energy production (including biofuels, waste, and wood-derived fuels) has increased by nearly 19 percent between 2001 and 2005 and now accounts for 48 percent of all non-hydropower renewable resource energy production (EIA 2007b). Of biomass energy production, biofuel use accounted for 23 percent of the biomass energy production (11 percent of all renewable energy production). The increased use of ethanol due to federal and state policies has primarily driven the recent increase in biomass energy production. The continuation of federal mandates, such as those under the Energy Policy Act of 2005, to increase renewable fuel use through 2012 will continue the increase in biomass energy production (EIA 2007c).

Solar energy production accounted for approximately one percent of all non-hydropower renewable energy production in the United States in 2006 (EIA 2007c). The US Department of Energy's Solar America Initiative aims to promote the development of solar technologies to make solar power as cost efficient as other methods of energy production by 2015 (USDOE 2007). If the solar initiative goals are met, solar generation is projected to increase by 10 to 15 percent above current levels by 2015 (OMB 2006).

Tidal energy serves as a predictable power source that uses turbines that generates power from the daily tidal fluxes. Currently, there are no tidal power plants in the United States (USDOE 2005), but FERC has one license pending for the construction of a tidal power generation unit in Washington State (FERC 2007). Further, FERC has issued 45 preliminary permits, with an additional 15 preliminary permits pending (FERC 2007). Feasibility studies under the preliminary permits are being conducted off the west coast, northeast coast, Alaska, and Florida.

The percentage of electricity generated from non-hydropower renewable energy sources at the national level is projected to remain consistent at comprising nine percent of the national energy production through 2030 (EIA 2007). Despite the current and future promotion of renewable energy use, the current growth rate of renewable energy would offset only a portion of the projected national energy demands. Therefore, we believe that these renewable energy sources would not be able to meet the overall objectives of the proposed Project and as a result are not preferable to the proposed action.

## **Energy Conservation Alternatives**

An increase in energy conservation measures employed throughout the proposed Project's market area could also potentially decrease or slow the nation's increasing energy demands. However energy demand in the United States has been increasing steadily with total energy consumption in the United States estimated to grow 41 percent from 3,660 billion kilowatt hours in 2005 to 5,168 billion kilowatt hours in 2030 (EIA 2007). Natural gas usage will represent about 22 percent of all energy consumption in the United States by 2015 and 16 percent of all United States energy consumption by 2030. To maintain pace with growing energy demands, the EIA anticipates that consumption of natural gas in the United States will grow from 22.0 Tcf per year in 2005 to 26.1 Tcf by 2030. The growth in natural gas demand is being driven primarily by increased use of natural gas for power generation and industrial applications. Given the anticipated increases of energy consumption over the next 25 years, it is unlikely

that voluntary energy conservation measures would be sufficient to offset increasing demands in general or affect the need for the proposed Project in particular.

## **4.2 SYSTEM ALTERNATIVES**

System alternatives are alternatives to the proposed action that would make use of existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed Project. Implementation of a system alternative would make it unnecessary to construct the proposed Project, although some modifications or additions to existing or proposed pipeline systems may be required to meet the objectives of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether or not the environmental impacts associated with the construction and operation of the proposed Project would be avoided or reduced by using existing, modified or proposed pipeline systems.

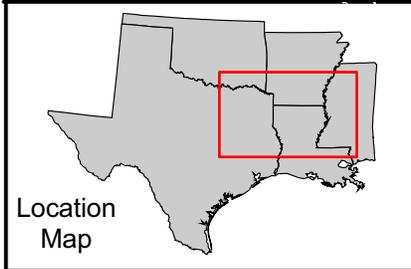
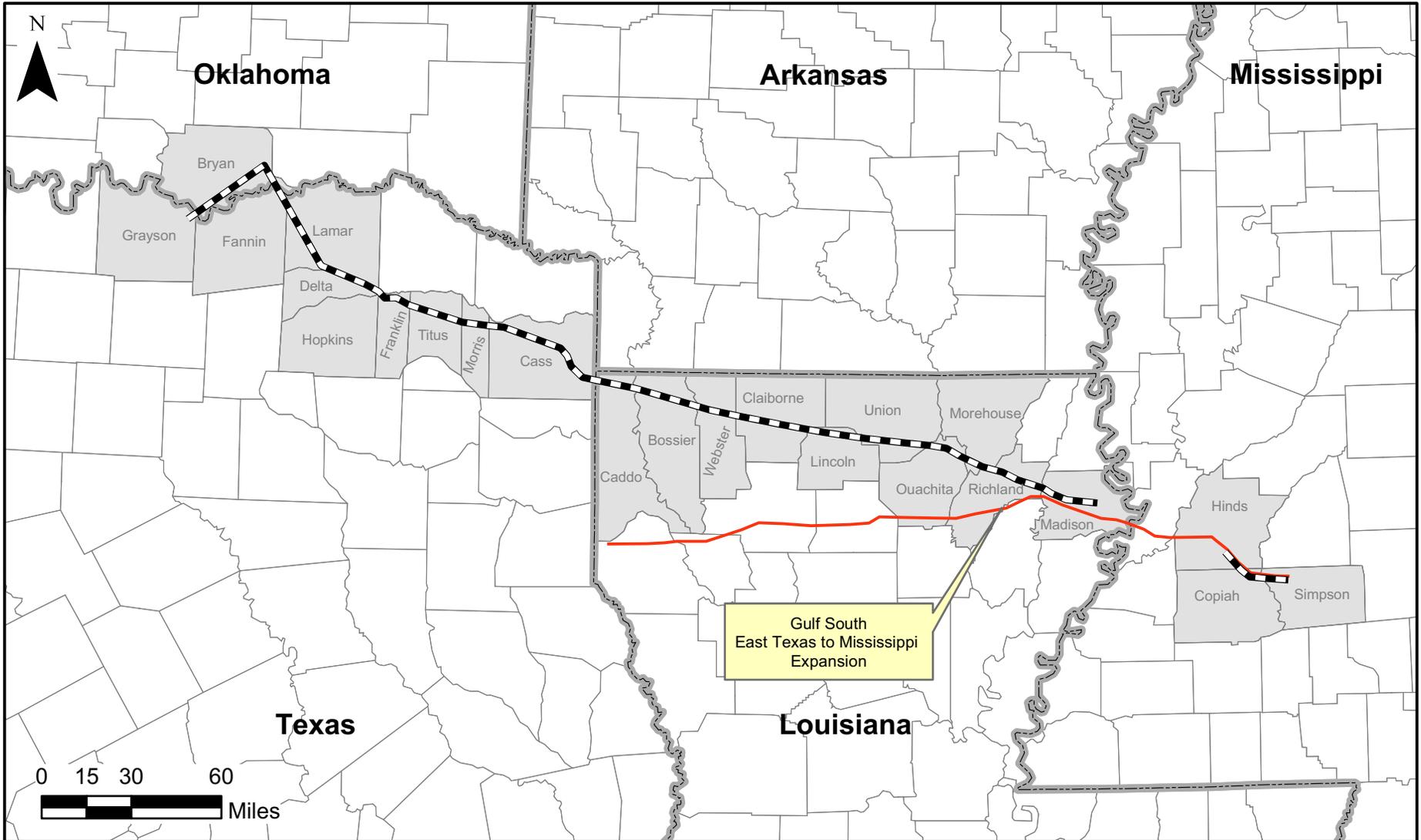
Our analysis of system alternatives includes an examination of existing and proposed natural gas systems that currently or would eventually serve the targeted markets and considers whether those systems would meet the proposed Project's objectives while offering an increased environmental advantage over the proposed Project. Specifically, the system alternatives considered in our analysis include an expansion of existing overland natural gas pipeline systems (Existing Pipeline System Alternatives) and the construction of new natural gas pipeline systems (New Pipeline System Alternatives).

### **4.2.1 Existing Pipeline System Alternatives**

Three existing pipeline systems operated by Gulf South, CenterPoint Energy Gas Transmission Company (CEGT), and Natural Gas Pipeline Company of America (NGPL) are located within the general vicinity of the proposed Project. Figures 4.2.1-1, 4.2.1-2, and 4.2.1-3 depict the location of the Gulf South, CEGT, and NGPL System Alternatives in relation to the proposed Project route. We evaluated these System Alternatives to determine whether expansion of these existing systems would be able to meet the objectives of the proposed Project and result in significantly less environmental impacts than those associated with the proposed Project. Use of existing pipeline systems would entail either the use of existing pipeline infrastructure or the addition of infrastructure to meet the Project objectives. Typically, the expansion of system infrastructure would entail the addition of compression or the looping of existing pipeline. A loop is a segment of pipeline that is typically built adjacent to another pipeline and is connected to it at both ends.

#### **4.2.1.1 Gulf South System Alternative**

Gulf South currently operates an interstate pipeline system in Texas, Louisiana, Mississippi, Alabama, and Florida, consisting of both low- and high-pressure facilities. Within the Project area, Gulf South operates low pressure pipelines, Index 250 and Index 381, through north Louisiana. Further, Gulf South has constructed or is planning the construction of a high-pressure pipeline system: Index 266, from Panola County, Texas, to Richland Parish, Louisiana; the East Texas to Mississippi Expansion Project, which is currently under construction, that extends from DeSoto Parish, Louisiana, to Simpson County, Mississippi; and the FERC Certificated Southeast Expansion Project, which extends from Simpson County, Mississippi to Choctaw County, Alabama.



**Legend**

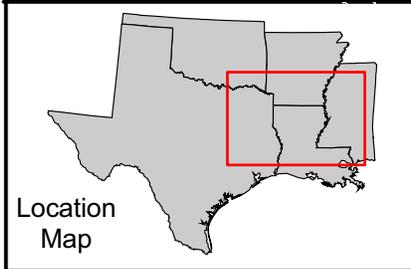
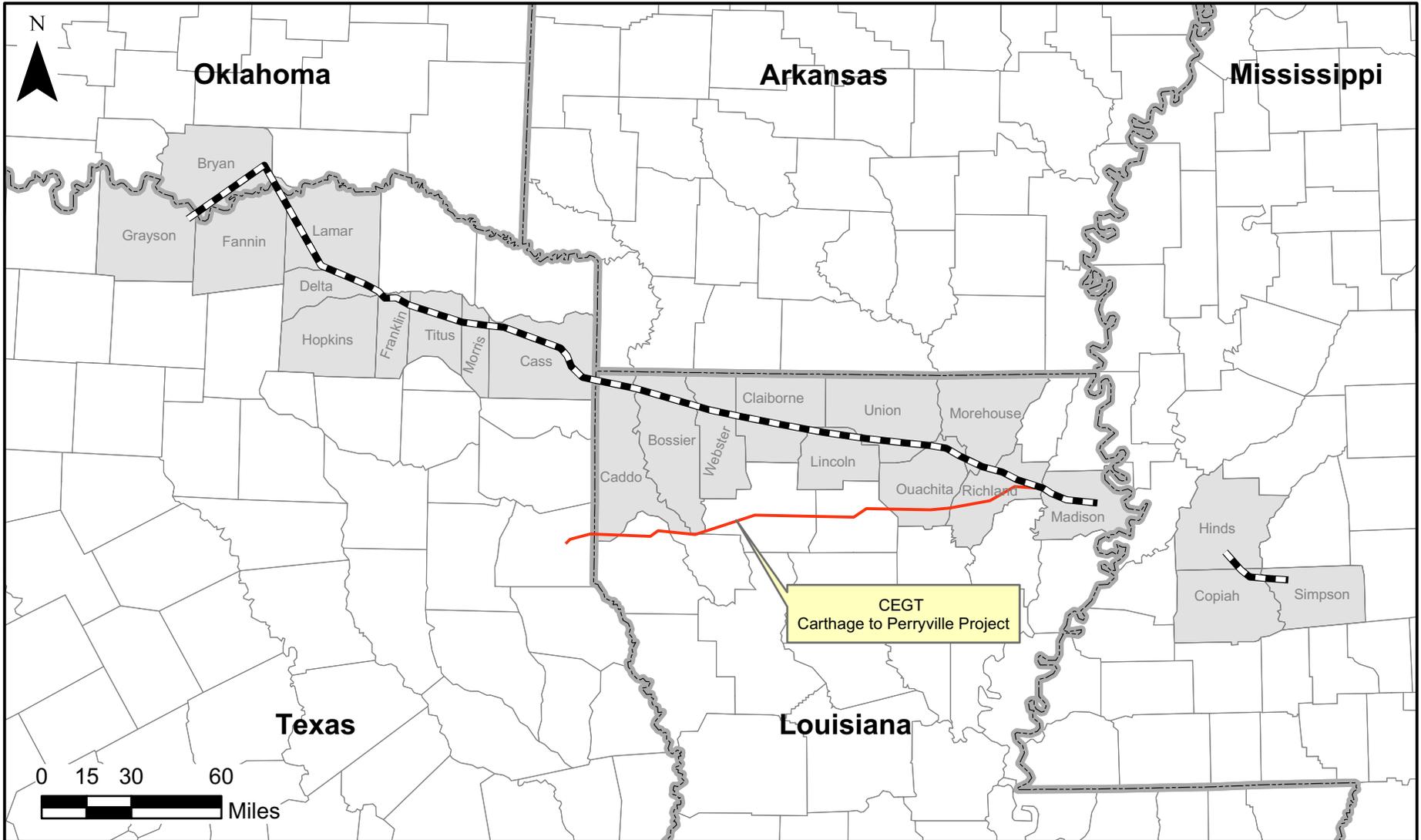
- Proposed Project Route
- Gulf South System Alternative

Gulf Crossing and Gulf South Pipeline Companies  
Proposed Gulf Crossing Project

EXISTING PIPELINE SYSTEM ALTERNATIVES

DATE: February 2008

Figure 4.2.1-1



**Legend**

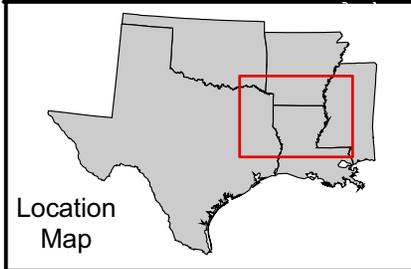
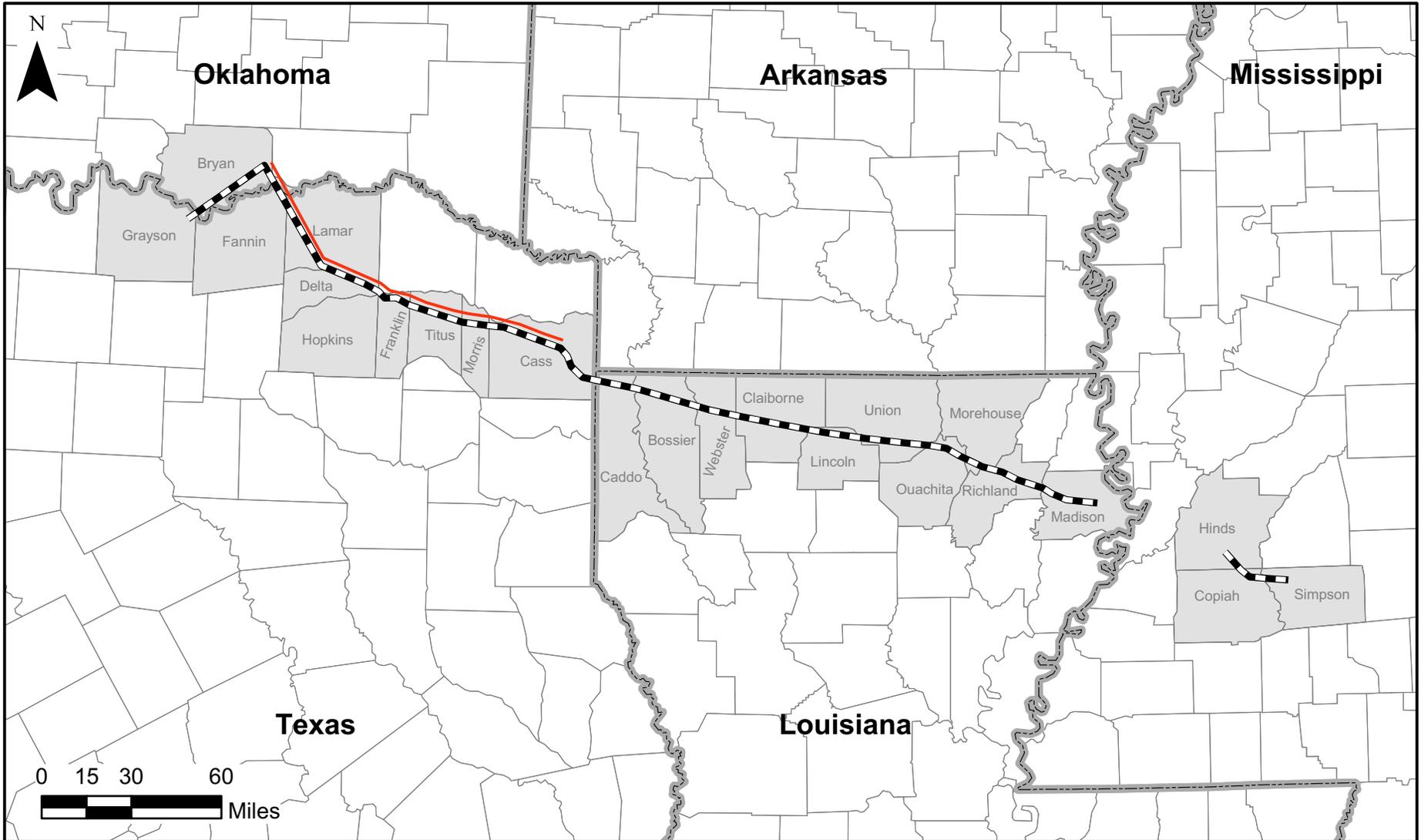
- Proposed Project Route
- CEGT System Alternative

Gulf Crossing and Gulf South Pipeline Companies  
 Proposed Gulf Crossing Project

EXISTING PIPELINE SYSTEM ALTERNATIVES

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Figure 4.2.1-2



**Legend**

- Proposed Project Route
- NGPL System Alternative

Gulf Crossing and Gulf South Pipeline Companies  
Proposed Gulf Crossing Project

EXISTING PIPELINE SYSTEM ALTERNATIVES

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Figure 4.2.1-3

The Gulf South System Alternative would use Gulf South's East Texas to Mississippi Expansion Project natural gas delivery system in the existing or in a modified form (by increasing compression or looping pipeline) to meet the proposed Project's objectives. There are currently no Gulf South high pressure pipelines in north central Texas or southeastern Oklahoma; therefore, construction of new pipeline in this area would still be required under this system alternative.

The Gulf South System Alternative would include the use of Gulf South's pipeline systems in northern Louisiana, as shown in Figure 4.2.1-1, and would require the construction of a new high-pressure pipeline in Texas and Oklahoma. Quantities of natural gas conveyed by the East Texas to Mississippi Expansion Project between Carthage, Texas, and Delhi, Louisiana are fully committed. Due to the fully subscribed nature of the high-capacity pipeline systems in the Project area, looping of the existing Gulf South high-pressure pipelines would be required to meet the additional 1.7 Bcf/d transport capacity proposed with the Gulf Crossing Project. To transport an additional 1.7 Bcf/d of natural gas, approximately 201.1 miles of pipeline would be looped and approximately 7,666 hp of compression would need to be added to the existing Gulf South system.

Although much of the high pressure pipeline looping would be collocated with existing Gulf South rights-of-way, construction of this length of pipeline looping within an assumed 100-foot-wide construction right-of-way would impact more than 2,400 acres of land, including wetlands and surface waters. Further, the construction of a new pipeline through Texas and Oklahoma would impact approximately 2,660 acres of land for a total of 5,060 acres affected by the alternative. The proposed Project would only affect about 4,220 acres of land between Grayson County, Texas, to Madison Parish, Louisiana. Therefore, the expansion of the current Gulf Crossing high-pressure pipeline system and the construction of a new high-pressure pipeline in Texas and Oklahoma in conjunction with the additional compression required for this system alternative would not be environmentally preferable to the Project.

While the Gulf Crossing System Alternative is not environmentally preferable to the proposed Project in Oklahoma, Texas, and Louisiana, it should be noted that Gulf Crossing would use Gulf South's existing pipeline infrastructure in eastern Louisiana, Mississippi, and Choctaw County, Alabama, to meet one of the Gulf Crossing Project's objectives of delivering natural gas from Texas to Choctaw County, Alabama. Gulf South is proposing to add compression at Gulf South's Harrisville Compressor Station, which is currently under construction; and to loop portions of the East Texas to Mississippi Project for 17.8 miles. Further, Gulf South would use unsubscribed capacity in Gulf South's Southeast Expansion Project to transport the natural gas conveyed by the Gulf Crossing Project, which terminates in Richland Parish, Louisiana, to the Transco Station 85 in Choctaw County, Alabama. This looping and expansion of Gulf South facilities would minimize the environmental impacts associated with construction of a new pipeline over the entirety of the route between Richland Parish, Louisiana, and Choctaw County, Alabama.

Because the Gulf South Pipeline System Alternative would be longer than the proposed Project and would require an additional compression, the potential environmental impacts associated with the additional length and the expansion or construction of additional compression would likely be greater than or similar to those associated with construction and operation of the proposed Project. Further, the Companies have made efforts to utilize proposed Gulf South infrastructure to the maximum extent practicable through Louisiana, Mississippi, and Alabama to minimize new pipeline construction and the associated environmental impacts. Therefore, we believe that the Companies have used existing Gulf South infrastructure to the maximum extent possible and that the additional use of existing infrastructure, as described as the Gulf South System Alternative, would not be environmentally preferable to the proposed Project. Further, the Gulf South System Alternative would not be feasible due to the lack of capacity in the existing Gulf South infrastructure.

#### **4.2.1.2 CEGT Pipeline System Alternative**

CEGT currently operates an interstate pipeline system in Texas, Louisiana, Oklahoma, and Arkansas, with segments extending from Franklin County, Texas, to Richland Parish, Louisiana. Because this pipeline system does not extend into northeast Texas and southern Oklahoma, a new pipeline would need to be constructed to extend from current CEGT infrastructure to the Project origin.

The CEGT Pipeline System Alternative would use the existing CEGT Carthage to Perryville high pressure natural gas delivery system or would use the existing low-pressure system in a modified form (by increasing compression or looping pipeline) to meet the proposed Project's objectives. There are currently no CEGT pipelines in north central Texas or southeastern Oklahoma; therefore, construction of new pipeline in this area would still be required under this system alternative. Further, due to the CEGT low pressure pipeline system's inability to convey natural gas at a pressure required for the Project from Lamar County, Texas, to DeSoto County, Louisiana, the CEGT System Alternative would require the construction of a new pipeline that would be collocated with the existing CEGT low-pressure pipeline infrastructure.

The CEGT System Alternative would include the use of CEGT's pipeline systems in northern Louisiana, as shown in Figure 4.2.1-2, and would require the construction of a new high-pressure pipeline in Texas and Oklahoma. Quantities of natural gas conveyed in CEGT's high-pressure pipeline system are currently fully subscribed. We recently approved CEGT's Carthage to Perryville Project - Phase III that would entail the construction of facilities to increase the CEGT capacity by 0.3 Bcf/d. Even with this approved increased capacity, the CEGT pipeline system would not have sufficient capacity to transport the 1.7 Bcf/d of natural gas that would be transported by the Gulf Crossing Project. Because the CEGT System Alternative does not contain sufficient capacity to transport the volumes of gas identified in the proposed action, it would need to be significantly expanded and modified to meet the proposed Project's objectives. Specifically, to add capacity for an additional 1.7 Bcf/d of natural gas to Richland Parish, Louisiana, approximately 206 miles of 42-inch-diameter pipeline looping, as well as 39,548 hp of additional compression, would need to be constructed.

Although much of the pipeline looping could be collocated with existing CEGT rights-of-way, construction of this length of pipeline looping within an assumed 100-foot-wide construction right-of-way would impact approximately 2,497 acres of land. An additional 1,224 acres of land would be encumbered for the new construction that would be collocated with existing CEGT low pressure pipelines. These land requirements would include wetlands and surface waters. The proposed Project would only affect approximately 2,929 acres of land between Titus County, Texas, and Madison Parish, Louisiana. The construction and installation of facilities necessary to extend this system from Oklahoma to Franklin County, Texas, would result in essentially the same impacts as the same segment of the proposed Project and therefore does not have and significant advantages.

Because the CEGT Pipeline System Alternative would be longer than the proposed Project, require the construction of new pipeline in Texas and Oklahoma, and require additional compression at existing or new facilities, the potential environmental impacts would likely be greater than or similar to those associated with the construction and operation of the proposed Project. Therefore, we believe that the CEGT Pipeline System Alternative would not be environmentally preferable to the proposed Project.

#### **4.2.1.3 NGPL System Alternative**

The NGPL pipeline system crosses Oklahoma, Arkansas, Texas, and southern Louisiana. Because this pipeline does not extend beyond eastern Texas, additional pipeline would need to be constructed to extend the system to eastern Louisiana under this System Alternative. Further, additional

pipeline would also need to be constructed from Bryan County, Oklahoma, to Grayson County, Texas, to service the Project's origin.

In addition to extensive construction of a new pipeline, the NGPL system does not have sufficient capacity to transport the quantities of natural gas required for the Gulf Crossing Project, therefore looping of the existing pipeline would be required. Under the NGPL System Alternative, approximately 120 miles of existing NGPL pipelines would require looping, while new pipeline would be constructed in Bryan County, Oklahoma; Grayson and Cass Counties, Texas; and from Caddo to Madison Parishes, Louisiana (Figure 4.2.1-3). As proposed, portions of the proposed Project alignment extending from Bryan County, Oklahoma, to Cass County, Texas, would be collocated with the NGPL pipeline system. Due to the lack of available capacity, the looping required for the NGPL System Alternative would require a similar 100-foot-wide construction right-of-way, resulting in similar impacts to environmental resources as the proposed Project. Since the Gulf Crossing Project is collocated with the NGPL System Alternative, the looping of this system would result in essentially the same impacts as the proposed Project.

Because the NGPL pipeline system commences and terminates at a different location than the Gulf Crossing Project and the NGPL System Alternative would require the construction of new pipelines or looping over a distance similar to that of the proposed Project. New pipeline construction and looping would produce similar environmental impacts as the proposed Project; therefore, we believe that the NGPL Pipeline System Alternative would not be preferable to the proposed Project.

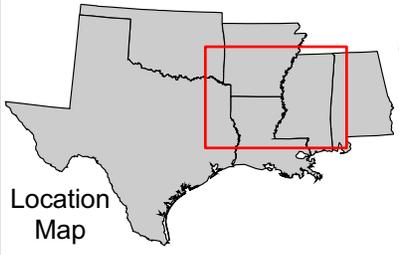
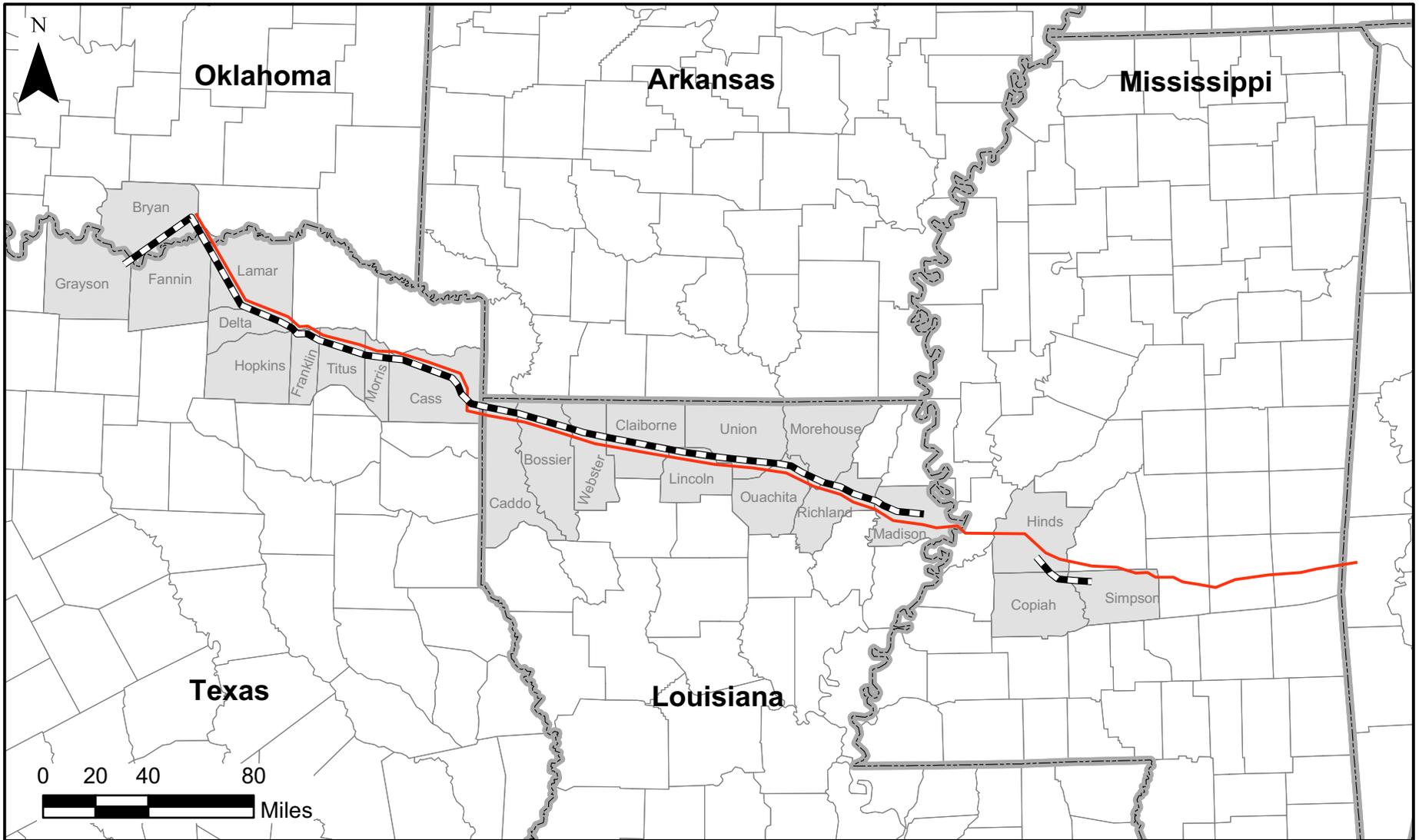
#### **4.2.2 New Pipeline System Alternatives**

The Midcontinent Express Pipeline (MEP) Project has been identified as a potential New Pipeline System Alternative to the proposed Project (Figure 4.2.2-1). The MEP Project is being reviewed under FERC docket number CP08-6-000. Due to the similarity of location between the Gulf Crossing and MEP Projects, a Single Pipeline System Alternative has also been evaluated.

##### **4.2.2.1 MEP System Alternative**

The MEP Project consists of a 30-, 36-, and 42-inch-diameter pipeline that when constructed would run from Bryan County, Oklahoma, to Choctaw County, Alabama. The MEP project application was filed with FERC on October 9, 2007 and the planned in-service date is February 2009. The pipeline would have a maximum send-out capacity of 1.5 Bcf/d, with capacity divided into two zones. Zone 1, which would extend from Bryan County, Oklahoma, to Madison Parish, Louisiana, would transport up to 1.5 Bcf/d and Zone 2, extending from Madison Parish, Louisiana, to Choctaw County, Alabama, would transport 1.2 Bcf/d of natural gas.

The proposed MEP Project capacity would not be sufficient to meet the binding precedent agreements of both MEP and Gulf Crossing. Thus, the MEP System Alternative would require looping between Bryan County, Oklahoma, and Richland Parish, Louisiana. Further, because the MEP Project would not extend into Grayson County, Texas, a lateral would need to be constructed to provide service to the Gulf Crossing Project origin in Grayson County. The looping and construction of the new pipeline associated with this system alternative would require a similar 100-foot-easement as the proposed Project, resulting in similar environmental impacts as those produced by the proposed Gulf Crossing and MEP Projects separately.



**Legend**

- Proposed Project Route
- Midcontinent Express Pipeline Project

Gulf Crossing and Gulf South Pipeline Companies  
Proposed Gulf Crossing Project

**NEW PIPELINE SYSTEM ALTERNATIVE**

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Figure 4.2.2-1

The required looping over the entire Gulf Crossing Project length that would be required under the MEP System Alternative would result in nearly identical environmental impacts as the construction of separate Gulf Crossing and MEP Projects. As such, the MEP System Alternative is not preferable to the proposed Project because it would not result in significantly less environmental impacts.

Due to the similarity of routing between the two projects and the similar construction timelines, we also evaluated a single pipeline system alternative that would call for a larger diameter pipe to accommodate the natural gas conveyance requirements of both projects. The Single Pipeline System Alternative is evaluated in Section 4.2.2.2 below.

#### **4.2.2.2 Single Pipeline System Alternative**

Due to the similarity of routing and construction timelines between the Gulf Crossing and MEP Projects, we evaluated the feasibility of a Single Pipeline System Alternative. Under this alternative, a single, pipeline would convey committed natural gas associated with both projects from Grayson County, Texas, to Choctaw County, Alabama. Adoption of a Single Pipeline System Alternative would result in the need for only a single pipeline right-of-way across the Project route, rather than the two separate rights-of-way proposed by Gulf Crossing and MEP. This alternative would likely result in corresponding reductions in land requirements and associated environmental effects; however, the feasibility of the Single Pipeline System Alternative would be constrained by multiple factors.

As stated in Section 4.2.2.1, a single, 42-inch diameter pipeline would be incapable of delivering sufficient natural gas quantities required to meet binding precedent agreements for both MEP and Gulf Crossing without significant amounts of additional compression and looping. Extensive looping associated with the Single Pipeline System Alternative would essentially result in the creation of two, parallel pipelines, which would offer no significant environmental advantage over the proposed individual projects.

The use of a single, large diameter pipeline to transport natural gas quantities associated with the Gulf Crossing and MEP Projects would present construction difficulties, resulting in delays of in-service dates and substantially increasing capital costs associated with the Project. At a minimum, a 48-inch diameter pipeline would be required to transport the volumes associated with both the Gulf Crossing and MEP Projects. This single pipeline would require an estimated construction easement ranging from 125 to 160 feet and would require additional compression. Trenches associated with the larger diameter pipeline construction easements would result in a 15 percent increase in spoil production compared to that produced by a 42-inch diameter pipeline trench, however as detailed above, the total soil disturbance would be less than the separately proposed projects. Gulf Crossing contends that the difficulties associated with handling increased spoil quantities in conjunction with the complexity of operating construction equipment designed to install a 48-inch diameter pipeline could result in construction safety issues.

Construction of this non-standard pipeline diameter would present numerous construction difficulties. Construction equipment capable of handling a 48-inch diameter pipe would likely need to be fabricated specifically for the Single Pipeline System Alternative. Side-boom tractors of sufficient size to transport a 48-inch diameter pipe are currently unavailable in the United States and would likely need to be constructed for the Project. Further, additional construction equipment such as bending and welding machines would require retrofitting to handle 48-inch diameter pipes. Fabrication of this specialized equipment would require significant lead time and would result in a significant delay in the commencement of Project construction activities.

The 48-inch diameter pipe and associated fittings are not currently available, thus additional time would be required to produce the Single Pipeline System Alternative specific construction materials. Due to the extended order time for the larger diameter pipe, materials would not be available to meet the proposed October 2008 in-service date.

Differences in delivery objectives, in-service dates, and fee schedules for the two projects would also require the development of extensive operating agreements, the redesign of corporate structures, and the redevelopment of delivery contracts for the operation of a Single Pipeline System Alternative. Natural gas transported by each respective project is committed under binding precedent agreements based on each individual project's fee and delivery schedules. Due to the extensive redesign of proposed facilities associated with a Single Pipeline System Alternative, one or both companies would potentially no longer be able to deliver gas at the agreed upon price resulting in a potential inability to meet contractual requirements and market demand.

The Gulf Crossing Project would primarily deliver natural gas from the Barnett Shale's Newark East Field in East Texas to an interconnect with the East Texas to Mississippi Expansion Project (as discussed in Section 4.2.1-1) in Richland Parish, Louisiana. In contrast, the MEP Project would primarily convey natural gas originating from supply fields in the Woodward and Fayetteville Shale's in Oklahoma and Arkansas to Choctaw County, Alabama. Differences in upstream supply sources and design would introduce additional difficulty in the operational agreements associated with a Single Pipeline System Alternative. Further operational difficulties and operating agreements would be required to establish daily and hourly pipeline pressures, interconnecting pressures, and customer delivery points. Negotiations associated with determining an acceptable operation plan for all companies associated with a Single Pipeline System Alternative would introduce a significant delay to the anticipated October 2008 in-service date.

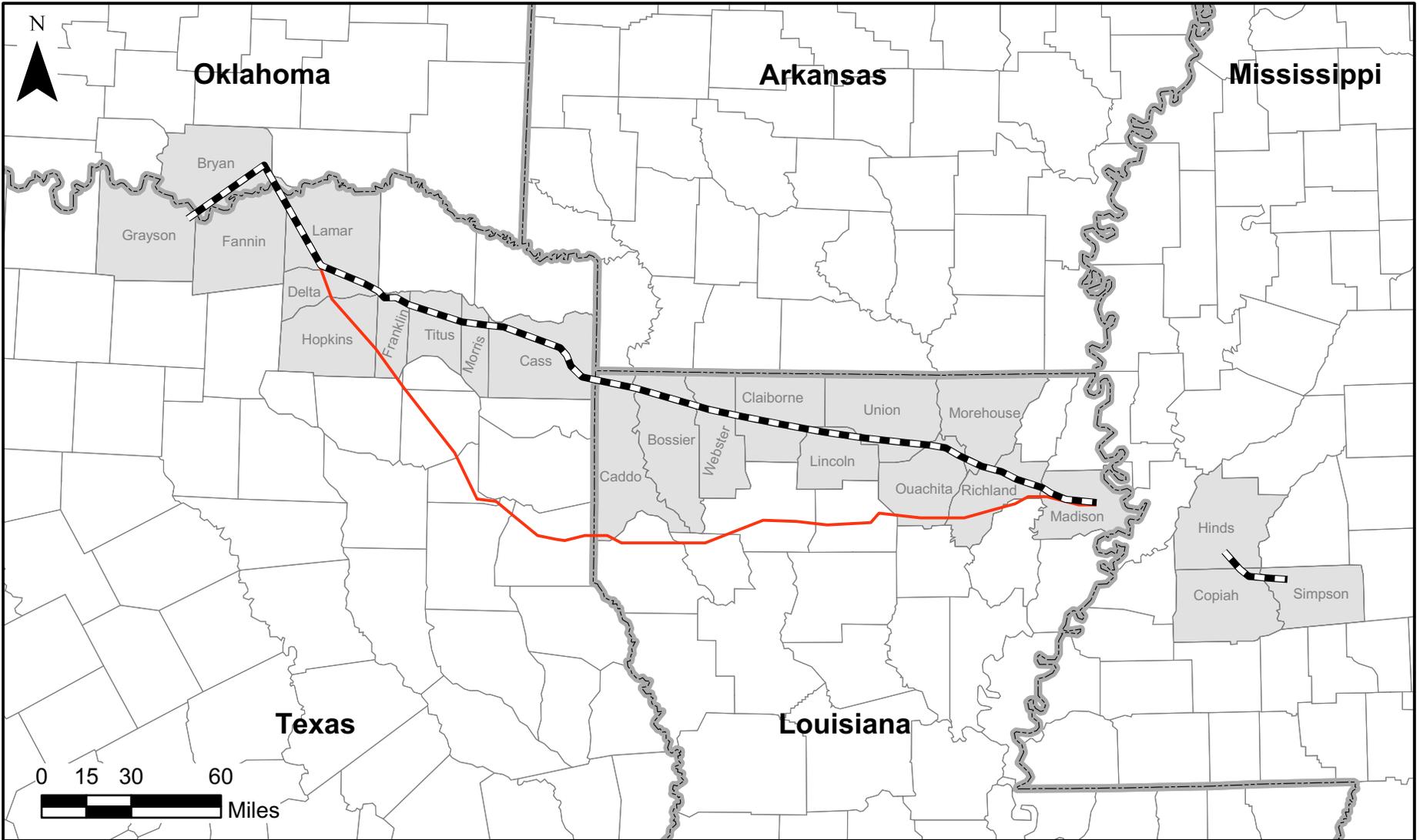
The Companies anticipate that delays associated with the planning, construction, and operation of a Single Pipeline System Alternative would delay the Project in-service date until the summer of 2009. Although resulting in less environmental impact, the in-service delays associated with construction difficulties and development of an operation agreement in conjunction with the increased economic costs would make a Single Pipeline System Alternative economically less preferable to the proposed Project and would not meet the Project's in-service date objectives and therefore be economically less preferable.

### **4.3 ROUTE ALTERNATIVES**

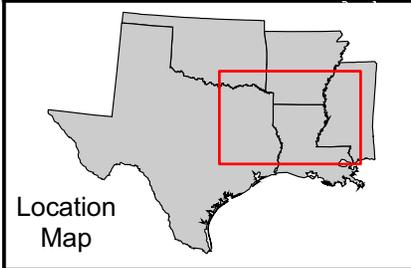
Route alternatives represent potential routes that the proposed Project could follow that vary significantly from the proposed route. A route alternative would deviate from the proposed route for its entire length or at least a large portion of its total length. Based on input provided to us by the general public, federal and state resource agencies, and our review of the proposed Project, we identified and evaluated two major route alternatives: the Southern and the Sherman to Texarkana Route Alternatives. We evaluated these alternatives to determine if either would avoid or significantly reduce environmental effects associated with the proposed Project.

#### **4.3.1 Southern Route Alternative**

We evaluated a Southern Route Alternative that would follow the route of the proposed Project alignment between MPs 0.0 to 72.0 in Lamar County, Texas, before diverging from the proposed Project alignment (Figure 4.3.1-1). The Southern Route Alternative would proceed in a southeasterly direction through Delta, Hopkins, Franklin, Camp, Wood, Upshur, Gregg, Harrison, Rusk, and Panola Counties, Texas. The route alternative would then continue to DeSoto Parish, Louisiana, before collocating with



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**Legend**

-  Proposed Project Route
-  Southern Route Alternative

Gulf Crossing and Gulf South Pipeline Companies  
 Proposed Gulf Crossing Project

**MAJOR ROUTE ALTERNATIVES**

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Figure 4.3.1-1

the East Texas to Mississippi Expansion Project route in DeSoto, Red River, Bienville, Jackson, Ouachita, Richland, and Madison Parishes, Louisiana.

The proposed Project route and the Southern Route Alternative impacts are compared in Table 4.3.1-1. Quantitative data is based upon a combination of field survey data, USGS topographic maps, National Wetlands Inventory maps, and USGS land cover land use data.

<b>Evaluation Criteria</b>	<b>Proposed Route<sup>a</sup></b>	<b>Southern Route Alternative</b>
Total Length (miles)	356.3	390.0
Construction Impacts (acres) <sup>b</sup>	4,318.8	4,727.3
Permanent Impacts (acres) <sup>b</sup>	2,591.3	2,836.4
Compression Requirements (hp)	100,734	98,871
Waterbody Crossings (number)	828	680 <sup>c</sup>
Wetland Affected by Construction (acres) <sup>d</sup>	130.6	75.1
Forested Wetlands Affected by Construction (acres) <sup>d</sup>	110.2	49.2
Residential Lands Affected by Construction (acres)	51.7 <sup>e</sup>	100.0
Forested Lands Affected by Construction (acres)	1,820.2 <sup>e</sup>	2,123.9
<b>NOTES:</b>		
<sup>a</sup> Values associated with the Mississippi Loop are not included.		
<sup>b</sup> Land requirements reported assume a 100-foot-wide construction right-of-way and a 60-foot-wide permanent right-of-way.		
<sup>c</sup> Information is based upon USGS topographic map interpretation in those areas not collocated with the Gulf Crossing Project or the East Texas to Mississippi Expansion Project.		
<sup>d</sup> Due to the unavailability of electronic NWI data for most of the Texas counties crossed by the Southern Route Alternative, only wetland impacts in Louisiana were compared.		
<sup>e</sup> Values are based on USGS Land Use Land Cover data and information presented in the East Texas to Mississippi Expansion Project final EIS.		

The Southern Route Alternative would be approximately 34 miles longer in length. Construction and operation of the Southern Route Alternative would encumber an additional 409 acres and 245 acres of land, respectively, compared to the proposed Project alignment. Further, construction of the Southern Route Alternative would encumber an additional 304 acres of forested lands and an additional 48 acres of low, medium, and high density residential lands compared to the proposed Project route. Due to the increased Southern Route Alternative length, an additional 4,735 hp of compression at the Mira Compressor Station would be required to convey necessary natural gas quantities. This route alternative would encumber 61 fewer acres of forested wetland and 56 fewer acres of total wetlands than the proposed Project route. The proposed Project route would cross 148 more waterbodies than the Southern

Route Alternative, a majority of which would be intermittent streams and ponds. The proposed Project alignment crosses eight fewer perennial streams compared to the Southern Route Alternative.

While both the proposed Project route and the Southern Route Alternative have environmental advantages and disadvantages associated with their routing, the proposed Project route would minimize the total quantity of land encumbered for both Project construction and operation. Further the proposed Project route would minimize the use of residential and forested lands. Due to the increased quantity of residential lands along the Southern Route Alternative, a greater number of landowners would be impacted by pipeline construction and operation. Despite the increased wetland and waterbody impacts associated with the proposed Project route, we find the proposed Project route preferable to the Southern Route Alternative due to its decreased length and associated land impacts and the decreased number of residential lands crossed.

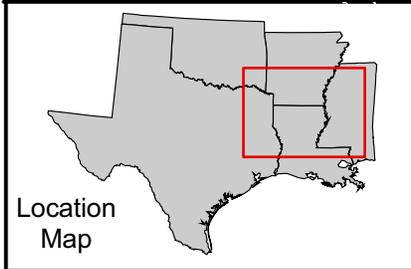
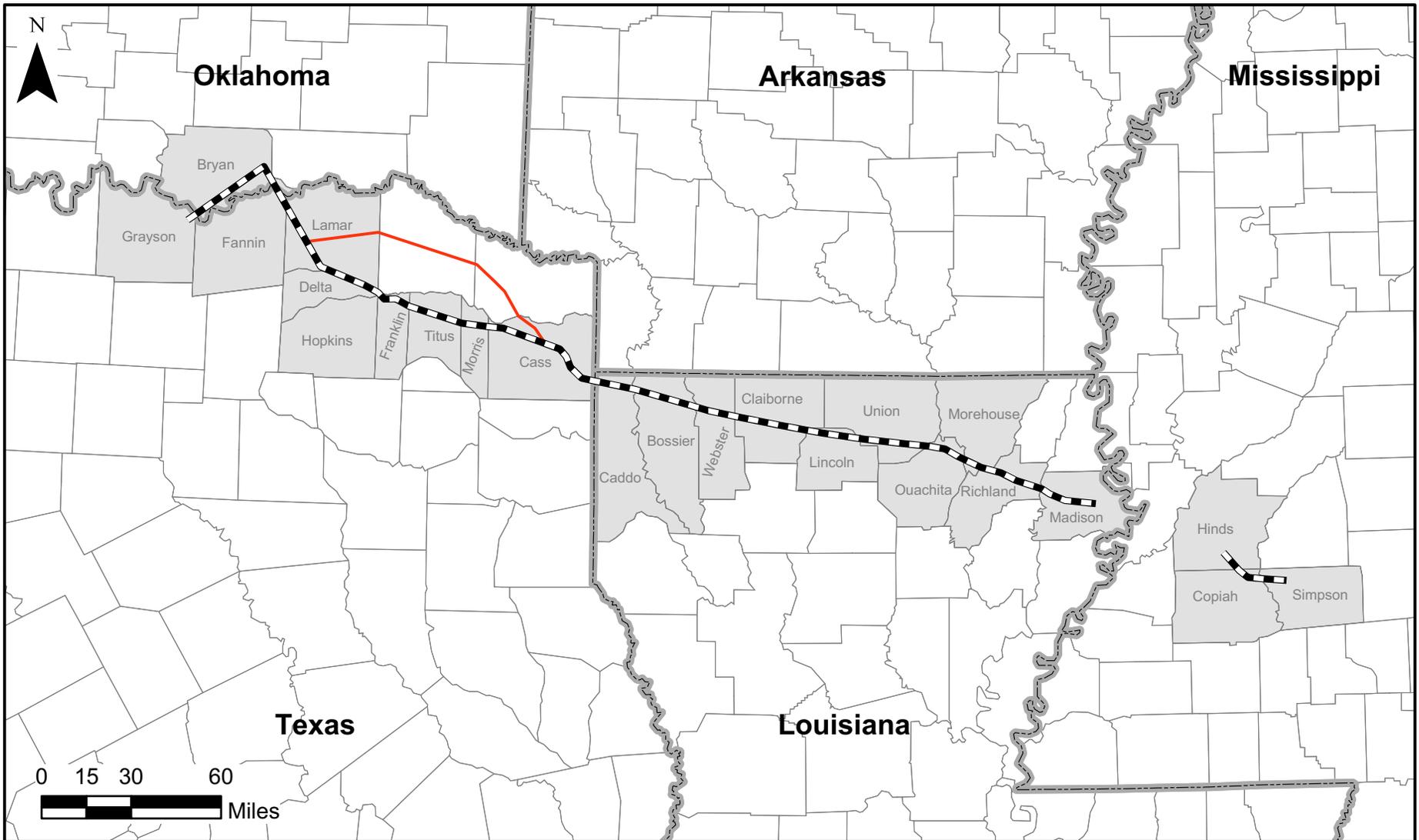
#### **4.3.2 Sherman to Texarkana Route Alternative**

We evaluated a Sherman to Texarkana Route Alternative based upon public suggestions that would align the Project with unused railroad easements in Lamar, Red River, Bowie, and Cass Counties, Texas (Figure 4.3.2-1). The proposed Sherman to Texarkana Route Alternative would follow the proposed Project alignment from MP 0 to MP 63 in Lamar County, Texas. At the MP 63 divergence point, this route alternative would travel east and then southeast through Lamar, Red River, Bowie, and Cass Counties, Texas, before rejoining the proposed Project alignment at MP 151.

As shown in Table 4.3.2-1, the Sherman to Texarkana Route Alternative would be approximately five miles longer in length compared to the proposed Project route. In addition to the extended length of this route variation, it would require the construction of a 9-mile-long lateral that would connect the route alternative to production areas near Paris, Texas. Construction and operation of this lateral would incur additional environmental impacts not discussed below. In total, the Sherman to Texarkana Route Alternative would add a total of 14 miles to the Project.

The five additional miles associated with the route alternative would result in an additional 59 acres of land that would be encumbered by construction and 36 acres of land that would be permanently encumbered for operation. While increased land would be encumbered by the route alternative, 61 fewer waterbodies would be crossed. In general, the route alternative and the corresponding proposed Project route would result in similar environmental impacts.

While the environmental impacts associated with the Sherman to Texarkana Route Alternative are similar to the proposed Project route, the increased number of residential lands along the route alternative would result in a greater number of landowners being impacted by the Project. Further, the nine mile lateral required for this route alternative would result in additional environmental impacts. Due to the increased number of residential areas crossed by the Sherman to Texarkana Route Alternative combined with the need of a nine mile lateral that would incur additional environmental impacts, we have eliminated the Sherman to Texarkana Route Alternative from further consideration.



**Legend**

- Proposed Project Route
- Sherman to Texarkana Route Alternative

Gulf Crossing and Gulf South Pipeline Companies  
Proposed Gulf Crossing Project

**MAJOR ROUTE ALTERNATIVES**

DATE: February 2008

Figure 4.3.2-1

<b>TABLE 4.3.2-1 Comparison of Sherman to Texarkana Route Alternative and the Proposed Route</b>		
<b>Evaluation Criteria</b>	<b>Proposed Route<sup>a</sup></b>	<b>Sherman to Texarkana Route Alternative<sup>b</sup></b>
Total Length (miles)	356.3	361.2
Construction Impacts (acres) <sup>c</sup>	4,318.8	4,378.2
Permanent Impacts (acres) <sup>c</sup>	2,591.3	2,626.9
Compression Requirements (hp)	100,734	98,871
Waterbody Crossings (number) <sup>d</sup>	828	767
Residential Lands Affected by Construction (acres) <sup>e</sup>	51.7	274.4
Forested Lands Affected by Construction (acres) <sup>e</sup>	1,820.2	1,986.7
<b>NOTES:</b>		
<sup>a</sup> Values reported are those presented in the Resource Reports submitted to FERC as part of the Gulf Crossing Application in June 2007. Values associated with the Mississippi Loop are not included.		
<sup>b</sup> Values do not include the 9 mile lateral that would be required reach production areas near Paris, Texas.		
<sup>c</sup> Land requirements reported assume a 100-foot-wide construction right-of-way and a 60-foot-wide permanent right-of-way.		
<sup>d</sup> Information is based upon USGS topographic map interpretation in those areas not collocated with the Gulf Crossing Project or the East Texas to Mississippi Expansion Project.		
<sup>e</sup> Values are based on USGS Land Use Land Cover data.		

**4.4 ROUTE VARIATIONS**

Route variations differ from system or major route alternatives in that they are identified to resolve or reduce construction impacts to localized, specific resources such as cultural resources sites, wetlands, recreational lands, residences, landowner requests, and terrain conditions. Because route variations are identified in response to specific local concerns, they are often the result of landowner comments. While route variations may be a few miles in length, most are relatively short and in proximity to the proposed route. We have considered a variety of factors in identifying and evaluating route variations, including length, land requirements, the number of landowners affected, and the potential for reducing or minimizing impacts to natural resources. The FERC staff has evaluated 19 route variations since the Companies filed their application, and recommended that six of these be adopted (three in the draft EIS and three in the final EIS). Additionally, Gulf Crossing adopted three of the variations evaluated by the FERC prior to the issuance of the draft or final EIS without formal recommendation from the FERC.

During the pre-filing and application review process, the Companies refined the proposed route based on discussions with landowners, resource stewards, project engineers, and FERC staff to avoid or minimize impacts to natural or cultural resources, reduce or eliminate engineering and constructability concerns, and/or avoid or minimize conflicts with existing land uses. These adopted minor route variations are described in Table 4.4-1. Further, after issuance of the draft EIS, the Companies have

adopted several minor route variations based upon additional survey data, engineering information, landowner discussions, and data requests from the FERC. These route variations are listed in Table 4.4-2. Figures depicting all adopted route variations listed in Tables 4.4-1 and 4.4-2 are in Appendix G. Route variations listed in Table 4.4-2 were developed after mileposts were established for the project and presented in the draft EIS; therefore, to easily identify these in the text and figures they have been assigned separate milepost references that include individual prefixes signifying that they occur along a route variation. We have evaluated each of these minor route variations and considered their associated environmental consequences as part of our environmental analysis of the proposed Project in Section 3.0.

**TABLE 4.4-1  
Minor Route Variations Incorporated into the Proposed  
Gulf Crossing Project**

<b>Milepost Range<sup>a</sup></b>	<b>County/Parish</b>	<b>Reason for Incorporation</b>
0.0-0.9	Grayson, TX	Sherman Compressor Station relocation, avoid incised creeks and heavily forested areas.
1.1-1.8	Grayson, TX	Straighten route for constructability.
2.0-3.8 <sup>c</sup>	Grayson and Fannin, TX	Straighten route for the Red River HDD.
4.5-7.2 <sup>c</sup>	Bryan, OK	Straighten route for the Red River HDD.
8.4-8.9	Bryan, OK	Avoid large timber per landowner request.
9.8-11.2	Bryan, OK	Reduce bends in pipeline to provide for a more direct alignment.
11.2-13.0 <sup>c</sup>	Bryan, OK	Avoid a house and reduce bends in pipeline to provide for a more direct alignment.
14.9-16.2 <sup>c</sup>	Bryan, OK	Reduce bends in pipeline to provide for a more direct alignment.
16.6-19.3 <sup>b</sup>	Bryan, OK	Avoid impacts to the Heady and Arapaho Parkway, LTD properties.
17.2-19.0	Bryan, OK	Reduce bends in pipeline to provide for a more direct alignment.
19.0-22.1	Bryan, OK	Reduce bends in pipeline to provide for a more direct alignment.
22.5-25.6 <sup>c</sup>	Bryan, OK	Reduce bends in pipeline to provide for a more direct alignment.
25.6-27.8 <sup>c</sup>	Bryan, OK	Minimize impacts to trees per landowner request.
27.8-30.0 <sup>c</sup>	Bryan, OK	Provide a straighter approach and additional workspace for HDD.
32.2-34.0 <sup>c</sup>	Bryan, OK	Avoid a pond and reduce bends in pipeline to provide for a more direct alignment.
35.0-36.0	Bryan, OK	Avoid road culvert and ravines.
37.0-38.9 <sup>c</sup>	Bryan, OK	Avoid ponds.
39.8-40.5	Bryan, OK	Avoidance for future land development per landowner request.
40.5-43.3	Bryan, OK and Fannin, TX	Provide HDD staging additional workspace.
55.4-57.2	Lamar, TX	Avoid collocated pipeline crossing.
70.1-73.1	Lamar, TX	Shorten the route and interconnect with Paris Station.
75.7-77.1 <sup>c</sup>	Lamar, TX	Optimize road bore location; avoid an additional road crossing.
80.0-80.6 <sup>c</sup>	Lamar, TX	Reduce bends in pipeline to provide for a more direct alignment.

**TABLE 4.4-1 (continued)**  
**Minor Route Variations Incorporated into the Proposed**  
**Gulf Crossing Project**

<b>Milepost Range<sup>a</sup></b>	<b>County/Parish</b>	<b>Reason for Incorporation</b>
84.5-85.1	Lamar, TX	Avoid pond and structure.
92.0-101.1 <sup>c</sup>	Lamar, Delta, Hopkins, and Franklin, TX	Avoid a large wetland area at the Sulphur River; avoid the planned Martin Nichols Reservoir development.
115.4-116.0	Titus, TX	Avoid a structure.
116.9-118.1	Titus, TX	Avoid a structure.
119.3-119.5	Titus, TX	Avoid ponds and existing Station 803.
121.1-121.7	Titus, TX	Avoid a creek.
122.9-123.4 <sup>c</sup>	Titus, TX	Optimize route for a road crossing drill.
126.2-129.1	Morris, TX	Shorten route.
133.8-135.8	Morris and Cass, TX	Avoid a culvert at a road crossing.
145.5-146.1	Cass, TX	Increase the distance from a cemetery and church.
166.3-166.7	Cass, TX	Avoid a lake.
168.7-173.2 <sup>c</sup>	Cass, TX	Avoid structures.
174.8-176.0	Cass, TX and Caddo, LA	Reduce bends in pipeline to provide for a more direct alignment.
177.2-178.5 <sup>c</sup>	Caddo, LA	Straighten route.
178.9-180.8	Caddo, LA	Straighten route.
182.9-187.4	Caddo, LA	Reconfigure to better accommodate HDD crossing of the I-49 corridor and enhance alignment near Red River.
183.4-184.0 <sup>b</sup>	Caddo, LA	Avoid a pending Louisiana Natural Area Registry site.
187.4-190.8	Caddo and Bossier, LA	Reconfigure to attain better crossing angle for HDD crossing of Red River.
190.7-193.4 <sup>b c</sup>	Bossier, LA	Avoid WRP land.
193.5-196.0 <sup>c</sup>	Bossier, LA	Avoid houses and shed.
196.0-198.0	Bossier, LA	Facilitate constructability.
199.9-200.2	Bossier, LA	Facilitate constructability.
200.8-203.1	Bossier, LA	Facilitate constructability.
208.5-209.1	Bossier, LA	Straighten route for HDD exit.
208.9-210.7 <sup>b</sup>	Bossier and Webster, LA	Avoid sensitive vegetation in the Bodcau WMA.
209.1-212.8 <sup>c</sup>	Bossier and Webster, LA	Avoid residences and reduce bends in pipeline to provide for a more direct alignment.
213.9-215.5	Webster, LA	Avoid residences and reduce bends in pipeline to provide for a more direct alignment.
220.9-223.8 <sup>c</sup>	Webster, LA	Avoid multiple houses and reduce number of affected properties.
234.2-235.5	Claiborne, LA	Allow additional workspace at roadways; avoid businesses; enhance route near power lines.
237.2-237.5	Claiborne, LA	Avoid houses.
238.5-239.7	Claiborne, LA	Avoid developed area.
249.2-249.6 <sup>c</sup>	Claiborne, LA	Facilitate constructability.
253.3-256.0	Lincoln, LA	Facilitate constructability.
261.0-263.8	Lincoln, LA	Avoid houses, outbuildings, and a pond.

**TABLE 4.4-1 (continued)  
Minor Route Variations Incorporated into the Proposed  
Gulf Crossing Project**

<b>Milepost Range<sup>a</sup></b>	<b>County/Parish</b>	<b>Reason for Incorporation</b>
264.9-268.8	Lincoln and Union, LA	Avoid residences, minimize impacts on surrounding area, and facilitate constructability.
272.1-272.2	Union, LA	Avoid storage tanks and a foreign pipeline.
275.5-277.2	Union, LA	Avoid small lake, businesses, a residence, and a small creek.
278.9-279.4	Union, LA	Avoid a residence and a road.
282.9-289.4 <sup>c</sup>	Union, LA	Provide additional workspace for HDD staging; avoid residences and outbuildings; and avoid congested area.
283.0-286.6 <sup>b c</sup>	Union, LA	Avoid impacts to D'Arbonne NWR and the Heartwood Natural Area.
290.1-293.8	Union and Ouachita, LA	Provide a straighter approach and additional workspace for HDD.
295.7-298.9 <sup>c</sup>	Ouachita, LA	Avoid WRP land.
299.4-301.3	Ouachita, LA	Provide work space and preferred alignment for HDD crossing Highway 165; crossing to north side of existing pipelines; avoid commercial buildings and provide work space for HDD.
304.2-306.9 <sup>c</sup>	Ouachita and Morehouse, LA	Provide workspace for HDD; minimize impacts on surrounding community.
315.9-318.7	Morehouse and Richland, LA	Avoid WRP land.
322.6-326.8 <sup>c</sup>	Richland, LA	Avoid property donated to the State of Louisiana for future development per landowner request; Avoid wetland.
327.9-330.0	Richland, LA	Avoid houses and other structures.
334.4-335.4	Madison, LA	Avoid WRP land.
338.9-343.4	Madison, LA	Reduce impacts to WRP land.
344.4-344.9	Madison, LA	Avoid pond.
346.0-346.8	Madison, LA	Facilitate constructability.
349.2-349.7	Madison, LA	Extend HDD to avoid WRP land.
352.6-353.2 <sup>c</sup>	Madison, LA	Extend HDD to reduce impacts to WRP land.

**NOTES:**

- <sup>a</sup> Milepost ranges may be different than those shown in Appendix G due to alignment changes before and after filing.
- <sup>b</sup> Reroute proposed after the originally filed Application that modifies the proposed alignment based in part on previously adopted reroutes.
- <sup>c</sup> Route variation has been further modified after the issuance of the draft EIS based on additional survey, engineering, and landowner discussions. See Table 4.4-2.

**TABLE 4.4-2  
Minor Route Variations Incorporated into the Proposed Gulf Crossing Project  
After Issuance of the Draft EIS**

<b>Milepost Range</b>	<b>Route Variation Mileposts<sup>a</sup></b>	<b>County/Parish</b>	<b>Reason for Incorporation</b>
1.9-2.9	A1.9- A3.0	Grayson, TX	Avoid septic system
5.5-5.8	B5.5- B5.9	Bryan, OK	Minimize impacts on residential property per landowner request.
12.5-15.2	C12.5- C15.6	Bryan, OK	Landowner request.
24.5-25.4	F24.5-F25.4	Bryan, OK	Avoid planned lake and spillway per landowner request.
26.8-27.7	BB26.8-BB27.7	Bryan, OK	Reverse direction of HDD for better constructability.
27.7-29.3	BC27.7-BC29.3	Bryan, OK	Reduce bends in pipeline, straighten pullback for Blue River HDD.
32.2-33.6	BD32.2-BD33.1	Bryan, OK	Accommodate location of planned Enogex facility.
37.7-38.2	BF37.7-BF38.2	Bryan, OK	Landowner request.
57.1-58.3	57.1-58.3 <sup>b</sup>	Lamar, TX	Avoid sensitive vegetative community. Identified as the Johnson Route Variation in the DEIS. (see discussion in Sections 3.5.1.1 and 3.5.2.2)
76.1-76.5	BH76.1-BH76.6	Lamar, TX	Landowner request.
80.0-80.7	J80.0-J80.7	Lamar, TX	Landowner request.
97.5-99.8	P97.5-P99.9	Franklin, TX	Obtain better angle for road crossing, move out of low-lying Sulphur River floodplain.
103.9-104.3	Q103.9-Q104.4	Franklin, TX	Avoid sensitive resources.
107.5-111.8	107.5-111.8 <sup>b</sup>	Titus, TX	Avoid sensitive vegetative community. Identified as the Willow Oak-Water Oak Route Variation in the DEIS. (see discussion in sections 3.5.1.1 and 3.5.2.2)
122.8-123.3	T122.8-T123.2	Titus, TX	Accommodate change from HDD to bore.
123.4-126.2	U123.4-U126.2	Titus & Morris, TX	Multiple landowner requests.
U126.2-127.0	U126.2-127.0 <sup>b</sup>	Morris, TX	Increase Project collocation.
130.8-131.5	V130.8-V131.5	Morris, TX	Obtain better angle for road crossing.
134.4-134.5	BL134.4-BL134.5	Morris, TX	Landowner request.
154.7-154.9	X154.7-X155.0	Cass, TX	Obtain better angle for crossing road; avoid two additional road crossings.
169.2-169.8	BN169.2-BN169.8	Cass, TX	Landowner request.
176.2-179.1	Z176.2-Z178.1	Caddo, LA	Obtain better crossing angle for Highway 1 and adjacent railroad track.
190.9-193.5	AD190.9-AD194.1	Bossier, LA	Previously identified route variation to avoid WRP land has been modified to avoid crawfish pond.
194.7-195.4	AE194.7-AE195.4	Bossier, LA	Avoid cemetery.
211.0-211.7	AG211.0-AG211.8	Webster, LA	Avoid property with possible restrictions.
212.3-212.5	BQ212.3-BQ212.6	Webster, LA	Obtain better crossing angle for railroad crossing.
223.3-223.9	BR223.3-BR223.9	Webster, LA	Landowner request.
249.1-249.8	AM249.1-AM249.8	Claiborne, LA	Avoid densely populated area.

**TABLE 4.4-2  
Minor Route Variations Incorporated into the Proposed Gulf Crossing Project  
After Issuance of the Draft EIS**

<b>Milepost Range</b>	<b>Route Variation Mileposts<sup>a</sup></b>	<b>County/Parish</b>	<b>Reason for Incorporation</b>
262.3-263.3	262.3-263.3 <sup>b</sup>	Lincoln, LA	Increase Project collocation. Identified as the Alexander Route Variation in the DEIS.
282.9-283.4	BU282.9-BU283.4	Union, LA	Reduce wetland impact.
284.7-286.7	AQ284.7-AQ287.0	Union, LA	Landowner request.
295.5-297.7	AR295.5-AR297.8	Ouachita, LA	Previously identified route variation to avoid WRP land has been modified based on further field survey and engineering evaluation.
304.9-306.2	AT304.9-AT306.2	Ouachita & Morehouse, LA	Avoid densely populated area.
309.6-310.6	BV309.6-BV310.6	Morehouse, LA	Avoid forested wetland.
321.9-324.3	AV321.9-AV324.4	Richland, LA	Landowner request.
352.3-353.2	BY352.3-BY353.4	Madison, LA	Previously identified construction modification to minimize impacts on WRP land has been modified by this route variation to avoid WRP land.
L17.6-L17.8	L17.6-L17.8	Simpson, MS	Allow for connection to Harrisville Compressor Station facilities.

Note:

<sup>a</sup> Because route variations listed in this table were developed after mileposts were established, they have been assigned separate milepost references that include individual prefixes signifying that they occur along a route variation.

<sup>b</sup> Revised milepost not available for this adopted route variation.

The FERC issued a data request (February 14, 2008) to the Companies requiring the evaluation of three additional route variations, two of which are discussed in further detail below. One request resulted from letters received by the FERC from a landowner requesting the pipeline route more closely parallel an existing right-of-way to the north of the Bagwell property (MP 262) located in Lincoln Parish, Louisiana. In their response to the FERC, the Companies indicated that the collocated route to the north of the Bagwell property was considered early in the planning process for the Project. However, based on field surveys and comments the Companies received during the pre-filing period, the current proposed route in this area was adopted as a route variation in the Companies' application in order to avoid impacts on the Happy Hollow residential community and other resources such as a pond and outbuildings. Therefore, returning the route to parallel the existing right-of-way would negate the benefits of avoiding impacts to the residential community. Therefore, we believe the current proposed route in this area is the most preferable. Furthermore, the Companies and the landowner have reached an agreement for an easement along the proposed route.

As part of our alternatives analysis, we have also evaluated variations to avoid or reduce impacts to sensitive environmental resources identified through our review of topographic maps, aerial photography, and other available information. These sensitive environmental resources include wetlands and waterbodies, as well as special land uses such as WRP easements. Other specially managed areas located in the vicinity of the proposed Project, including the D'Arbonne NWR, the Bayou Bodcau WMA, the Heartwood Natural Area, The Nature Conservancy (TNC) Caddo Black Bayou Reserve, and Louisiana Natural Area Registry sites, all of which would either be avoided entirely, have surface impacts

that would be avoided through use of special construction techniques such as HDD, or would have sensitive features avoided to the maximum extent practical through adopted Project route variations that would minimize impacts. Sections 3.6, 3.7, and 3.8 further describe proposed actions and our recommendation to minimize impacts to these sensitive environmental resource areas.

As shown in Table 4.4-1, Gulf Crossing adopted five route variations prior to the issuance of the DEIS to avoid impacts to WRP lands in Bossier, Ouachita, Morehouse, Richland, and Madison Parishes, Louisiana. Further, Gulf Crossing has adopted an additional route variation, between MP 352.6 and MP 353.2, after the issuance of the DEIS to further minimize WRP impacts by eliminating the temporary WRP encumbrance by a false right-of-way during construction. Gulf Crossing proposes to encumber a total of three WRP lands; the Companies would avoid surface impacts to one of these parcels through the use of HDD. As described in Section 3.8, we recommend that Gulf Crossing file with the FERC all applicable documentation of meetings, special considerations, and agreements reached as a result of consultation with NRCS regarding construction activities on the WRP land located between MP 340.4 to MP 341.1. We also recommend the adoption of the route variation evaluated in Section 4.4.5 and further NRCS consultation for the WRP located at MP 46.7 to further minimize WRP impacts.

In addition to the route variations considered below, it is anticipated that further minor alignment shifts would be required prior to and during construction to accommodate currently unforeseeable site-specific constraints related to engineering, landowner, and environmental concerns. All such alignment shifts would first be subject to post-Certificate review and approval by the FERC.

### Identified Route Variations

Based on our analysis of the proposed Project and comments provided by the public, we have identified and evaluated 13 route variations. Table 4.4-3 lists these route variations, the segments of the proposed Project route that they would replace, and the reason for the proposed variation. Each route variation considered was compared to the corresponding segment of the proposed Project route to determine whether potential environmental benefits would be afforded. Our evaluation of route variations was based on information provided by Gulf Crossing, comments filed with the FERC, review of available aerial photography and USGS topographic maps, and site visits performed by FERC staff.

<b>TABLE 4.4-3 Summary of Route Variations Identified in Response to Public Comments Received for the Proposed Gulf Crossing Project</b>				
<b>Route Variation</b>	<b>Proposed Route Mileposts (approximate)</b>	<b>Reason for Variation</b>	<b>Analysis in Section Noted</b>	<b>Alternative Recommended</b>
Wilkerson I	MP 0.3 to 0.6	Avoid or minimize impacts to stock pond and trees	4.4.1	No
Wilkerson II	MP 0.4 to 0.6	Avoid or minimize impacts to stock pond and trees	4.4.1	No
Wilkerson III	MP 0.0 to MP 0.6	Avoid or minimize impacts to stock pond and trees	4.4.1	No
Doyle	MP 1.4 to 2.9	Minimize impacts to landowner	4.4.2	No

**TABLE 4.4-3 (continued)**  
**Summary of Route Variations Identified in Response to Public Comments**  
**Received for the Proposed Gulf Crossing Project**

<b>Route Variation</b>	<b>Proposed Route Mileposts (approximate)</b>	<b>Reason for Variation</b>	<b>Analysis in Section Noted</b>	<b>Alternative Recommended</b>
Everhart I	MP 27.8 to 29.2	Minimize impacts to ranching operations, soils, and ground water well.	4.4.3	No
Everhart II	MP 27.7-29.8	Minimize impacts to ranching operations, soils, and ground water well; eliminate two crossings of Sulphur Creek	4.4.3	Yes
Foster	MP 40.7 to 42.4	Minimize impacts to landowner	4.4.4	No
Fannin County WRP	MP 45.1 to 48.7	Minimize impacts to WRP	4.4.5	Yes
The Nature Conservancy	MP 174.5 to 177.1	Avoid or minimize sensitive natural communities and habitat on TNC property	4.4.6	No
Radescich	MP 230.4 to 231.0	Minimize impacts to forested area	4.4.7	No
Tripp Trust	MP 241.4 to 242.1	Avoid or minimize impacts to landowner	4.4.8	No
Stonebridge Estates I	MP 294.9 to 298.6	Avoid impacts to planned residential development	4.4.9	No
Stonebridge Estates II	MPAR295.5 to AR 297.8	Avoid impacts to planned residential development	4.4.9	Yes

#### **4.4.1 Wilkerson Route Variations**

The three Wilkerson Route Variations were developed in response to the landowner’s request to avoid a stock pond and associated vegetation. All of the Wilkerson Route Variations would avoid the landowner’s stock pond by moving the alignment south. The Wilkerson Route Variation I would diverge from the proposed Project alignment at MP 0.3, southwest of the Wilkerson property line, and resume the original alignment at MP 0.6 (see Figure 4.4.1-1). The Wilkerson Route Variation II would diverge from the proposed Project route at MP 0.4 and travel 0.2 mile east before resuming the original Project alignment at MP 0.6 (see Figure 4.4.1-2). The Wilkerson Route Variation III would travel northeast from MP 0.0 to MP 0.6 before resuming the proposed alignment (see Figure 4.4.1-3).

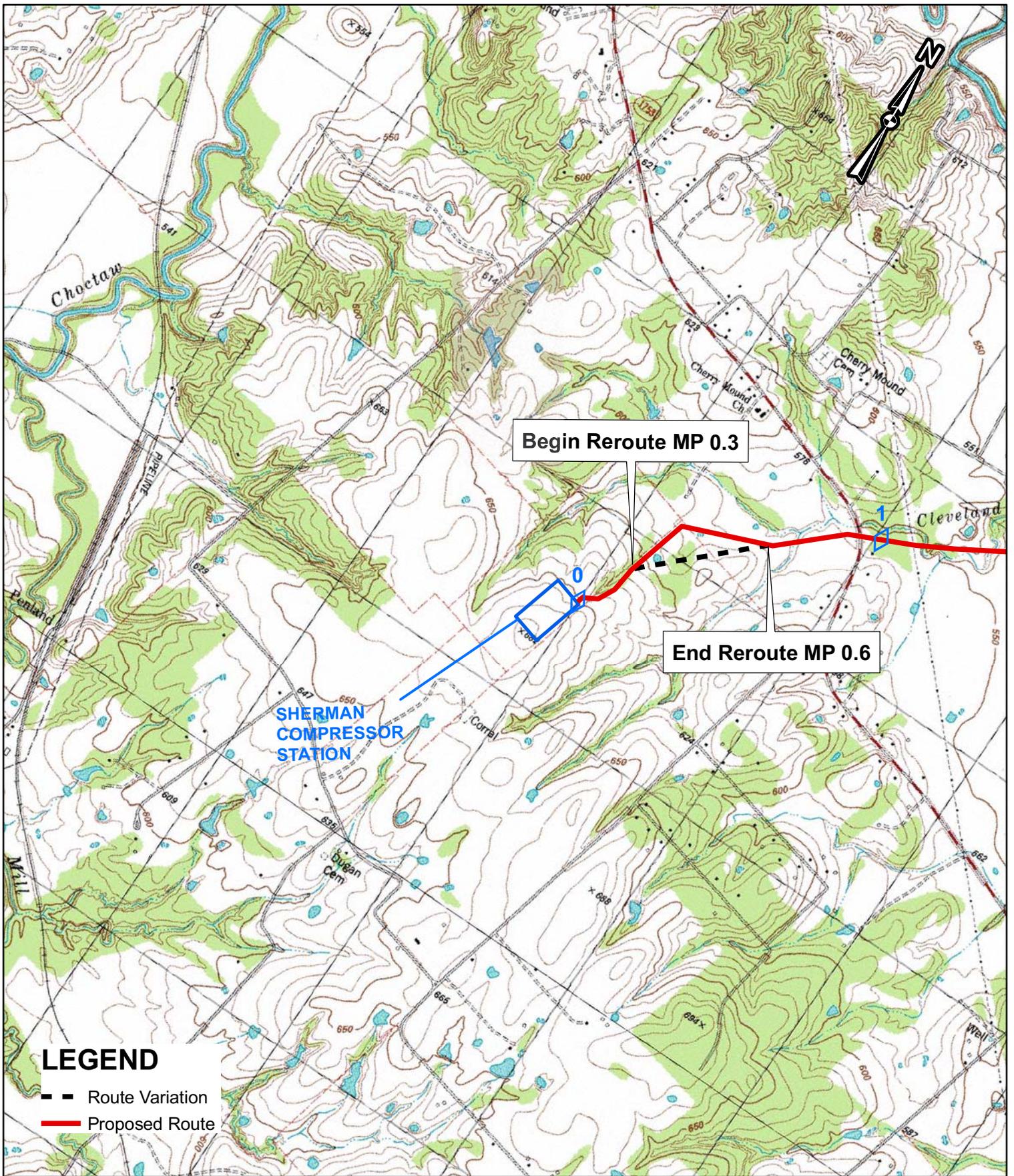


Figure 4.4.1-1

**Wilkerson Route Variation I  
Gulf Crossing Pipeline Project**

**1" = 2,000 feet**  
4-26



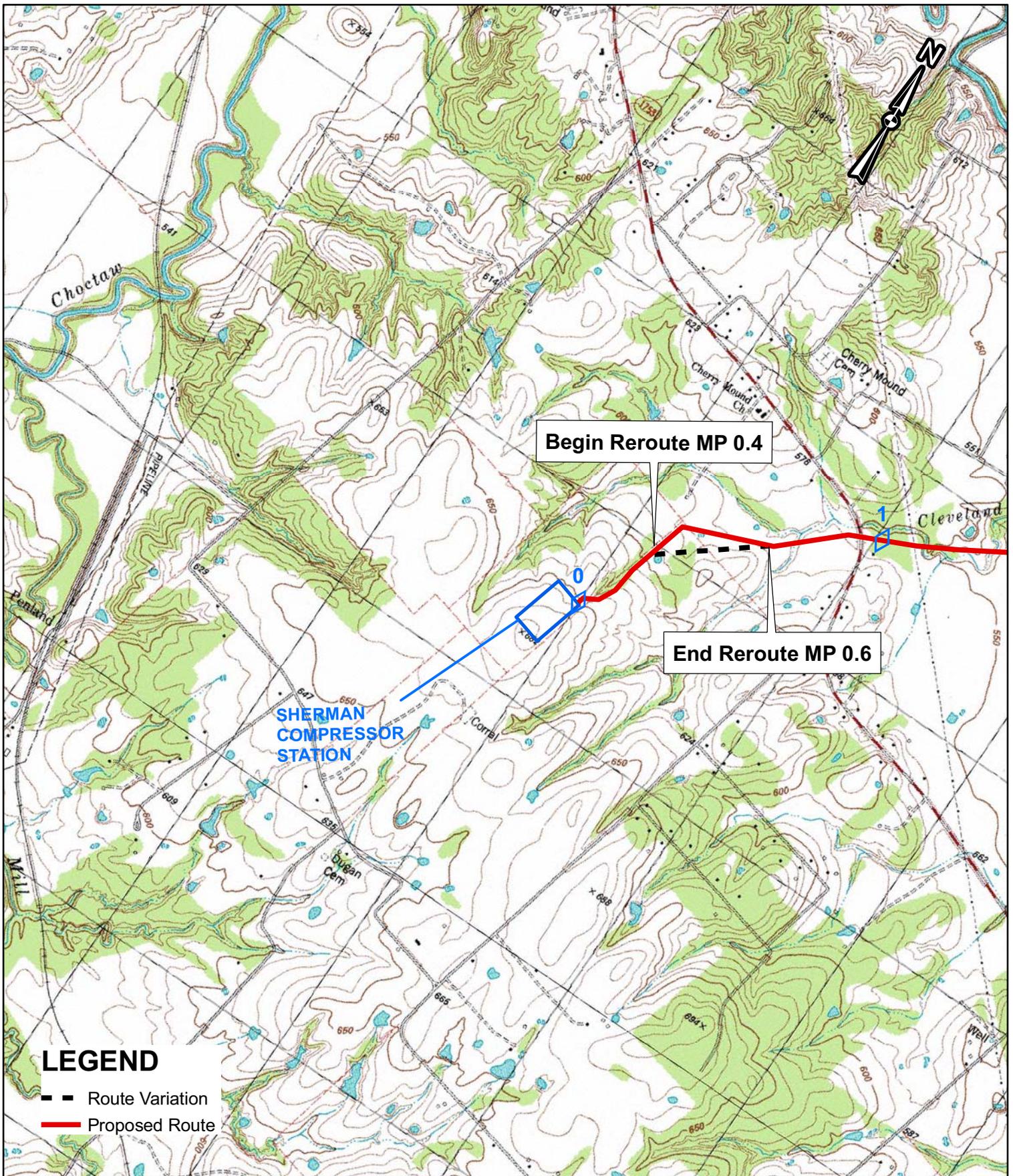
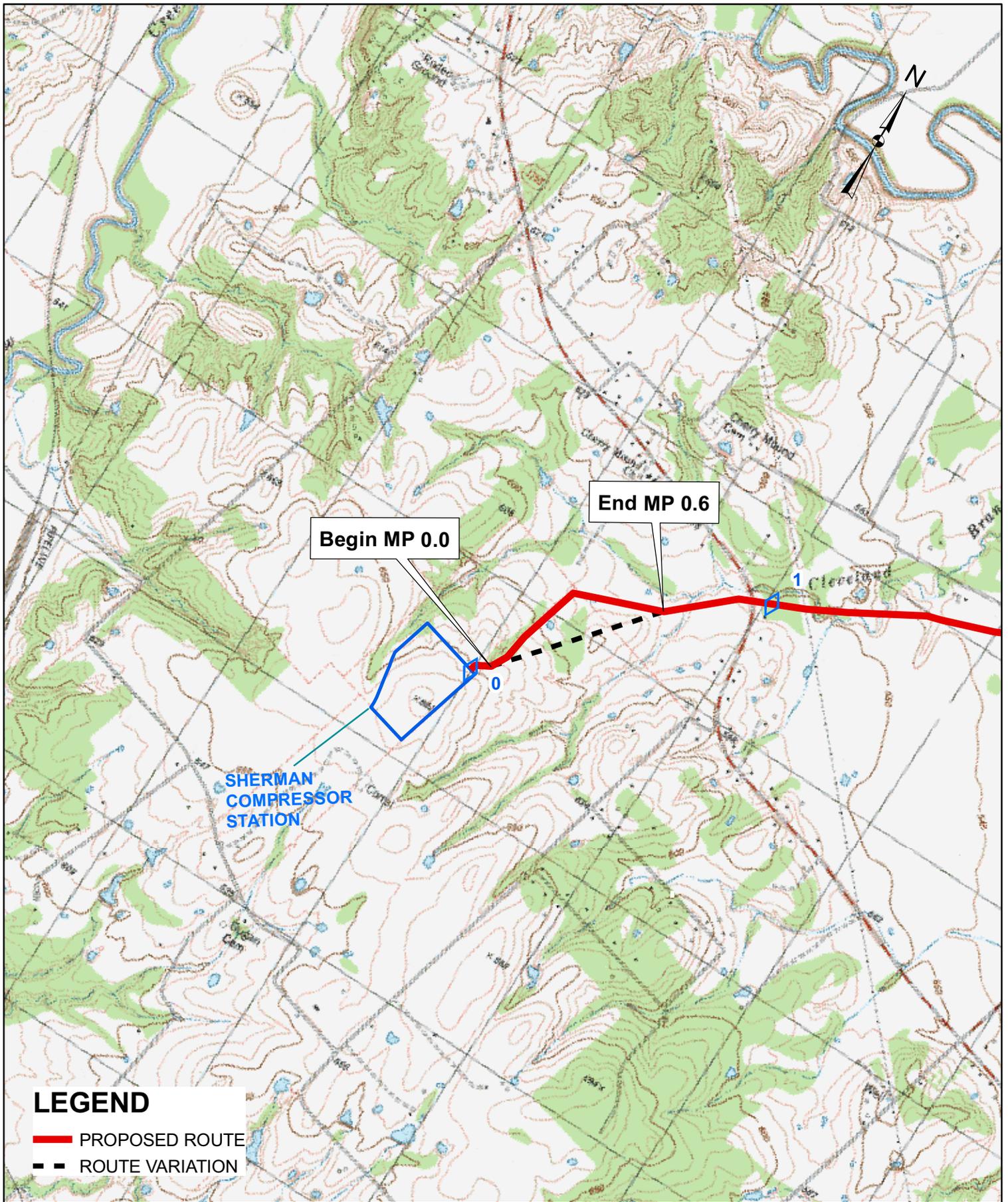


Figure 4.4.1-2

**Wilkerson Route Variation II  
Gulf Crossing Pipeline Project**

1" = 2,000 feet  
4-27





**Wilkerson Route Variation III  
Gulf Crossing Pipeline Project**

Figure 4.4.1-3



The Wilkerson Route Variations I and III would be approximately 0.1 mile shorter than each corresponding segment of the proposed Project alignment and would require 1.2 fewer acres of land for construction compared to the proposed Project alignment (Table 4.4.1-1). While these route variations would encumber less land during construction and operation, they would cross significantly more forested lands on an adjacent landowner's property. Neither the proposed Project alignment nor the route variations would impact wetlands or streams in this area.

Evaluation Criteria	Proposed Project Route	Wilkerson Route Variation I	Proposed Project Route	Wilkerson Route Variation II	Proposed Project Route	Wilkerson Route Variation III
Total Length (miles)	0.3	0.2	0.2	0.2	0.6	0.5
Landowners Affected (number)	2	2	2	2	2	2
Construction Impacts (acres)	3.6	2.4	2.4	2.4	7.3	6.1
Permanent Impacts (acres)	2.2	1.5	1.5	1.5	4.4	3.6
Adjacent to Existing Rights-of-Way (miles)	0.0	0.0	0.0	0.0	0.0	0.0
Stream Crossings (number)	0	0	0	0	0	0
Wetland Impacts (acres)	0.0	0.0	0.0	0.0	0.0	0.0
Land Uses	Pasture	Pasture, Forest	Pasture	Pasture, Forest	Pasture, Forest	Pasture, Forest

The Wilkerson Route Variation II would require a similar pipeline length and land requirements as the proposed Project route. Like the Wilkerson Route Variations I and III, this route variation would not impact any streams or wetlands within the area. Like the other evaluated route variations, the Wilkerson Route Variation II would impact more mature forested lands than the proposed Project route.

Although all of the Wilkerson Route Variations evaluated would avoid the stock pond on the Wilkerson property, the evaluated route variations would result in increased impacts to forested lands that would not return to pre-Project condition in a similar manner as the pasture lands associated with the proposed Project route. As discussed in Section 3.3, Gulf Crossing would implement its Plan and Procedures to minimize impacts to waterbodies on the Wilkerson property. Measures taken would include the use of temporary and permanent sediment and erosion control structures, implementation of a spill prevention plan, and a shortened construction timeline for crossing the waterbody. Due to the increased forested habitat that would be crossed by the evaluated route variations and the minimization of waterbody impacts associated with the implementation of the Companies' Plans and Procedures, we believe that none of the Wilkerson route variations would result in an environmental benefit and we have eliminated them from further consideration.

#### **4.4.2 Doyle Route Variation**

The Doyle Route Variation was developed in response to a landowner's comment expressing concerns about future land development in the vicinity of the proposed Project. Mr. Doyle suggested that the Project route be diverted approximately 0.25 mile south of his property and be collocated with an

existing Lonestar pipeline easement. In response to this comment, a route variation was developed that would deviate from the proposed Project alignment at MP 1.4, travel southeast and then turn northeast to resume the proposed route near MP 2.9 (see Figure 4.4.2-1).

Relative to the proposed route, the Doyle Route Variation would be 0.3 mile longer and incur an additional 2.4 acres of construction impacts and 2.0 acres of permanent land impacts (Table 4.4.2-1). The evaluated route variation would be collocated with an existing right-of-way for approximately 0.7 mile, while the proposed Project route would not be collocated in this area. Both evaluated routes would impact the same number of landowners and primarily cross pasture lands that would return to pre-Project land uses. Neither route would result in wetland impacts, but the route variation would result in one additional stream crossing.

<b>TABLE 4.4.2-1 Comparison of Doyle Route Variation and the Original Route</b>		
<b>Evaluation Criteria</b>	<b>Proposed Project Route</b>	<b>Doyle Route Variation</b>
Total Length (miles)	1.5	1.8
Landowners Affected (number)	10	10
Construction Impacts (acres)	18.2	21.6
Permanent Impacts (acres)	10.9	12.9
Adjacent to Existing Rights-of-Way (miles)	0	0.7
Stream Crossings (number)	0	1
Wetland Impacts (acres)	0	0
Land Uses	Pasture	Pasture

Despite the Doyle Route Variation alleviating landowner concerns about impacting future land development potential, the route variation would result in the additional encumbrance of land and an additional stream crossing. While the route variation would be collocated with an existing easement for a portion of the route, we believe that the additional land requirements and stream crossing would not result in an environmental benefit over the proposed Project route. Therefore, we have eliminated the Doyle Route Variation from further consideration.

#### **4.4.3 Everhart Route Variation**

The Everhart Route Variations were developed in response to a landowner’s comment expressing concerns about disruptions to his ranching operations, the degradation of well water, and the presence of erodible soils on his property. In response to this comment, we evaluated the Everhart Route Variation I that would deviate from the proposed Project alignment at MP 27.8, travel northwest and then turn east prior to resuming the proposed route near MP 29.2 (see Figure 4.4.3-1). The Everhart Route Variation II would diverge from the proposed Project alignment near MP 27.7, travel northwest and then northeast to resume the proposed Project alignment near MP 29.8 (see Figure 4.4.3-2).

Relative to the proposed route, the Everhart Route Variation I would be 0.4 mile longer and incur an additional 4.8 acres of construction impacts and 2.9 acres of permanent land impacts (Table 4.4.3-1). Neither the evaluated route variation nor the proposed Project route would be collocated with an existing right-of-way or would impact any wetland resources. The Everhart Route Variation I would cross one less intermittent stream, compared to the Proposed Project route, but would encumber additional land on three additional landowner’s property.

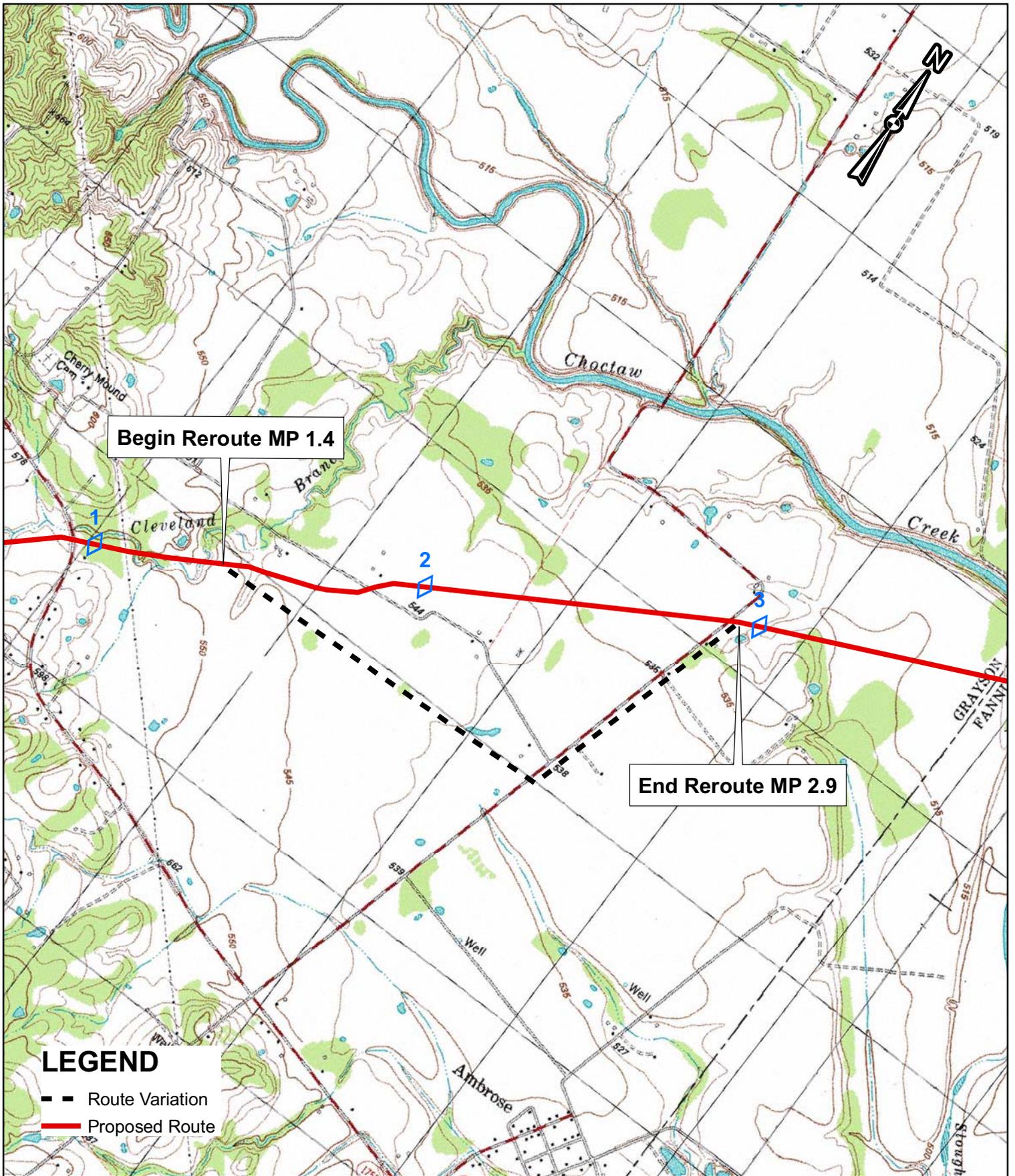


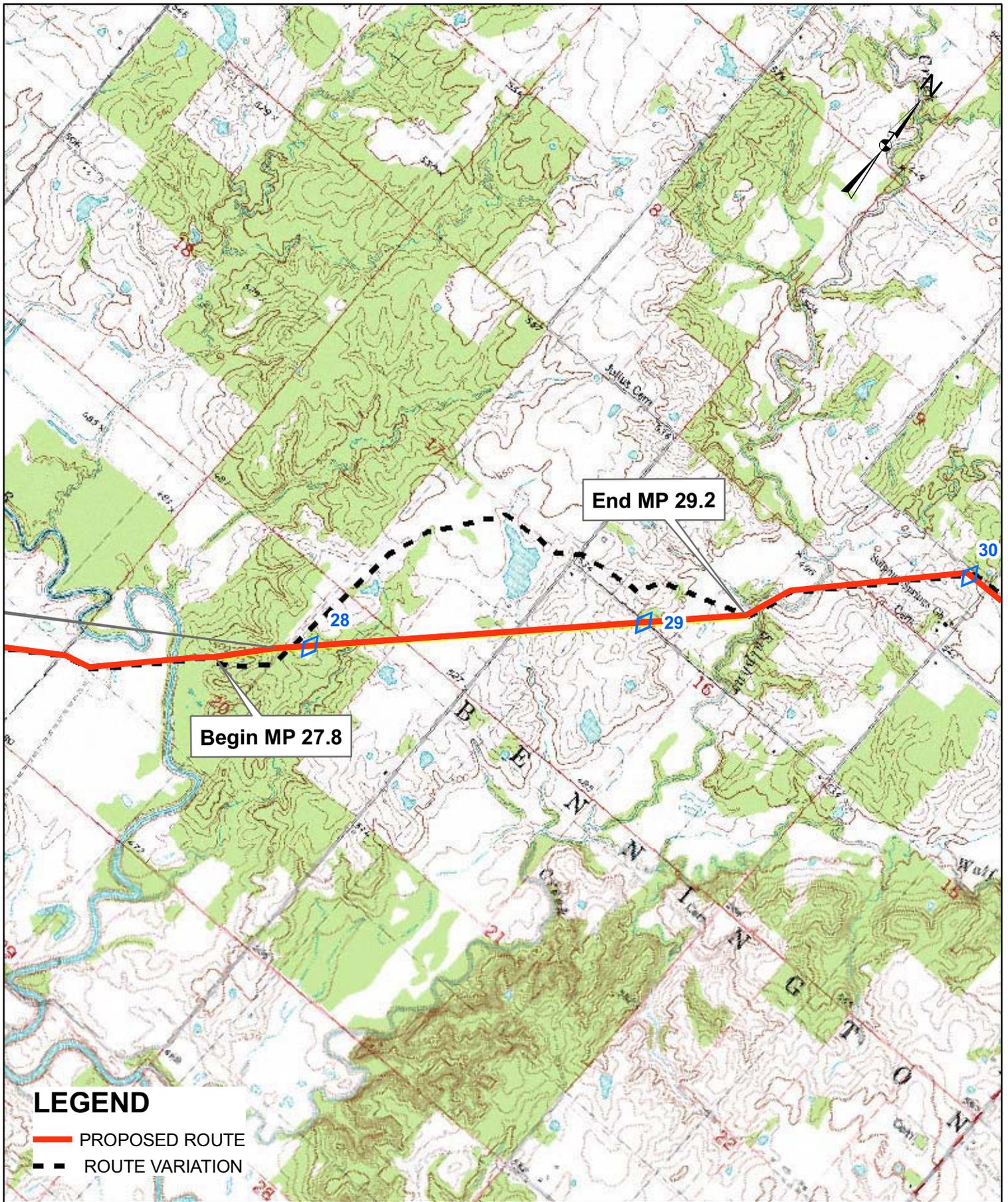
Figure 4.4.2-1

**Doyle Route Variation  
Gulf Crossing Pipeline Project**

**1" = 2,000 feet**

4-31





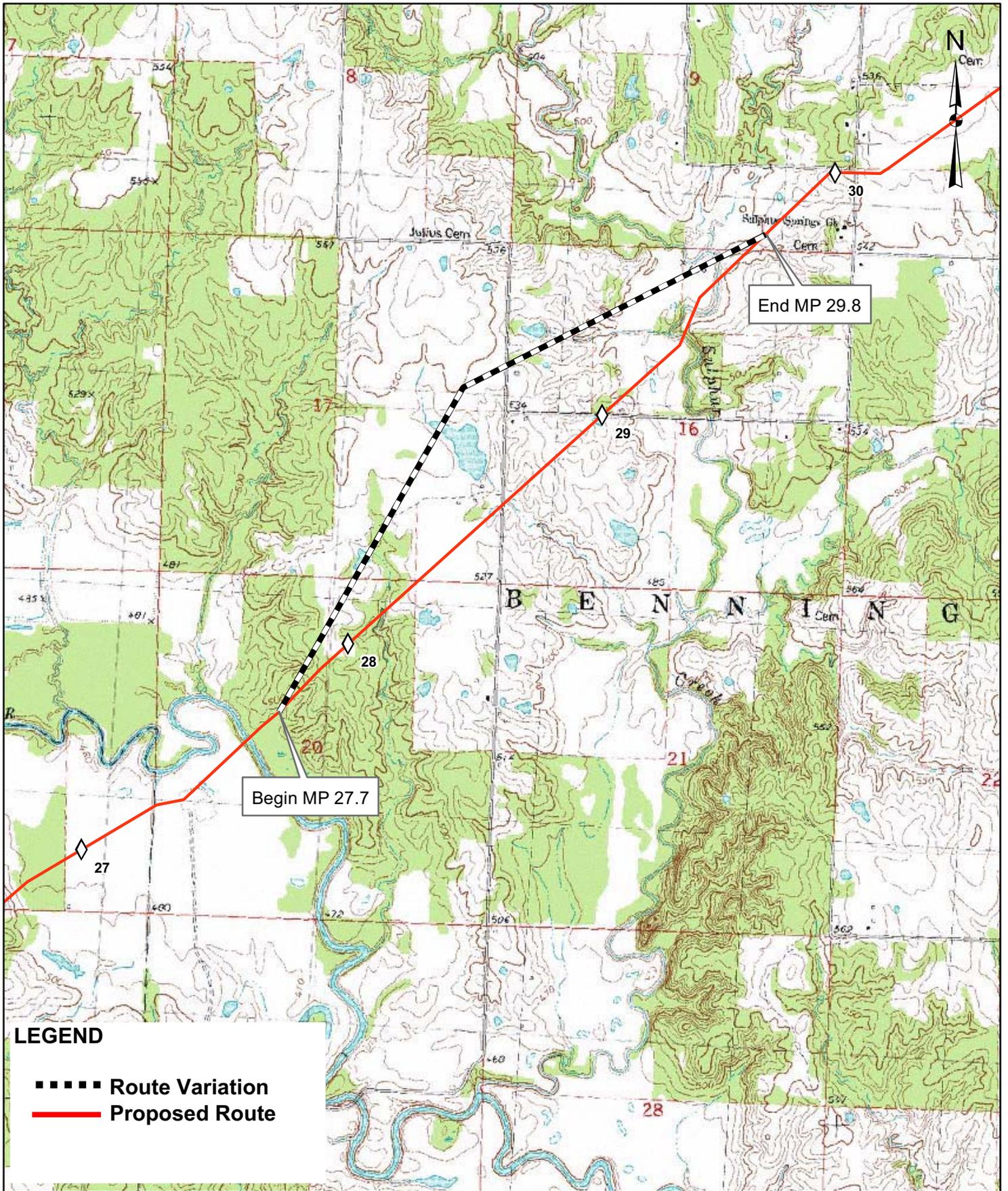
**LEGEND**

- PROPOSED ROUTE
- - - ROUTE VARIATION

**Everhart Route Variation I  
Gulf Crossing Pipeline Project**

Figure 4.4.3-1





**Everhart Route Variation II  
Gulf Crossing Pipeline Project**

Figure 4.4.3-2



TABLE 4.4.3-1 Comparison of Everhart Route Variations and the Original Route				
Evaluation Criteria	Proposed Project Route	Everhart Route Variation I	Proposed Project Route	Everhart Route Variation II
Total Length (miles)	1.4	1.8	2.1	2.1
Landowners Affected (number)	1	4	2	3
Construction Impacts (acres)	17.0	21.8	25.5	25.5
Permanent Impacts (acres)	10.2	13.1	15.3	15.3
Adjacent to Existing Rights-of-Way (miles)	0.0	0.0	0.0	0.0
Stream Crossings (number)	2	1	3	1
Wetland Impacts (acres)	0.0	0.0	0.0	0.0
Land Uses	Pasture, Agricultural, Forest	Pasture, Agricultural, Forest	Pasture, Agricultural, Forest	Pasture, Agricultural, Forest

The Everhart Route Variation II would be approximately the same length as the proposed route and incur similar construction and permanent impacts land impacts (Table 4.4.3-1). Neither the revised route variation nor the proposed Project route would be collocated with an existing right-of-way or impact any wetland areas. The Everhart Route Variation II would affect one additional property owner, but the additional landowner would not be newly affected. The revised route variation would eliminate two crossings of Sulphur Creek, a perennial stream.

Because the revised route variation would address landowner concerns and reduce the number of perennial stream crossings without incurring additional land impacts or other environmental impacts, **we recommend that:**

- **Gulf Crossing should incorporate the Everhart Route Variation II (MP 27.7 to 29.8) into the Gulf Crossing pipeline route. Gulf Crossing should file with the Secretary for written review and approval by the Director of OEP, revised construction alignment sheets that show the modified route and workspaces, prior to construction in this area.**

#### 4.4.4 Foster Route Variation

The Foster Route Variation was developed in response to a landowner's request for the Project to be collocated with an existing right-of-way on his property. The Foster Route Variation deviates from the proposed route at MP 40.7, where the route variation would continue north and then east across the Red River before rejoining the proposed alignment at MP 42.2 (see Figure 4.4.4-1).

The Foster Route Variation would be 0.1 mile longer than the proposed Project route, encumbering an additional 1.2 acres of land for construction and an additional 0.7 acre of land for operation (Table 4.4.4-1). Both routes would cross one stream and would cross open and agricultural lands. The proposed Project route would also cross forested habitat. Further, the proposed Project route would not be collocated with an existing right-of-way, while the route variation would be collocated for 1.6 miles. Gulf Crossing proposes to cross the Red River via HDD, which would require extra workspace adjacent to the proposed Project right-of-way. Due to the angle of the existing pipeline in which the Foster Route Variation would be collocated, the Foster Route Variation would require that HDD extra workspace be placed over the existing, live pipeline. Mr. Foster requested this co-location in several

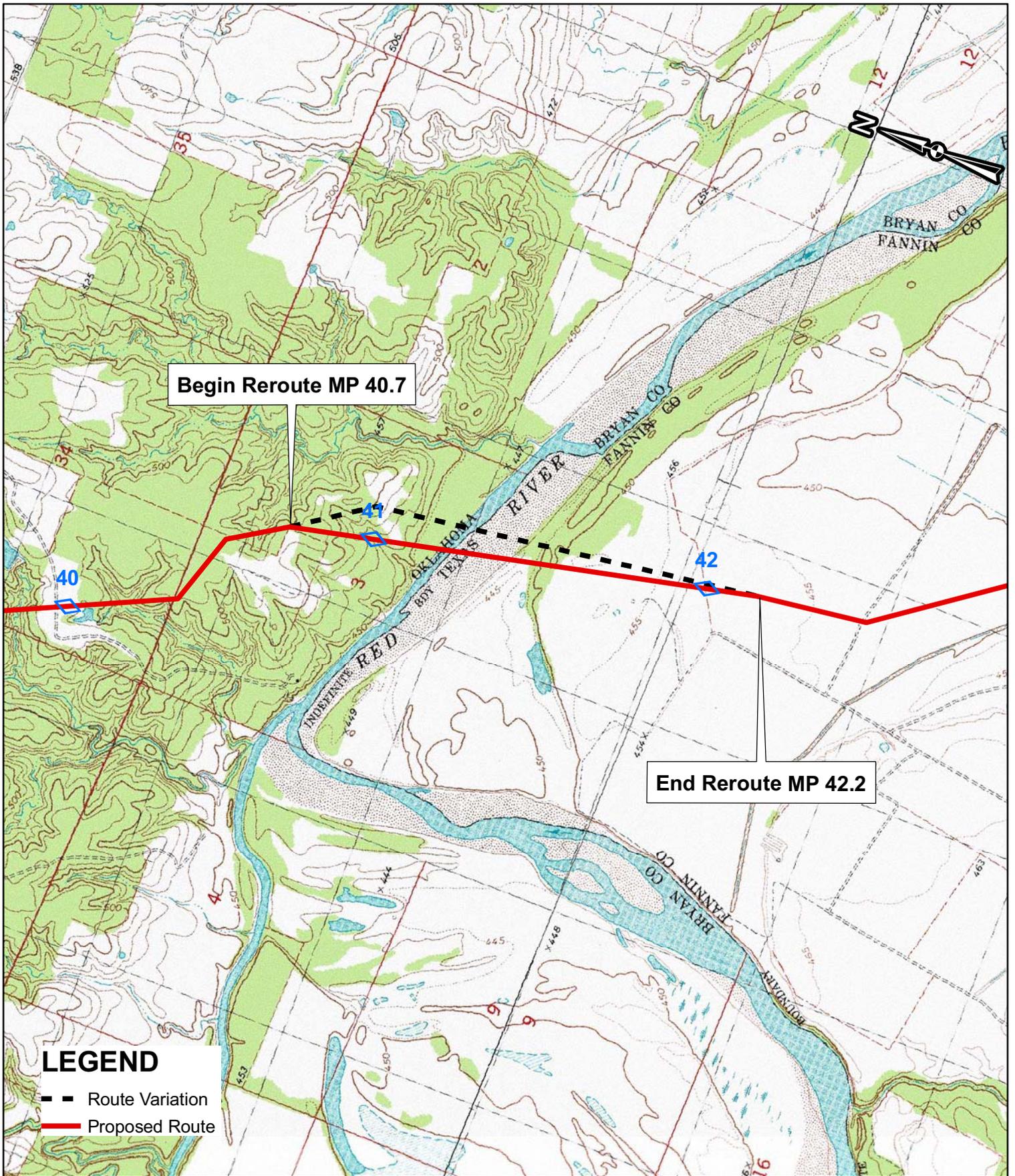


Figure 4.4.4-1

**Foster Route Variation  
Gulf Crossing Pipeline Project**

**1" = 2,000 feet**  
4-35



comment letters and was concerned about the “orphaning” of land between the two rights of ways that would occur for the proposed route. Gulf Crossing’ engineers have expressed concerns that this placement of extra workspace could compromise worker’s safety due to the possibility of working over the existing active pipeline. In addition, for the pipeline to collocate, the HDD entry or exit pit would be closer to the bank of the Red River and result in a higher risk of frac-out.

Evaluation Criteria	Proposed Project Route	Foster Route Variation
Total Length (miles)	1.5	1.6
Landowners Affected (number)	2	2
Construction Impacts (acres)	18.2	19.4
Permanent Impacts (acres)	10.9	11.6
Adjacent to Existing Rights-of-Way (miles)	0	1.6
Stream Crossings (number)	1	1
Wetland Impacts (acres)	0	0
Land Uses	Open Land, Forest, Agriculture	Open Land, Agriculture

While the Foster Route Variation would result in pipeline collocation and a reduction of forest habitat crossed, compared to the proposed Project route, adoption of this route variation would result in safety concerns associated with locating HDD work space over an existing pipeline. Due to the safety concerns raised by Gulf Crossing engineers, and concerns over HDD frac-outs along this sensitive waterbody, we have eliminated the Foster Route Variation from further consideration.

#### **4.4.5 Fannin County WRP Route Variation**

The Fannin County WRP Route Variation was developed to reduce the WRP crossing length and associated impacts to a WRP encumbered parcel in Fannin County, Texas. The Fannin County WRP Route Variation would diverge from the proposed Project alignment at MP 45.1 and would continue southeast from the divergence point to the Fannin/Lamar County line, where it would travel due south along the county line prior to resuming the proposed Project route near MP 48.7 (Figure 4.4.5-1). Table 4.4.5-1 provides a comparison of the Fannin County WRP Route Variation and the corresponding proposed Project alignment.

The Fannin County Route Variation would result in an additional 0.6 mile of pipeline that would permanently encumber approximately 4.3 acres of land. Further, the Fannin County WRP Route Variation would require increased greenfield construction and would result in increased wetland impacts, compared to the proposed Project alignment. While the route variation would have less of its length collocated with existing rights-of-way, the route variation would be collocated with existing roadways to minimize greenfield construction. All other environmental impacts associated with the Fannin County Route Variation and the proposed Project route would be similar.

The NRCS has requested that the proposed Project route avoid and minimize the use of lands encumbered by WRP easements to the maximum extent practicable. Approximately 1.9 miles of the proposed Project alignment would traverse the WRP easement, and a single HDD of the length required to entirely avoid impacts to the WRP easement would not be feasible; therefore, a portion of the WRP

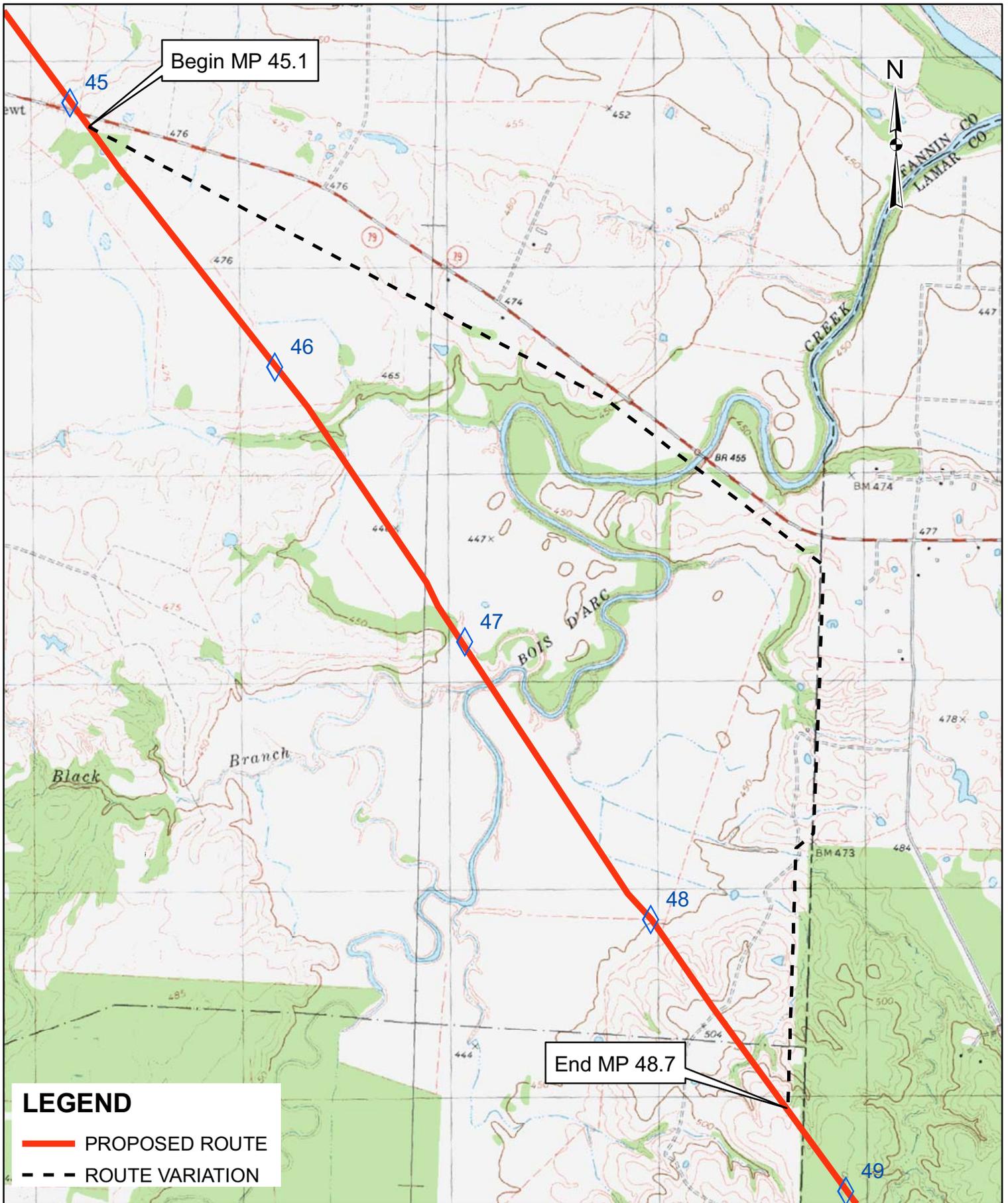


Figure 4.4.5-1

**Fannin County WRP Route Variation  
Gulf Crossing Pipeline Project**



would be crossed via open-cut. In contrast, the Fannin County WRP Route Variation would reduce the WRP crossing length by approximately 0.9 mile. Given the extended length of the WRP easement crossing associated with the proposed Project alignment, we believe that the proposed Project alignment in this area would result in increased impacts to the WRP, compared to the evaluated route variation.

<b>TABLE 4.4.5-1 Comparison of Fannin County WRP Route Variation and the Original Route</b>		
<b>Evaluation Criteria</b>	<b>Proposed Project Route</b>	<b>Fannin County WRP Route Variation</b>
Total Length (miles)	3.6	4.2
Landowners Affected (number)	1	1
Construction Impacts (acres)	43.6	50.9
Permanent Impacts (acres)	26.2	30.5
Adjacent to Existing Rights-of-Way (miles)	3.6	0.7
Stream Crossings (number)	6	6
Wetland Impacts (acres)	0.4	0.7
WRP Lands Crossed	1.9	1.0
Land Uses	Open land, Forest	Open land, Forest

In an effort to reduce both WRP-related and non-WRP-related environmental impacts, we believe that the Fannin County WRP Route Variation would best balance impacts to environmental resources and WRP easements, and **we recommend that:**

- Gulf Crossing should incorporate the Fannin County WRP Route Variation (MP 45.1 to 48.7) into the Gulf Crossing pipeline route. Gulf Crossing should file with the Secretary, for written review and approval by the Director of OEP, revised construction alignment sheets that show the modified route and workspaces, prior to construction in this area. Further, Gulf Crossing should consult with the NRCS regarding proposed crossing methods and mitigation measures for the Fannin County WRP located between MPs 46.7 and 47.8. Gulf Crossing should file for review all applicable documentation of meetings, special considerations, and agreements reached as a part of consultation.**

#### **4.4.6 The Nature Conservancy Route Variation**

The TNC Route Variation was developed in response to a TNC request that the proposed Project shift 0.25 mile north of the proposed alignment to minimize impacts to sensitive wetland and upland species and their habitats present on the Caddo Black Bayou Reserve. The route variation would diverge from the proposed Project route at MP 174.5 and resume the original alignment at MP 177.1 (see Figure 4.4.6-1).

The TNC Route Variation would increase the Project's length by 0.1 mile and encumber additional temporary and permanent right-of-way relative to the proposed Project route (Table 4.4.6-1). The evaluated route variation would cross less wetland habitat than the proposed Project route, but Gulf Crossing proposes to use HDD to cross wetland habitat contained within the Caddo Black Bayou Reserve. The nature of the wetland approach associated with the route variation would require additional

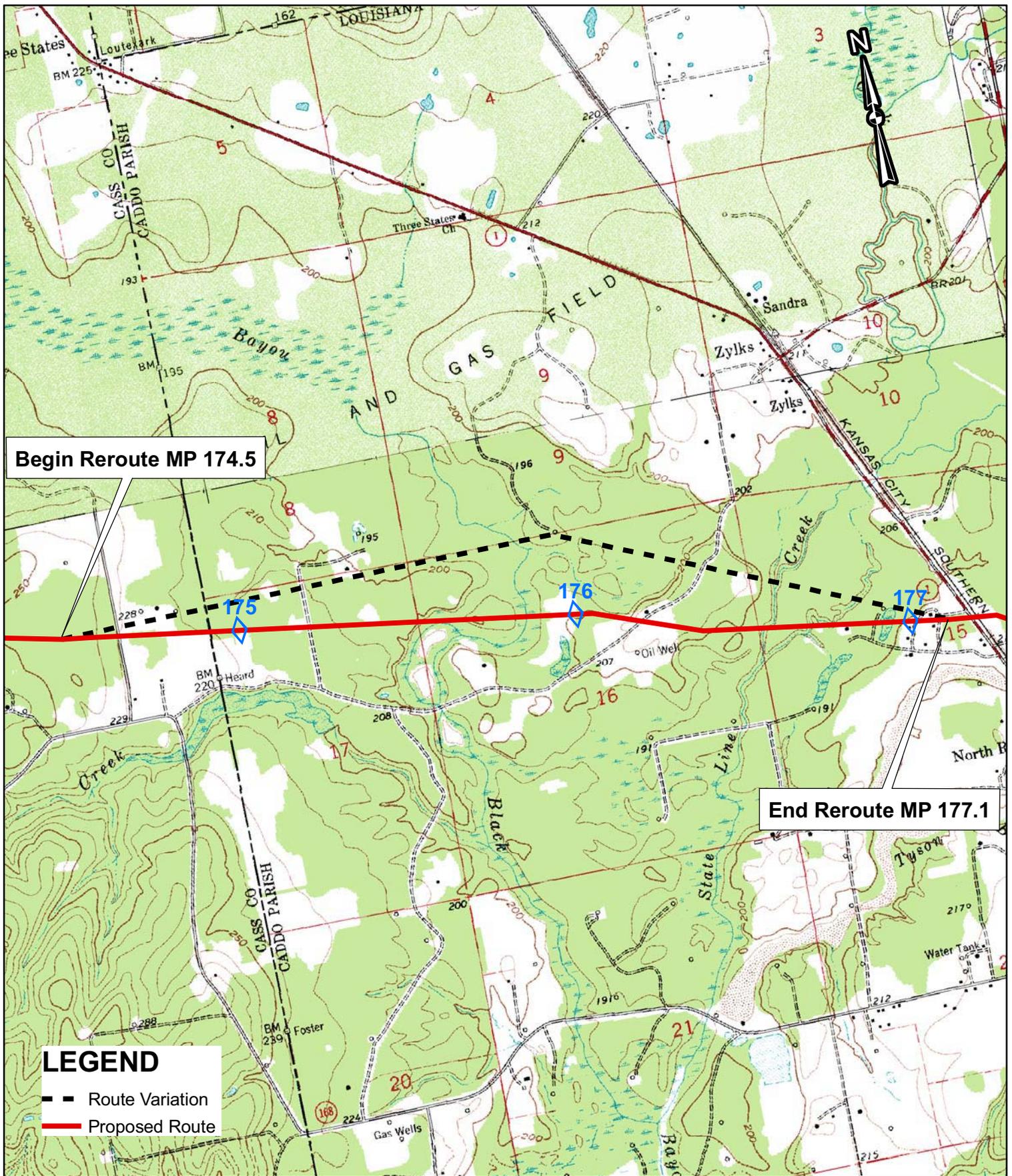


Figure 4.4.6-1

**TNC Route Variation  
Gulf Crossing Pipeline Project**

1" = 2,000 feet  
4-39



temporary workspace in the form of a false right-of-way (additional workspace required for stringing the pipeline) for HDD use, thus the route variation would result in increased temporary construction impacts to forested upland habitats on the property.

Evaluation Criteria	Proposed Project Route	TNC Route Variation
Total Length (miles)	2.6	2.7
Landowners Affected (number)	10.0	10.0
Construction Impacts (acres)	31.5	32.7
Permanent Impacts (acres)	18.9	19.6
Adjacent to Existing Rights-of-Way (miles)	0.0	0.0
Stream Crossings (number)	3.0	3.0
Wetland Impacts (acres)	1.6	1.3
Land Uses	Forest, Wetland	Forest, Wetland

Gulf Crossing has surveyed the proposed route in this area and has indicated that mixed forested upland vegetative communities exist within construction right-of-way and extra workspaces. Gulf Crossing proposes to use HDD to minimize impacts to wetland communities in the Preserve. Gulf Crossing has also indicated that no sensitive upland communities would be crossed via open-cut. However, it is not clear to the FERC if the proposed HDD and mitigation measures would adequately minimize Project related impacts on the Caddo Black Bayou Preserve. We have recommended in Section 3.6.1.5 that Gulf Crossing finalize consultations with the Nature Conservancy regarding impacts and mitigation within the Caddo Black Bayou Preserve.

#### **4.4.7 Radescich Route Variation**

The Radescich Route Variation was developed in response to landowner concerns about Project-related impacts to forested areas on his property. This route variation would diverge from the proposed Project alignment at MP 230.4 in Claiborne Parish, Louisiana (Figure 4.4.7-1). The Radescich Route Variation would travel east and then southeast before returning to the proposed Project alignment at approximately MP 231.0.

The Radescich Route Variation would increase the Project's length by 0.1 mile and encumber additional temporary and permanent right-of-way, relative to the proposed Project route (Table 4.4.7-1). The evaluated route variation would cross less forested habitat than the proposed Project route, but would require more greenfield construction due its collocation for only half its length. The same waterbody would be crossed by both the proposed Project route and the route variation at different locations.

While the route variation would reduce the quantity of forested lands crossed, we believe that the extensive collocation of the proposed Project route in this area would minimize impacts to forested areas. Further, we believe that the longer length and additional land requirements of the Radescich Route Variation would not result in an environmental benefit over the proposed Project route. Therefore, we have eliminated the Radescich Route Variation from further consideration.

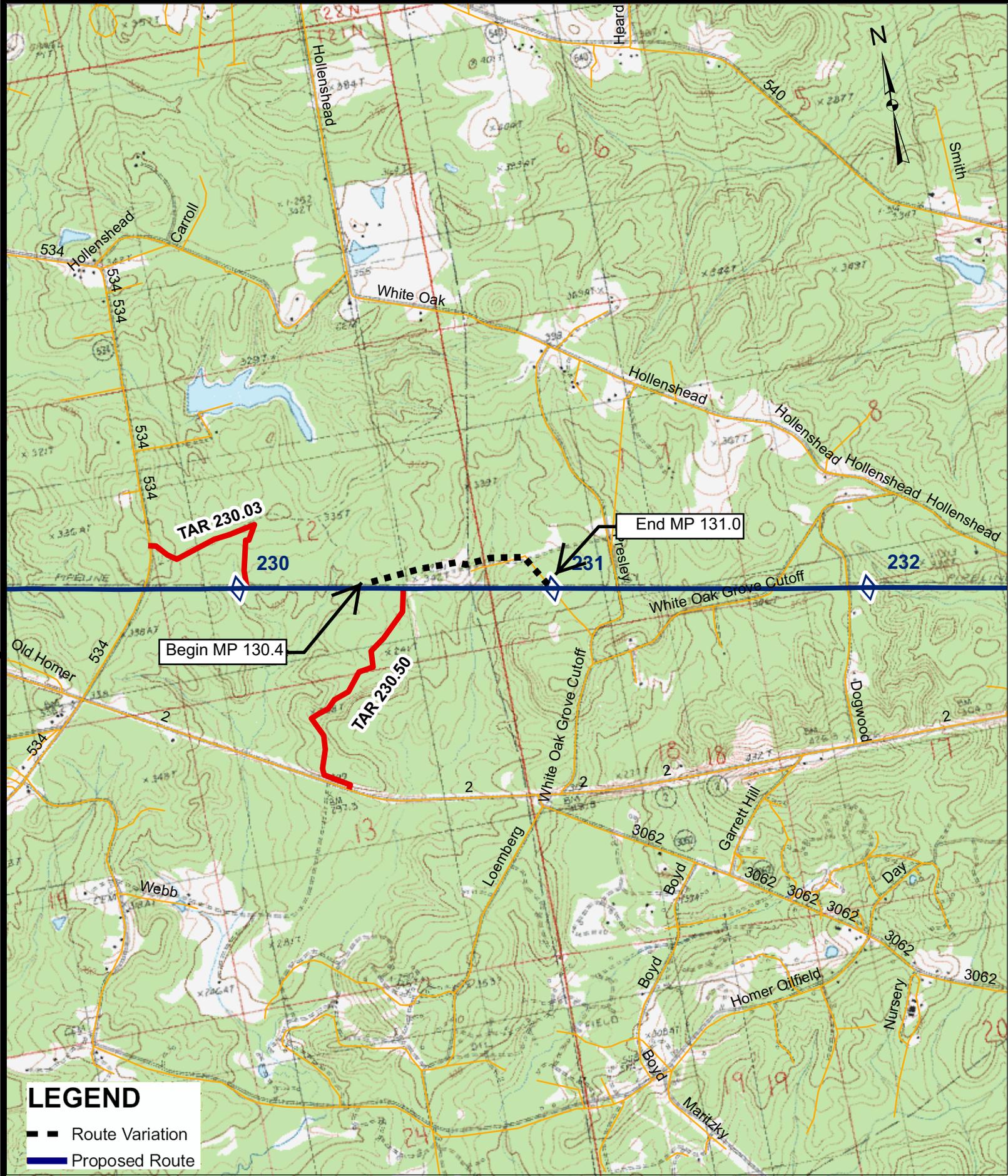


Figure 4.4.7-1

**Radescich Route Variation  
Gulf Crossing Pipeline Project**



<b>TABLE 4.4.7-1 Comparison<sup>a</sup> of Radescich Route Variation and the Original Route</b>		
<b>Evaluation Criteria</b>	<b>Proposed Project Route</b>	<b>Radescich Route Variation</b>
Total Length (miles)	0.5	0.6
Landowners Affected (number)	5	5
Construction Impacts (acres)	6.1	7.3
Permanent Impacts (acres)	3.6	4.4
Adjacent to Existing Rights-of-Way (miles)	0.5	0.3
Stream Crossings (number)	1	1
Land Uses	Forest	Forest, Open land
Note: <sup>a</sup> This evaluation was based upon USGS topographic mapping and aerial photo interpretation. Survey data was not available for this comparison.		

#### **4.4.8 Tripp Trust Route Variation**

The Tripp Trust Route Variation was evaluated in response to landowner concerns regarding Project impacts to their property. This route variation would diverge from the proposed Project alignment at MP 241.4 in Claiborne Parish, Louisiana (Figure 4.4.8-1). This route variation would then travel north of the proposed Project route before returning to the proposed alignment at MP 242.1.

The route variation would be 0.1 mile longer than the proposed alignment in this location and would require an additional 1.2 acres for Project construction and an additional 0.7 acres for Project operation (Table 4.4.8-1). The Tripp Route Variation would result in greenfield construction through forested lands along its entire length. One less waterway would be crossed under this route variation.

<b>TABLE 4.4.8-1 Comparison of Tripp Trust Route Variation and the Original Route</b>		
<b>Evaluation Criteria</b>	<b>Proposed Project Route</b>	<b>Tripp Route Variation</b>
Total Length (miles)	0.8	0.9
Landowners Affected (number)	5	3 minimum
Construction Impacts (acres)	9.7	10.9
Permanent Impacts (acres)	5.8	6.5
Adjacent to Existing Rights-of-Way (miles)	0.8	0
Stream Crossings (number)	3	2
Wetland Impacts (acres)	0	0
Land Uses	Forest; Open land	Forest

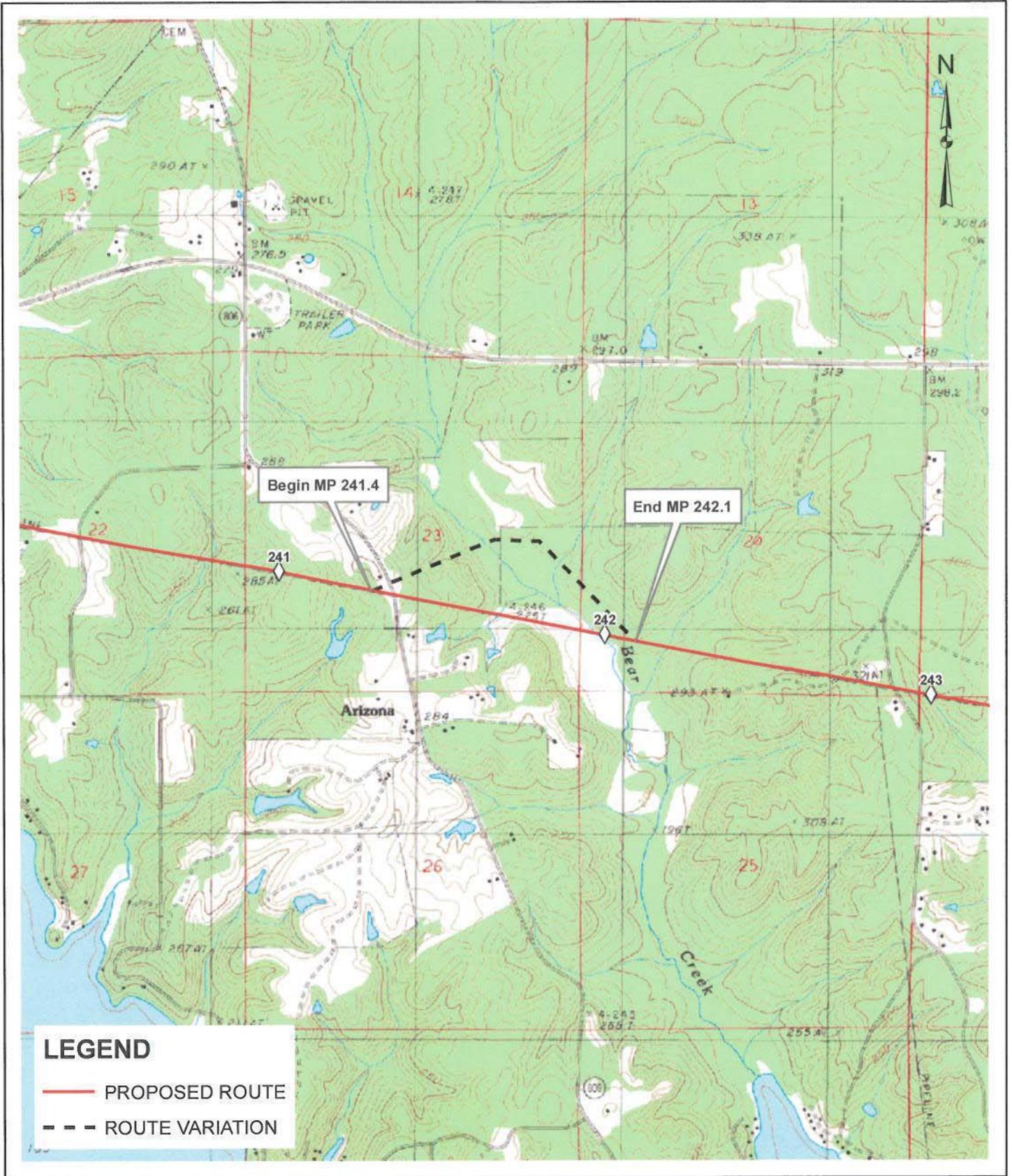


Figure 4.4.7-1



**Tripp Trust Route Variation  
Gulf Crossing Pipeline Project**

Despite the Tripp Trust Route Variation alleviating landowner concerns about Project impacts, the route variation would result in the additional encumbrance of land for Project construction and operation and would not be collocated with existing right-of-way. While the route variation would reduce the number of waterways crossed, we believe that the additional land requirements and the greenfield construction would not result in an environmental benefit over the proposed Project route. Therefore, we have eliminated the Tripp Trust Route Variation from further consideration.

#### **4.4.9 Stonebridge Estates Route Variation**

We developed the Stonebridge Estates Route Variations in response to comments received from the property owner regarding Project-related impacts to a proposed residential development located in Ouachita Parish, Louisiana. The Stonebridge Estates Route Variation I would diverge from the proposed Project route at approximately MP 294.9 and would avoid the proposed Stonebridge Estates and WRPs in the area (Figure 4.4.9-1). This route variation would travel south along an existing right-of-way before traveling in a southeasterly, easterly, and northeasterly direction. The proposed Project alignment would be resumed at approximately MP 298.6. The Stonebridge Estates Route Variation II would diverge from the proposed Project alignment at approximate MP AR 295.5, where the route variation would continue northeastern direction until reaching Louisiana State Highway 2. The Stonebridge Route Variation II would then travel south to resume the original alignment at approximately MP AR 297.8.

The Stonebridge Estates Route Variation I would be approximately 0.5 miles longer than corresponding segment of the proposed Project route, which would result in the permanent encumbrance of approximately 3.6 additional acres of land (Table 4.4.9-1). While this route variation would result in an increased quantity of land being encumbered for operation, it would impact significantly fewer wetlands. Further, the Stonebridge Estates Route Variation I would require approximately one additional mile of greenfield construction, compared to the proposed Project alignment. This route variation would cross the southern extent of the planned Stonebridge Estates; which would potentially impede future development of some of the planned parcels within the community. All WRPs in the area would be avoided.

The Stonebridge Estates Route Variation II would be approximately 0.5 mile longer than the corresponding segment of the proposed Project route and would permanently encumber approximately 3.6 additional acres of land. Further, this route variation would impact fewer wetlands and the same number of waterbodies as the proposed Project alignment. A significant portion of the Stonebridge Estates Route Variation II would be collocated with existing rights-of-way; the corresponding proposed Project alignment would not be collocated. The planned Stonebridge Estates development and WRPs in the area would be avoided under this route variation.

Gulf Crossing has indicated that it has routed the proposed Project alignment as close as practical to the Stonebridge Estates property line. Further, construction and operation of the proposed Project would not preclude the development of Stonebridge Estate parcels, as long as they meet certain restrictions (such as not placing structures or trees within the bounds of the permanent right-of-way). Our review of aerial photography and proposed development plans indicate that placement of the Project alignment, as proposed, could impede development along the northern boundary of the planned development.

The Stonebridge Route Variation I would potentially impede future development of parcels within the proposed development in those portions of the route variation traversing the development. Additionally, this route variation would encumber more land, require increased greenfield construction, and would cross more waterbodies, compared to the proposed Project. Despite the Stonebridge Route



Variation I impacting fewer wetlands, we believe that the environmental benefits associated with the route variation would not exceed those of the proposed Project route; therefore, we have eliminated the Stonebridge Route Variation I from further consideration.

Evaluation Criteria	Proposed Project Route	Stonebridge Estates Route Variation I	Proposed Project Route	Stonebridge Estates Route Variation II
Total Length (miles)	3.8	4.3	2.3	2.8
Landowners Affected (number)	6	6 minimum	NA	NA
Construction Impacts (acres)	45.8	52.1	27.8	33.9
Permanent Impacts (acres)	27.5	31.3	16.7	20.3
Adjacent to Existing Rights-of-Way (miles)	1.5	0.5	0.0	0.6
Stream Crossings (number)	2	4	1	1
Wetland Impacts (acres)	10.7	4.4	6.6	5.4
Land Uses	Forested and shrub wetland, Open land, Forested, and Agriculture	Agriculture, Forested, Forested wetland, and Open land	Agriculture, Forested, Forested Wetland, and Open land	Agriculture, Forested, Forested Wetland, and Open land
<p>Note:            NA = Information not available.  <sup>a</sup> This evaluation was based upon USGS topographic mapping and aerial photo interpretation. Survey data was not available for this comparison.</p>				

The Stonebridge Route Variation II would decrease the quantity of wetlands impacted and would avoid the planned development and WRPs in the area. This route variation would be longer in length, compared to the proposed Project alignment, but we believe that the increased collocation associated with this route variation would compensate for its increased length. We believe that the Stonebridge Estates Route Variation II would best minimize environmental impacts while avoiding the planned residential development and WRPs; therefore, **we recommend that:**

- Gulf Crossing should incorporate the Stonebridge Estates II Route Variation (MP 295.5 to 297.8) into the Gulf Crossing pipeline route. Gulf Crossing should file with the Secretary, for written review and approval by the Director of OEP, revised construction alignment sheets that show the modified route and workspaces, prior to construction in this area.**

#### **4.5 ABOVEGROUND FACILITY ALTERNATIVES**

We evaluated the proposed locations of the new aboveground facilities to determine whether environmental impacts would be reduced or mitigated by the use of alternative facility sites. Our

evaluation involved the inspection of aerial photography and mapping, as well as site visits along the proposed Project corridor. The aboveground facilities for the proposed Project include four new compressor stations and the addition of new compression at one existing station, seven M/R stations, 18 MLVs, and eight pig launcher/receiver stations. All MLV station sites would be located within the proposed permanent right-of-way and all of the pig launcher/receiver facilities would be located within the confines of the proposed compressor stations or pipeline permanent right-of-way. The proposed locations of the MLVs along the Project route were largely determined based on DOT safety regulations that specify the maximum distance between sectionalizing block valves while being located in readily accessible areas. For these reasons, we did not consider alternatives for these facilities.

Of the seven M/R stations proposed, all would be located within a proposed or existing compressor station facility, except for the Enogex, Texas Gas, and CGT M/R stations. Because the location of the M/R stations would be linked to the location of the associated natural gas receipt and interconnect points, the search for alternatives was constrained to sites located adjacent to the intersection of the proposed Project route and the planned and existing pipeline facility locations.

We did not identify any alternative sites that would offer significant environmental advantages over the proposed sites for the Enogex and Texas Gas M/R stations. The initially proposed area of disturbance for the proposed CGT M/R station (MP 335.8) would have been located within 50 feet of Cow Bayou in an agricultural field in Madison Parish, Louisiana. However, Gulf Crossing has since determined that this M/R station would need to be located approximately 1,650 feet southwest of the originally proposed location, which will increase the distance from Cow Bayou to approximately 500 feet. Further, the location of the CGT pipeline restricts the alternate placement of this facility. As such, we did not identify an alternative site for the CGT M/R station.

As with the other proposed aboveground facilities, the compressor station locations would be constrained to sites near the proposed pipeline route. Additionally, the proposed compressor station sites along the pipeline route were largely dictated based on engineering and economic design standards. As described in Section 2.0, the proposed Sherman and Paris Compressor Stations would be located in Texas, while the Mira and Sterlington Compressor Stations would be located in Louisiana. Additional compression would be added to the Harrisville Compressor Station in Simpson County, Mississippi. As described in Section 3.8, construction and operation of the four new compressor stations would result in a permanent conversion of approximately 11 acres of forest land, 10 acres of agricultural land, and 9 acres of open land. However, no wetlands or other environmentally sensitive features would be affected at any of these proposed compressor station locations. Given the measures proposed by the Companies and our recommendations, we have determined that operation of these facilities would not result in significant long term air quality degradation or significant noise impacts to any nearby residents (see Section 3.11). Since construction of the Sterlington Compressor Station and the expansion of the Harrisville Compressor Station would occur within the bounds of existing Gulf South compressor station footprints, alternative sites for these facilities were not evaluated. Discussion of alternative sites for the Sherman, Paris, and Mira Compressor Stations are included below.

#### **4.5.1 Sherman Compressor Station Site Alternatives**

Based on engineering and economic limitations, alternatives for the Sherman Compressor Station Site were constrained to the first four miles of the pipeline origin. We evaluated seven alternative sites to the proposed site, located at MP 0, between MPs 1 and 4 (see Figure 4.5.1-1). These alternative sites were developed in response to comments from several community members expressing concerns about future air emission, noise, and visual impacts at the proposed site. Project noise and air emission impacts and



plans to minimize these impacts are discussed in detail in Section 3.11 and visual impacts are discussed in Section 3.8.

All of the compressor station alternatives would be located primarily in agricultural land use areas, would not impact any wetlands, and none, with the exception of Alternative 1, would impact any waterbodies (Table 4.5.1-1). Two alternative sites (Alternative 2 and 4) would be located within a 100-year floodplain, which would make these sites unsuitable for long-term operation due to the threat of flooding. No residences are located within 0.5 mile of the proposed site, while multiple residences are located within 0.5 mile of all alternative sites. Further, the proposed Sherman Compressor Station site would provide the greatest distance between the proposed facility and the nearest residence, compared to the alternative sites. The proposed Project site would contain the second greatest number of residences located within one mile of the site.

Operational noise would decrease as the distance between the noise source and receptors increases. Therefore, operational noise would result in the greatest impacts to those residences located closest to the proposed Sherman Compressor Station. As shown in Table 4.5.1-1, the proposed site, compared to the alternative sites, provides the greatest distance between the compressor station facilities and the nearest resident, which would result in the smallest increase in noise. The nearest residence to the proposed site would potentially experience a 4.6 dBA increase in noise, which would barely be perceivable above existing ambient noise levels. The nearest residence to all other alternative sites would potentially experience noise increases between 7.8 and 19.8 dBA. The proposed site does contain significantly more residences within one mile of the proposed Project, compared to most alternatives. Gulf Crossing modeled projected noise increases associated with Project operation at distances of 4,500 feet and 1 mile from the proposed site (described further in Section 3.11.2). Residences located between 4,500 feet and one mile from the proposed site would experience a 1.5 to 2.2 dBA increase in noise; individuals should not perceive this level of noise above ambient noise conditions. Typically, a 3 dB increase is the limit of perceptible noise increase.

We have received many comments regarding the air, noise, and visual impacts to residences located within 1 to 2 miles of the proposed compressor station site. As stated in Section 3.11.1.3, Gulf Crossing's modeling indicates that air emissions from the proposed Sherman Compressor Station would not be significant. Further, compressor station operation would be subject to federal and state air quality permitting to ensure that emissions are within acceptable limits. Forested vegetation surrounds three of the four sides of the proposed site, which would provide a visual buffer to minimize visual impacts to nearby residences. Gulf South, in a letter dated filed on October 19, 2007 committed to work with the community to minimize visual impacts at the proposed Sherman Compressor Station. In Section 3.8, we recommend that Gulf Crossing provide a final visual screening plan to minimize any visual impacts at the proposed site.

Due to the lack of residences within 0.5 mile of the proposed Project site, the small noise increase to residents within a one-mile radius of the proposed Project site, and the lack of environmental benefit associated with the considered alternative sites, we believe that none of the evaluated alternatives are preferable to the proposed Sherman Compressor Station site.

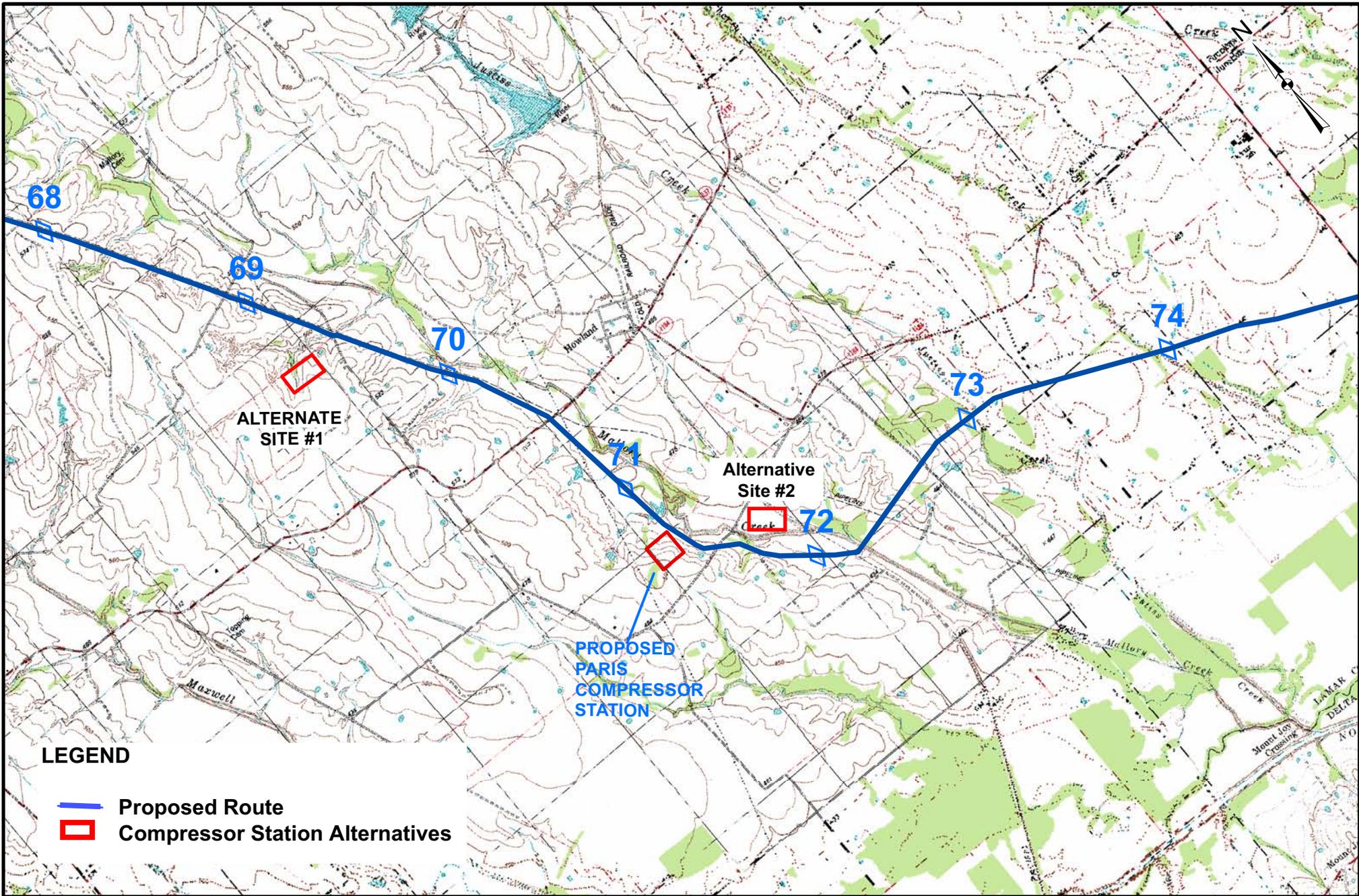
#### **4.5.2 Paris Compressor Station Site Alternatives**

We compared two alternative sites, located between MPs 69 and 70 (Figure 4.5.2-1), to the proposed Paris Compressor Station site at MP 71. Based on hydraulic analysis and modeling results, alternatives for the Paris Compressor Station site were constrained to an area within approximately one mile of the proposed compressor station site.



**TABLE 4.5.1-1 (continued)  
Comparison of Sherman Compressor Station Site Alternatives**

<b>Evaluation Criteria</b>	<b>Proposed Site</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>	<b>Alternative 4a</b>	<b>Alternative 5</b>	<b>Alternative 6</b>
Herbaceous	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
Industrial	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
NOTE: NA = Information not available.								



Paris Compressor Station Site Alternatives  
Gulf Crossing Pipeline Project

Figure 4.5.2-1



The proposed Paris Compressor Station site would be located near an existing compressor station (NGPL) and at the Project's Crosstex interconnect point and M/R station. Thus, locating the Paris Compressor Station at this proposed site would facilitate the collocation of interconnect facilities, which would minimize the quantity of land required for interconnect construction. The proposed site would encumber five acres of forest land and 15 acres of open land (Table 4.5.2-1). In contrast, Alternative Site 1 would encumber 20 acres of agricultural land, but may require additional land area for the construction of a Crosstex interconnect facility; since this interconnect facility would not be located within the compressor station footprint. Two residences are located 0.5 mile of the proposed site, but visual impacts would be screened by an adjacent hillside and forested areas. No residences are located within 0.5 mile of Alternative Site 1.

<b>TABLE 4.5.2-1 Comparison of Paris Compressor Station Site Alternatives</b>		
<b>Evaluation Criteria</b>	<b>Proposed Site</b>	<b>Alternative 1</b>
Construction Impacts (acres)	20.0	20.0
Permanent Impacts (acres)	10.0	10.0
Landowners Affected (number)	1.0	0.0
Residences within 0.5 Mile (number)	2.0	0.0
Waterbody Impacts (number)	0.0	0.0
Proportion of Site Within 100-Year Floodplain (Percent)	0.0	0.0
Prime Farmland (acres)	0.8	5.5
Land uses (acres)		
Agriculture	0.0	20.0
Wetland	0.0	0.0
Herbaceous	0.0	0.0
Forest	5.0	0.0
Open Land	15.0	0.0
Industrial	0.0	0.0

We also evaluated an alternative location (Alternative Site 2) for the Paris Compressor Station adjacent to the existing NGPL compressor station. Based on the analysis of aerial photographs and topographic maps, the site is located adjacent to Mallory Creek and possibly within the floodplain of the creek. The site is at a lower elevation compared to the proposed location, which may contribute along with the NGPL compressor station, increased air quality and noise impacts to residences located within 0.5 mile of this location. Alternative Site 2 would also require additional land area for construction; since the Crosstex interconnect facility would not be located within the compressor station footprint.

Although Alternative Site 1 has fewer residences with 0.5 mile of the proposed compressor station, more land impacts would be required for construction and operation because of the lateral pipeline that would be required for the Crosstex interconnect. Additionally, Alternative Site 1 would also impact more prime farmland compared to the proposed site. Alternative Site 2, located adjacent to an existing compressor station, would contribute increased air quality and noise impacts to the residences located near that facility. The ability to collocate the Crosstex interconnect facility with the proposed

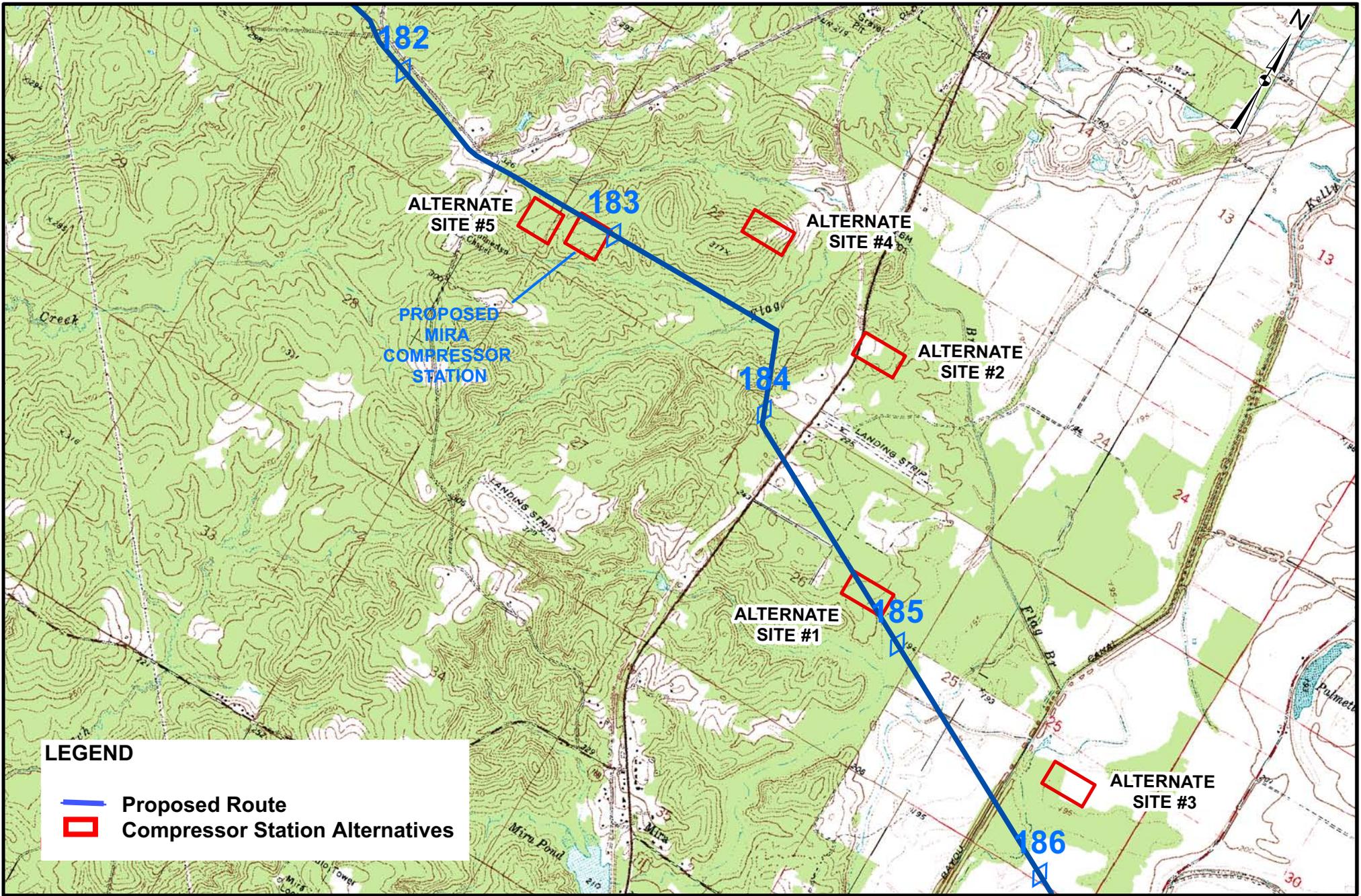
Paris Compressor Station would reduce the amount of land impacts from construction and operation compared to the two alternative sites. Due to the lack of environmental benefit associated with the considered alternative sites, we believe that none of the evaluated alternatives are preferable to the proposed Paris Compressor Station site.

### 4.5.3 Mira Compressor Station Site Alternatives

In addition to the proposed site at MP 182 for the Mira Compressor Station site, we evaluated the environmental impacts associated with five alternative sites located between MPs 182 and 186 (Figure 4.5.3-1).

All evaluated alternatives, with the exception of Alternative 5, would impact between 4 and 10 acres of wetlands, while the proposed site would not impact any wetland resources (Table 4.5.3-1). The proposed site and all alternatives, with the exception of Alternative 4, would impact between 10 and 20 acres of forested land for construction. Forested lands contained within the bounds of the proposed site are relatively immature, having been recently cleared by the landowner, thus minimizing the impacts of land clearing for construction and operation. In contrast, each of the alternatives would impact relatively mature forested areas. Of the evaluated alternatives, two (Alternatives 3 and 4) would be located within a 100-year floodplain, which would present operational issues associated with the risk of flooding. Alternative 5 would be located in close proximity to the proposed site and would have similar environmental impacts on wetland and forest resources. However, due to the proximity of Alternative 5 to Highway 71, locating the compressor site in this location may require the use of a false right-of-way for the Highway 71 HDD, thus increasing the amount of cleared area.

<b>Evaluation Criteria</b>	<b>Proposed Site</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>	<b>Alternative 5</b>
Construction Impacts (acres)	20.0	20.0	20.0	20.0	20.0	20.0
Permanent Impacts (acres)	10.0	10.0	10.0	10.0	10.0	10.0
Landowners Affected (number)	2.0	1.0	1.0	2.0	1.0	2.0
Residences within 0.5 Mile (number)	2.0	0.0	1.0	0.0	5.0	5.0
Waterbody Impacts (number)	0.0	0.0	0.0	1.0	0.0	1.0
Proportion of Site Within 100-Year Floodplain (Percent)	0.0	0.0	0.0	100.0	30.0	0.0
Prime Farmland (acres)	6.8	0.0	0.0	4.5	0.0	6.5
Land uses (acres)						
Agriculture	0.0	0.0	0.0	16.0	0.0	0.0
Wetland	0.0	5.0	10.0	4.0	10.0	0.0
Herbaceous	0.0	0.0	0.0	0.0	0.0	0.0
Forest	20.0	15.0	10.0	0.0	10.0	20.0
Open Land	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	0.0	0.0	0.0	0.0	0.0	0.0



**Mira Compressor Station Site Alternatives**  
**Gulf Crossing Pipeline Project**

Figure 4.5.3-1

1" = 2,700 feet



4-55

Due to the presence of wetlands and the location of 100-year floodplains, Alternatives 1 through 4 would not be environmentally preferable to the proposed site. Alternative 5 also would not be environmentally preferable to the proposed site due to the additional workspace associated with the Highway 71 HDD and the mature forested area that would require clearing. For these reasons, we believe that the proposed Mira Compressor Station Site would be environmentally preferable to the five evaluated alternative sites.

#### **4.5.4 Sterlington Compressor Station Site Alternatives**

The proposed location for the Sterlington Compressor Station is in an existing industrial setting. An existing compressor station would be located adjacent to the proposed facility. Therefore, given the industrialized setting at this location and lack of substantive resource protection issues, we did not evaluate alternative site locations for the Sterlington Compressor Station.