4.0 ALTERNATIVES

As required by NEPA, DOS and the cooperating agencies conducted an analysis of a range of reasonable alternatives to the proposed Project, based on the defined purpose and need for the Project. The alternatives assessed in this section have been derived based on information provided to the agencies in various applications and submittals by the Project sponsors, information and suggestions provided to the agencies during public and agency scoping for the proposed Project, and through research and analysis of available data bases and literature that address the general Project area by DOS and its third-party contractor A reasonable range of alternatives to the Project was defined and each alternative was analyzed to determine whether or not it would achieve the following objectives:

- Meet the Project's purpose and need;
- Provide a feasible alternative to the proposed action; and
- Provide at least an equivalent level of Project benefit given the potential environmental consequences.

Several potential pipeline routes from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas were considered. Factors considered during the alternatives analysis include the following:

- The Project's purpose and need;
- The locations of crude oil receipt and delivery points along the proposed route;
- Existing developed linear corridors and aboveground facilities that if paralleled might reduce the Project environmental effects;
- The presence of sensitive environmental and human use features along alternative pipeline routes; and
- The engineering, technical, and practical feasibility of constructing and operating the Project along alternative routes.

The following alternatives were assessed by DOS:

- No Action Alternative (Section 4.1) − the proposed Project would not be built;
- System Alternatives (Section 4.2) − use of other pipeline systems or other methods of providing crude oil supplies to the U.S. Gulf Coast market;
- Major Route Alternatives (Section 4.3) − other pipeline routes for transporting crude oil from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas; and
- Alternative Routes for the Electrical Transmission Line (Section 4.4) − preliminary alternative routings for the proposed 230-kV transmission line in South Dakota that is needed to ensure power system stability given the loads required for providing electrical power to the pump stations in South Dakota.

As noted in Section 1.2.2.1, the Energy Information Administration (EIA) evaluated the future need for

crude oil in relation to many variables, including the cost and availability of substitute forms of energy. These substitute forms include many alternative energy sources such as wind power, biofuels, hydroelectric power, and nuclear power. The EIA evaluations indicate that there is a general consensus that the volume of crude oil consumed world wide, as well as the volume consumed domestically, is unlikely to decrease substantially over the next 30 years (EIA 2009a, EIA 2009b), and that the mix of crude oil consumed in the future will include an increased proportion of heavy crude. Further, the use of alternative forms of energy would not meet the needs of refiners in PADD III or the purpose of the proposed Project. As a result, the use of alternative forms of energy in place of the proposed Project was not considered in the environmental review of the Project.

4.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed and operated as described in Section 2.0. Therefore, selection of the No Action Alternative would not require issuance of a DOS Presidential Permit for the specific action of building and operating the Project (the proposed action).

Under the No Action Alternative, the environmental effects associated with the Project discussed in this EIS would not occur; however, the development of oil sands in Canada and their refining in the U.S. would still occur. While this alternative would eliminate the environmental impacts associated with the Project, it would not meet the purpose and need for the proposed action. As stated in Section 1.2.1, the primary purpose of the proposed Project is to transport WCSB crude oil from Canada to (1) existing delivery points in PADD III that provide connections to existing refineries, and (2) the existing Cushing Oil Terminal in Cushing, Oklahoma. The Project would counteract insufficient domestic crude oil supply while reducing U.S. dependence on less reliable foreign oil sources.

4.1.1 Crude Oil Demand and Supply Under the No Action Alternative

As described in Section 1.2.2, U.S. demand for petroleum products has increased and is likely to continue increasing for the foreseeable future. At the same time, the overall domestic U.S. crude oil supplies continue to decline and many of the major suppliers of crude oil to PADD III refiners face declining or uncertain production horizons (see Section 1.2.3). In 2008, PADD III refineries imported 2.2 million bpd of heavy crude oil from 43 different countries. The top four suppliers were Mexico (22 percent), Saudi Arabia (17 percent), Venezuela (17 percent), and Nigeria (11 percent) (CAPP 2009). While the supply of crude oil from Saudi Arabia to the U.S. appears to be fairly stable, the remaining major suppliers each face declining or uncertain production horizons (see Section 1.2.2.3).

Reasonably foreseeable projects, energy conservation efforts, and the development of renewable energy resources represent a small fraction of the projected energy demand in the PADD III service area, and it is unlikely that this would offset the projected demand for crude oil to produce refined petroleum products to meet the needs of end users over the lifetime of the Project. Under the No Action Alternative, the PADD III refineries would continue to acquire crude oil primarily from sources other than Canada to fulfill this demand and/or find alternative methods of delivery of Canadian oil sands. This crude oil would be transported to PADD III primarily from countries outside of North America by tankers or from Canada through the construction of an alternative pipeline, tankers, trucks or rail or a combination thereof from the WCSB.

The No Action Alternative would not provide the United States with a relatively stable and secure source of North American crude oil for the PADD III market. As a result, PAD III and other areas of the U.S. would continue to be dependent on less reliable foreign oil supplies from the Mideast, Africa, Mexico, and South America. In comparison, the proposed Project would provide the United States with a relatively stable and secure source of North American crude oil for the PADD III market and reduce U.S.

dependence on less reliable foreign oil supplies.

4.1.2 PAD III Crude Oil Supplies Under the No Action Alternative

The declining and uncertain supply horizons of lighter crude oils from foreign countries have prompted some PADD III refineries to modify their existing facilities to allow the refinement of heavy crude oil (Gunaseelan and Buehler 2009, Sword 2008). This diversification strategy could increase the reliability of the supply to PADD III and put downward pressure on PADD III crude oil prices provided that sufficient transportation capacity is available for heavy crude oil. Major refinery upgrades representing a total of 365,000 bpd of new capacity are planned at Port Arthur, Texas refineries that would have direct pipeline access to oil transported through the proposed Project, and several PADD III refineries without direct pipeline access (Borger, Texas; Artesia, New Mexico; and Garyville, Louisiana) are also planning upgrades to increase bitumen and heavy oil refining capacity (CAPP 2009). However, as noted above, under the No Action Alternative, the PADD III refineries would continue to acquire crude oil primarily from sources other than Canada to fulfill this demand. The refineries would also continue to receive Canadian crude oil from the 96,000-bpd ExxonMobil Pegasus Pipeline, which is the only pipeline that provides PADD III refineries direct access to WCSB crude (CAPP 2009). The limited capacity of this pipeline constrains the supply of WCSB crude oil to PADD III (CAPP 2009, Purvin & Gertz 2009), which represents the largest refining capacity in the U.S. This in turn tends to put upward pressure on the price of crude oil shipped from Canada and other sources into PADD III and on the prices of refined products shipped out of PADD III. Therefore, the No Action Alternative could result in more expensive and less reliable crude oil supplies for Gulf Coast refineries; this would increase the costs and availability of the refined products for end-users. In contrast, under the proposed Project, the U.S. would be able to obtain reliable and cost efficient source of oil from the WSCB region into the later part of the 21st century.

In the near term, the current sources of supply would likely continue to provide crude oil to PADD III under the No Action Alternative; i.e., the vast majority of the crude oil would be transported from countries outside of North America by tankers. In the future, a crude oil pipeline system other than the proposed Project could be constructed and provide WCSB crude oil to PADD III refineries. That system would have to obtain a Presidential Permit and all other required federal, state, and local environmental permits and would likely have environmental impacts that are similar to those of the proposed Project.

Oil shocks (unanticipated supply reductions that result in price spikes) reduce the amount of goods and services the U.S. can produce given a fixed amount of other inputs and cause some inputs (e.g., land, labor, and capital) to be under-utilized. Oil shocks arise through unstable crude oil supplies and would be more likely to occur under the No Action Alternative, as compared to the proposed Project, since crude oil supplies would continue to be sought from unstable foreign sources in the near term. In contrast, projects which stabilize crude oil supply through diversification and increased access to politically stable regions, such as the proposed Project, benefit the U.S. economy.

Under the No Action Alternative, positive socioeconomic impacts associated with construction and operation of the Project would not be realized along the proposed route and elsewhere in the U.S. No annual property tax revenues would be generated, as opposed to an estimated $138.4 million in annual property tax revenues that would be generated by the proposed Project in the region of influence. The generation of local employment as well as substantial expenditures on goods and services would also not occur under the No Action Alternative. However, if an alternative pipeline is constructed elsewhere, socioeconomic benefits would be realized as a result of construction and operation of that alternative at a later time.

4.1.3 Potential WCSB Markets Under the No Action Alternative

At the current and projected rates of annual production, production from the estimated proven reserves in the WCSB could continue into the later part of the 21st century. Under the No Action Alternative, crude oil from the WCSB would not have a ready conduit for export to available refineries and markets in the United States and it is likely that alternative transportation systems to move this oil to market would emerge. Crude oil would be transported by other planned or existing pipelines or alternative transportation methods (such as tank trucks, barges, or crude oil tankers) to markets in the U.S. Gulf Coast or to the global marketplace.

Producers in Canada have indicated that if the U.S. market is not available to them, much of the crude would be shipped outside of North America, particularly to Japan, China, and India which are the world's third, fourth, and eighth largest importers of oil, respectively (CIA 2010). To accomplish that, oil would be transported via tanker to countries outside of North America. Within Canada this would require construction of a new pipeline from the WCSB production area to a port on the Canadian coast; if there is not a port that can accommodate the volume of oil that would be shipped or the size and number of tankers, an existing port would have to be modified or a new port would have to be constructed. Construction of the pipeline and either modification to an existing port or construction of a new port would produce adverse environmental impacts within Canada that would be similar in nature to those of the proposed Project. In addition, the transport of crude oil by tanker would result in impacts in Canada and elsewhere along the tanker routes. The construction of a new pipeline and a new or modified port may produce more or less greenhouse gases than the proposed Project; however, shipment of the oil by tanker would produce substantially more greenhouse gases than would transportation of crude oil by pipeline to the U.S.

Under the proposed Project, much of the crude oil imports from the WCSB to PADD III would be supplied along a transportation pathway that would be shorter than that of most other sources. Crude oil supplies in Western Canada represent the closest foreign supply source for PADD III refineries, other than Mexico and Venezuela, and do not require many days or weeks of marine transportation, in contrast to most other suppliers. The No Action Alternative would not therefore necessarily result in a reduction in physical, biological, and human resource impacts as compared to the proposed Project, and may actually result in an increase in adverse environmental impacts if alternative methods of transportation were developed.

4.1.4 Summary

The increasing demand for crude oil in the U.S. cannot be entirely met by efforts to conserve use of refined petroleum products or the increased use of renewable energy. As crude oil demand increases, the overall domestic supplies of crude oil are declining. At the same time, only a small volume of WCSB crude oil can be shipped to PADD III through a single pipeline, and a substantial portion of the oil imported from outside of North America originates in countries with decreasing or undependable oil supplies. Under the No Action Alternative, it is likely that other projects would be proposed to meet the increased demand. Although it is not possible to identify the specific impacts of such projects, it is likely that they would be similar in nature to those of the proposed Project and either smaller, greater than, or equal to the magnitude of impacts of the proposed Project.

Under the No Action Alternative, the U.S. would not receive a reliable and cost efficient source of crude oil from the WSCB region and would remain dependent upon unstable foreign oil supplies from the Mideast, Africa, Mexico, and South America. Further, the WCSB crude oil would likely be shipped to countries outside of North America, which would require new infrastructure that would result in environmental impacts at least as great as those of the proposed Project. In addition, the transport of

crude oil by tanker would likely result in greater GHG emissions than those that would occur as a result of the proposed Project. Finally, the No Action Alternative would not meet the purpose and need of the proposed Project.

Therefore, the No Action Alternative is not considered preferable to the proposed Project.

4.2 SYSTEM ALTERNATIVES

System alternatives to the proposed Project would make use of other existing, modified, or proposed pipeline systems—or non-pipeline systems—to meet the purpose and need of the proposed Project. A system alternative would render the construction of the proposed Project unnecessary, although some modifications or additions to other existing pipeline systems would be required to increase the current delivery capacity of those systems. Such modifications or additions would result in environmental impacts that are less than, similar to, or greater than those associated with construction of the proposed Project. After identifying systems alternatives, DOS evaluated the systems to determine whether or not the anticipated environmental effects of construction and operation of the Project could be avoided or reduced by using a system alternative. This system alternatives analysis addresses existing and proposed crude oil pipeline systems that currently or eventually could serve the PADD III market, as well as alternative transportation systems that are not wholly reliant on pipelines. The analysis considers whether these systems could meet the proposed Project objectives while offering an environmental advantage over the proposed Project. The system alternatives assessed include the following:

- Use of existing or expanded pipeline systems (ExxonMobil Pegasus Pipeline);
- Transport of oil in proposed pipeline systems (Altex, Chinook/Maple Leaf, Trailbreaker, and Enbridge/BP); and
- Alternative modes of transportation.

4.2.1 Existing Pipeline Systems

There is currently only one existing pipeline system that extends from the Midwest to the Gulf region. The ExxonMobil Pegasus pipeline is a system that transports Canadian crude oil from Patoka, Illinois to Nederland, Texas. In mid 2009, ExxonMobil completed an expansion of the system that increased capacity from 66,000 bpd to 96,000 bpd. Even with the expansion, the Pegasus pipeline does not meet the demand of the PADD III market. The Project's current binding contractual commitments of 380,000 bpd in the PADD III market far surpass the existing or proposed expansion capacity of the Pegasus pipeline. The proposed Project's ultimate potential capacity of 900,000 bpd is well beyond the capacity of the Pegasus system under any realistic expansion scenario. Given the inability of this system to deliver crude oil in volumes necessary to meet the Project's purpose and need, DOS does not consider it to be a feasible alternative to the proposed action.

4.2.2 New Pipeline System Alternatives

Other new pipeline system alternatives have been proposed or planned by proponents, and if successfully designed, permitted, and constructed, they could transport crude oil from the oil sands of the WCSB to the PADD III market. For a potential new pipeline system to be considered a viable alternative to the Project, it must meet the purpose and need of the Project as described in Section 1.0, including meeting U.S. demand in delivery volume and within the planned timeframe. As proposed, the Project would be operational on its Gulf Coast Segment by 2011 and operational on the Steele City Segment by 2012, with an ultimate system capacity of up to 900,000 bpd. The Project has gone through a successful open season with a sufficient binding commitment for crude oil deliveries to PADD III to economically justify Project

construction. The potential system alternatives discussed in this section have not solidified commercial commitments through open seasons or announced the submittal of permit applications. At this time, the possibility of their existence is speculative. Nonetheless, these potential projects have been assessed relative to their potential to meet the proposed Project's purpose and need. These potential pipeline system alternatives include the following:

- Altex Pipeline System: Plans for the Altex (Alberta-Texas) Pipeline System were initially announced in 2005 by Calgary-based energy infrastructure-development company, Altex Energy Ltd. The Altex Pipeline System would include a 2,360-mile-long greenfield pipeline system that would originate north of Fort McMurray, Canada, extend to the Redwater-Fort Saskatchewan area and from there to Hardisty, Alberta. It would cross the international border in Montana and head southeast through Montana, Wyoming, South Dakota, Nebraska, Kansas, Oklahoma, and Texas on a relatively straight line to the Houston area in PADD III. DOS anticipates that Altex is refining a route for the project, conducting preliminary design studies, and attempting to secure contract volumes from potential shippers (altex-energy.com). As initially planned, service would start no sooner than 2013, with a proposed initial crude oil capacity of 425,000 bpd. However, at this time Altex has not applied for a Presidential permit or other permits in the U.S. and therefore a NEPA environmental review has not been initiated.
- Chinook-Maple Leaf Pipeline System: The Chinook-Maple Leaf Pipeline System (Figure 4.2.2-1) is a project considered by KinderMorgan and TEPPCO (now merged with Enterprise Products Partners, LP). This 2,050-mile-long pipeline system would originate near Hardisty, Alberta and cross the international border from Alberta into Montana. It would then traverse Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas to deliver crude oil to the Houston area within PADD III. The system would have a capacity of 440,000 bpd between Hardisty and Cushing (Chinook), and 550,000 bpd between Cushing and PADD III (Maple Leaf). The proponents initially indicated a planned in-service date of late 2011 or early 2012 (Canadian Association of Petroleum Producers (CAPP) 2008); however, the proponents have not applied for a Presidential permit or other permits in the U.S. and the project could not be in service at that time.
- Trailbreaker Transportation System: Enbridge has proposed The Trailbreaker Transportation System as an option for supplying crude oil to PADD II and PADD III. Enbridge's proposed Trailbreaker project would involve shipping crude oil to the northeast U.S., and then transporting crude oil by tanker from that area to PADD III as early as mid 2010. This project would allow for the transport of WCSB oil production to refineries in Ontario, Quebec, the Canadian maritime provinces, and U.S. markets. It includes an expansion of existing Enbridge Line 6B from Chicago, Illinois to Sarnia, Ontario, as well as terminal expansions and upgrades, increasing the capacity of existing Enbridge Line 7 between Sarnia and Westover, Ontario, and the reversal of existing Enbridge Line 9 to flow from Sarnia east to Montreal, Quebec. Another component of the project would be the proposed reversal of the pipeline owned by Portland-Montreal Pipe Line (PMPL), which currently transports product from Portland, Maine to Montreal. In late 2008, PMPL completed an open season to gauge shipper interest in the proposed reversal; however, they did not receive the level of firm volume commitments required to proceed at this time. PMPL will continue to monitor market conditions and may resume work on the project when market conditions warrant. In addition, CAPP decided not to support the proposed Trailbreaker project at this time as a result of the PMPL open season. The Trailbreaker project is therefore on hold and timing for the project is being reviewed. As currently planned, the Trailbreaker proposal would deliver approximately 200,000 to 230,000 bpd of heavy crude oil to the PADD III market.

- Enbridge-BP Delivery System: Enbridge and BP have entered into an agreement to develop the Enbridge-BP Delivery System (Figure 4.2.2-2) to transport WCSB heavy crude oil from Flanagan, Illinois, to Houston and Texas City, Texas, using a combination of existing facilities and new pipeline and looped pipeline construction where required. The project would traverse parts of Illinois, Missouri, Kansas, Oklahoma, and Texas and would be in service by late 2012, with an initial total system capacity of 250,000 bpd into the Gulf Coast. Enbridge and BP intend to use the BP #1 System and other existing pipelines north of the Cushing, Oklahoma, crude oil hub with some new pipeline construction south of Cushing to connect to markets in Houston and possibly in Nederland, Texas. Initial receipts at Flanagan, where the system would interconnect with Enbridge Energy Partners' Southern Access pipeline, would be approximately 140,000 bpd for transport to Gulf Coast markets. The remaining 110,000 bpd would originate from interconnecting pipelines at Cushing.

Part of the purpose and need of the proposed Project is to provide up to 900,000 bpd of crude oil to PADD III in as short a timeframe as possible; as currently proposed, operation of the Gulf Coast Segment would begin in 2011, and the Steele City Segment would be in service in 2012. None of the proposed system alternatives would provide the delivery capacity of the proposed Project alone. Further, Keystone has already filed for regulatory approvals in the U.S. and Canada and conducted environmental and cultural resource studies in advance of those filings that could allow the proposed service delivery dates to be met. None of the other potential systems alternative have progressed that far and could not provide WCSB crude oil to PADD III in the same time frame as the proposed Project. In summary, none of the systems alternatives considered can meet the purpose and need of the proposed Project, and none of them offer a significant environmental advantage over the proposed Project.

4.2.3 Alternative Modes of Transportation

Surface transportation modes of crude oil delivery from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas were considered as an alternative to the proposed Project. Use of those modes, which include delivery by truck, railroad cars, and barges, is assessed below.

4.2.3.1 Trucking

Hauling crude oil by truck from Morgan, Montana to the PADD III area is not a feasible potential alternative to constructing the proposed Project. Important considerations are safety, traffic congestion, fuel demands, and delivery interruptions. Table 4.2.3-1 summarizes accident statistics by method of transport compiled by Association of Oil Pipe Lines (AOPL). Pipelines are a safer method of transporting crude oil than trucking. AOPL reports that trucking is 87 times more likely than pipeline transport to result in a human fatality. In similar findings, fire and/or explosions are 35 times more likely when transporting crude oil via truck. Vehicle accidents and accidental releases are also concerns with surface transportation crude oil delivery. According to DOT safety statistics, pipeline transport of liquids is safer than vehicle transport. The Bureau of Transportation Statistics (2009) reported that the transport of hazardous liquids (including crude oil) on highways resulted in five times as many fatalities as transportation of hazardous liquids by pipeline between 1975 and 2007. It is estimated that transport of the equivalent daily crude oil capacity of the Project pipeline would require 4,000 trucks per day from the U.S./Canadian border to Texas (Keystone 2009).

The trucking alternative would add congestion to highways in all states where the best transport route was determined. These trucks would consume millions of gallons of fuel per year, with subsequent exhaust emissions (including GHG) and other negative environmental effects. Trucking would likely be subject to interruptions due to unfavorable weather and road conditions, especially in Montana and other northern

states. At the Gulf Coast delivery points, surface transportation would necessitate significant refinery transfer facilities, personnel, and a delivery fleet. Truck transportation would not be a practical way to meet the Project's purpose and need.

4.2.3.2 Railroad

There is not an existing direct rail line from Morgan, Montana, to Port Arthur, Texas and the east Houston areas of Texas. Developing such a rail system would require construction of spur lines, terminal facilities, and upgrades to existing rail lines with corresponding environmental impacts. The impacts of such a system development would be considerable, and would not provide the same level of operational safety as the pipeline system included within the Project. Should such a train-dependent alternative system be developed, crude oil would move south into the PADD III area by rail. To provide the potential capacity for oil delivery consistent with the Project's purpose and need, this system would require approximately 40 unit trains per day, each with 100 tank cars, and each traveling 1,300 miles daily (Keystone 2009). It is expected that this configuration would result in significantly more environmental impact during construction and operation than the Project. Impacts on the existing multi-model rail system throughout the Midwest from the Canadian border to Texas would be substantial. For these reasons, railroad delivery of WCSB crude oil is not considered a feasible system alternative to the Project.

4.2.3.3 Barging/Shipping

Barging the oil would not be feasible due to the lack of a large waterway system between Morgan, Montana, and the PADD III area capable of supporting barge traffic. Crude oil would first have to be transported to a large waterway system before barging could be feasible. The Enbridge Trailbreaker, discussed in Section 4.2.2 as a system alternative, is an example of such an undertaking. The proposal would involve shipping crude oil to the northeast U.S., and then transferring crude oil by ship to the PADD III area. As with the trucking alternative discussed above, the need for transport by internal combustion engine powered vehicles, in this case either barges or tankers, would increase operational emissions, including the emission of GHG. As stated previously, the proposed Trailbreaker project has not received firm shipper volume commitments to render it economically feasible, it is not supported by CAPP, which can be seen as an indication that it is not a feasible alternative to pipeline transport of crude oil from the WCSB to the U.S., and the proposal is currently on hold. As with other alternative modes of transport, barging has more reported fire/explosion incidents and injuries than that of pipelines. Therefore, delivery of WCSB crude oil by barge was not considered a reasonable alternative and was not further evaluated.

TABLE 4.2.3-1
Reported Incident Rates for Alternative Methods of Liquids Transport

Method of Transport [1]	Death	Fire/Explosion	Injury
Truck	87	35	2
Rail	3	9	0.1
Barge	0.2	4	4
Tank Ship	4	1	3
Pipeline	1	1	1

[1] Relative rates are calculated based on incidents per ton-miles for each transportation mode (AOPL 2005).

4.2.4 Conclusion

Approximately 66 percent of petroleum and petroleum products shipped are shipped by pipeline in the U.S., or about 12.9 billion barrels annually (AOPL 2004). As described above, the alternative modes considered would be less safe, would require construction of substantially more infrastructure, have greater atmospheric emissions (including GHG), and/or pose greater safety hazards than the proposed Project. Therefore, none of the alternative modes of transportation have been evaluated further.

4.3 PIPELINE ROUTE ALTERNATIVES

4.3.1 Introduction

DOS assessed available information to identify alternatives to the route proposed by the Applicant that would potentially reduce environmental effects while still meeting the Project's purpose and need. In identifying route alternatives, consideration was given to suggestions by tribes, agencies, and the public where feasible.

4.3.2 Approach

To be considered, most alternative routes were required to connect to several Project control points to meet the Project's purpose and need. These fixed control points, which placed constraints on potential geographic alternatives to achieve the Project's purpose and need, consist of the following:

- The international border crossing between Saskatchewan and Montana near the town of Morgan, Montana (northern end of the Steele City Segment);
- The northern end of the previously permitted and now under construction Cushing Extension to the Keystone Mainline pipeline near Steele City, Nebraska (southern end of the Steele City Segment);
- The southern end of the previously permitted and now under construction Cushing Extension to the Keystone Mainline pipeline in Cushing, Oklahoma (northern end of the Gulf Coast Segment);
- The two crude oil delivery points in PADD III, one at Nederland, Texas (southern end of the Gulf Coast Segment) and one at Moore Junction, Texas (southwestern end of the Houston Lateral).

These control points define the three pipeline segments (Steele City Segment, Gulf Coast Segment, and Houston Lateral) and provide the framework for identifying alternatives. However, as described below (Section 4.3.3), alternatives that originated at Hardisty, Canada and extended into the U.S. at a point other than near Morgan, Montana were considered in response to agency scoping comments regarding alternatives.

The second phase of considering potential alternative routes involved developing routes that would, to the extent practical, avoid or minimize extending through key areas of environmental concern. The primary areas to be avoided or used minimally are listed below.

- Public lands (except in Montana, where there is a state regulatory preference for the use of public lands; this issue is addressed in Appendix I);
- Crossings of large waterbodies and water control structures;
- Rugged, terrain that could impact constructability;

- Crossings of large wetland complexes;
- Highly developed urban areas and urban infrastructure;
- Properties listed on the NRHP;
- Wildlife refuges and management areas;
- Key waterfowl use or nesting areas;
- Irrigated croplands;
- Forested areas, including commercial forest lands; and
- Close approaches to residences and outbuildings.

In addition, the overall constructability of the pipeline and associated facilities along the potential alternatives was considered. Development of alternatives also considered the desire to reduce the line miles of pipeline that would be required to reach the Project terminus. As a general rule, each mile of the proposed Project would impact approximately 13.3 acres during construction and 6.0 acres during operation (the exact acreage is dependent on such factors as the construction methods, workspaces, and access roads). As a result, there generally are environmental advantages to keeping the length of pipe required to reach the Project destination as low as possible while considering all other issues of concern.

The extent, shape, and prevalence of many resources (e.g., rivers, historical trails, wetlands, and farmlands) preclude completely avoiding impacts to them on any selected route, particularly on a Project with an overall length of approximately 1,375 miles in the U.S. In determining potential route alternatives, there is consideration given to routes that would have all or part of their length parallel existing linear facility ROWs. For the purposes of this EIS, we considered routes to be parallel to existing ROWs if they were overlapping, directly adjacent to, or within 150 feet of an existing ROW. The industry standard for new pipeline centerline separation from existing pipelines is 25 feet to provide room for maintenance and abide by construction restrictions; therefore there is a limit to how close a new ROW can be to an existing one.

The rationale for siting a new pipeline parallel to an existing ROW is that concentrating linear developments in or near existing linear corridors may reduce to some degree the need for impacting resource areas that are not currently disturbed by major linear project construction. However, in some cases it may be advantageous to select a new pathway, depending on the number of miles of new construction that may be required to capitalize on these existing development corridors and the specific effects of corridor expansion in areas with important human development, cultural resources, or environmental resources. As an example, while a new corridor may contribute to habitat fragmentation in areas with currently uninterrupted species use areas, the expansion of an existing corridor laterally across existing ROW and new ROW may exacerbate the problem along that linear corridor.

The following sections identify the alternatives developed for the three pipeline segments:

- Steele City Segment Alternatives (Section 4.3.3);
- Alternatives to Using the Cushing Extension (Section 4.3.4);
- Gulf Coast Segment Alternatives (Section 4.3.5); and
- Houston Lateral Alternatives (Section 4.3.6).

4.3.3 Steele City Segment Alternatives

For the Steele City Segment, five alternatives were considered:

- Express-Platte Alternative (Section 4.3.3.1);
- Steele City Segment (SCS) Alternative A (Section 4.3.3.2);
- SCS Alternative A1A (Section 4.3.3.3);
- SCS Alternative B (the proposed Project; Section 4.3.3.4); and
- Baker Alternative (Section 4.3.3.5).

These alternatives are depicted in Figures 4.3.3-1 and 4.3.3-2, and Section 4.3.3.6 provides a summary of the comparison of the Steele City Segment Alternatives.

As a cooperating agency, the Montana Department of Environmental Quality (MDEQ) considered the alternatives as described below. To comply with the requirements of the state's Major Facility Siting Act (MFSA), MDEQ also considered two other route alternatives in Montana as well as minor route variations in Montana. The development and analysis of those alternatives and variations are described in Appendix I of this EIS and summarized below in Section 4.3.3.7.

4.3.3.1 Express-Platte Alternative

The Express-Platte Alternative is a 1,049 mile route that would cross the border from Saskatchewan, Canada into the U.S. near the Port of Wild Horse, Montana. From there it would extend parallel to the Express and Platte Pipeline Systems ROW until it deviated from the alignment in its southern extent to allow a tie-in to the Project control point at Steele City, Nebraska. A potential advantage for the Express-Platte Alternative is that it would parallel a developed utility corridor through Montana, Wyoming, Nebraska, and Kansas before diverting to connect with the Cushing Extension at Steele City. However, the northern section of the alternative in Montana would run primarily through agricultural and densely populated areas. In Carbon County, Montana, both the Yellow River and its tributaries and the Pryor Mountain ranges would be difficult terrain to traverse during construction. Although it would parallel the existing pipeline corridor, the existing easements along that corridor are in the control of a different company and therefore it cannot be assumed that there would be any less acreage disturbed by an adjoining ROW than for a ROW that would not parallel the existing pipelines. Additionally, it is likely that landowner or land manager negotiations would be difficult given that for many affected parties the ROW requirements would mean more of their land would be affected by an adjoining pipeline system. With the additional length of the Express-Platte Alternative as compared to the other Steele City Segment alternatives, more wetlands, developed land, forested lands, and federal lands would be impacted than for the other alternatives and more streams/rivers crossings would be required than the other alternatives considered (see Table 4.3.3-1). In summary, the greater length of the Express-Platte Alternative, and the associated greater area of impacts and the likely requirement for construction along a new ROW along its length indicate that this alternative would not be environmentally preferable to the proposed route.

TABLE 4.3.3-1 Summary Impact Statistics for Steele City Segment Alternatives by Acres				
Parameter	**SCS-B**	**SCS-A**	**SCS-A1A**	**Express-Platte**
Total Length (Miles)	851.3	923.3	954.7	1,049.0
Land Use (Acres)[1]				
Agricultural Land	3,000.9	7,009.7	7762.0	5,240.8
Barren Land	5.9	9.2	11.5	66.1
Developed Land	162.9	367.3	367.4	432.6
Forested	37.2	54.8	55.1	93.1
Rangeland/Grassland	7,991.9	4,305.3	4,366.3	7,841.0
Wetlands	135.7	119.1	118.7	290.3
Open Water	15.6	45.5	48.6	23.3
Total	11,350.2	12,310.9	127,29.6	13,987.2
Federal Land Ownership (Acres)[2]				
Bureau Land Management	583.3	271.9	283.4	1,380.7
Bureau of Reclamation	0.0	0.0	0.0	286.8
Department of Defense	0.0	16.5	16.5	0.0
Fish and Wildlife Service	0.0	0.0	2.9	0.0
Forest Service	0.0	97.5	97.5	0.0
National Park Service	0.0	20.4	20.4	0.0
Total	584.9	1,606.5	420.8	1,667.4
Fort Peck Indian Reservation[3]	0.0	1200.0	0.0	0.0
Number of Streams/Rivers crossed[4]	443	544	538	745

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[3] Fort Peck Indian Reservation from ESRI Federal Lands, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[4] Streams/Rivers from ESRI, 2004.

4.3.3.2 Steele City Segment Alternative A

Steele City Segment Alternative A would parallel the existing Northern Border Pipeline ROW in its northernmost section for approximately 555 miles and the currently under construction Keystone Mainline pipeline for approximately 368 miles until it reaches the control point at the northern end of the Cushing Extension. Alternative SCS-A would cross parts of Montana, North Dakota, South Dakota, and Nebraska in order to reach this control point. This alternative would cross 90 miles of the Fort Peck Indian Reservation in Montana and would affect approximately 1,200 acres, assuming a 110-foot-wide construction ROW. In Montana, Alternative SCS-A would cross the BLM-managed Bitter Creek Wilderness Study Area, an area designated under the Federal Land Policy and Management Act as having wilderness characteristics consistent with the provisions of the Wilderness Act of 1964.

In North Dakota, Alternative SCS-A would cross the Little Missouri National Grassland, lands managed by the USFS. It would also cross the Missouri River along the South Dakota-Nebraska border and the

Missouri River National Recreational Area administered by the NPS. A listing of approximate acres that would be affected by Alternative SCS-A is presented in Table 4.3.3-1 and mileage along land use categories is listed in Table 4.3.3-2. Alternative SCS-A would cross significantly more agricultural and developed land, and streams/rivers than the preferred alternative. Therefore, this alternative would have greater environmental impacts than those of the proposed Project and has been eliminated from further consideration.

TABLE 4.3.3-2
Summary Impact Statistics for Steele City Segment Alternatives by Miles

	SCS-B	SCS-A	SCS-A1A
Alternative Length (Miles)	850.7	919.8	951.2
Land Use			
Agriculture	411.9	704.0	729.3
Barren	2.1	0.7	0.7
Developed	0.2	0.5	0.5
Forest/Woodlands	1.7	1.6	1.1
Rangeland/Grassland	375.5	149.1	161.4
Wetlands	1.9	7.7	5.2
Water	0.3	2.1	2.1
Shrubland	56.9	56.1	51.0
Stream Crossings (ESRI)			
Artificial Path/Canal/Ditch	10	21	18
Intermittent	405	498	489
Perennial	38	48	51

Source: Keystone 2009.

4.3.3.3 Steele City Segment Alternative A1A

Steele City Segment Alternative A1A is similar to Alternative A in that it parallels a portion of the Northern Border Pipeline and also parallels a portion of the Keystone Mainline pipeline that is now under construction. However, Alternative SCS-A1A deviates from Alternative SCS-A to avoid affecting lands within the Fort Peck Indian Reservation. The deviation from Alternative SCS-A begins in central Valley County, Montana, extending east to pass north of the reservation, then turns south to the eastern edge of the reservation in Sheridan County, Montana. The route would then cross into Roosevelt County, Montana, turning to the southeast and crossing into Williams County, North Dakota where it would follow the same route as Alternative SCS-A to reach the control point at the northern end of the Cushing Extension.

Alternative SCS-A1A would extend through the USFWS managed Medicine Lake National Wildlife Refuge (NWR) and prairie potholes east of the Fort Peck Indian Reservation. Medicine Lake NWR is a 31,660-acre refuge established to provide breeding habitat for migratory birds and other wildlife. This alternative would traverse Diversion Ditch No. 1 in the NWR, a canal that connects the refuge to Big Muddy Creek in Sheridan County, Montana. Prairie potholes are depressional wetlands (primarily freshwater marshes) often found in the Upper Midwest, including northeastern Montana and North Dakota. These permanent or temporary potholes provide breeding and habitat for migratory birds and help prevent downstream flooding. These sensitive habitats are more prominent in the eastern portion of

Alternative A1A than other Steele City Segment alternatives. Like Alternative SCS-A, Alternative SCS-A1A would cross significantly more agricultural and developed land, and streams/rivers than the preferred alternative. A summary of approximate acres that would be affected by Alternative SCS-A1A is presented in Table 4.3.3-1 and mileages along land use categories are listed in Table 4.3.3-2. Similarly to Alternative SCS-A, Alternative SCS-A1A does not offer an environmental advantage as compared to the proposed Project and has therefore been eliminated from further consideration.

4.3.3.4 Steele City Segment Alternative B (Proposed Project)

Steele City Segment Alternative B is the Applicant's preferred alternative and is addressed in Sections 2.0 and 3.0 of this EIS. This alternative would enter the U.S. parallel to the Northern Border Pipeline in Philips County, Montana and continue along that route until diverging west of the Fort Peck Indian Reservation at the crossing of the Missouri River. The USACE administers property on the south and southeastern side of the Missouri River where the alternative crosses. This crossing would require an easement from the USACE and/or the BLM, and, because the proposed pipeline is greater than 24 inches in diameter, a Congressional notification of the intent to grant an easement is also required. At the Missouri River crossing, Alternative SCS-B passes just east of the Charles M. Russell NWR which is administered by USFWS. While the proposed pipeline would not directly impact the refuge, transmission lines needed to provide electrical power to pump stations potentially could cross the area near the Fort Peck Dam. Approximately 3.6 linear miles of the refuge would be impacted by a transmission line coming in from the north, and a transmission line would also parallel, but not enter, the refuge to the east. After crossing the Missouri River, the alternative extends southeast through Harding County, South Dakota into Nebraska. At Keya Paha County, Nebraska, the alternative would cross the Niobrara River east of the reach designated under the federal Wild and Scenic River program. Alternative SCS-B parallels the Keystone Pipeline ROW for 7.4 miles in Jefferson County, Nebraska before connecting with the control point at the northern end of the Keystone Mainline's Cushing Extension near Steele City. Table 4.3.3-1 summarizes the acres of land by land use that would be affected by the construction ROW of Alternative SCS-B and mileage along land use categories is presented in Table 4.3.3-2. The majority of lands being crossed by Alternative SCS-B are rangeland/grassland rather than agricultural and developed land. The Applicant's preferred alternative crosses significantly fewer streams/rivers than the other alternatives (the closest being Alternative SCS-A1A with approximately 95 more crossings).

4.3.3.5 Baker Alternative

As part of the proposed route development and selection process, a deviation for Steele City Segment Alternative B was identified and assessed. The Steele City Segment Baker Alternative was developed based on an agency scoping comment. Tables 4.3.3-3 and 4.3.3-4 summarize impacts of the Baker Alternative and Alternative SCS-B.

The Baker Alternative would deviate for 62.1 miles from Alternative SCS-B paralleling an existing pipeline ROW near Baker, Montana in Fallon County through southwest North Dakota in Bowman County. The alternative would rejoin Alternative SCS-B in northeastern South Dakota in Harding County and reduce the total length of the Project by 2.1 miles (Tables 4.3.3-3 and 4.3.3-4). This alternative could impact Baker Lake by being routed through its watershed. It would also cross an existing oil and gas field, southeast of Baker. At the oil and gas fields, the alternative would require special crossing techniques, which could potentially offset cost savings from reducing pipeline length. Construction of the alternative could also result in an interruption to access and collection from existing wells and an increase in the potential for environmental impact through damage to gathering system pipelines or injury to workers and the public due to proximity to wells, particularly those with potential to release hydrogen sulfide. The Baker Alternative would cross more developed areas and streams/rivers and a significant amount of BLM property in Montana.

The initial assessment of the Baker Alternative indicates that it does not offer a significant environmental advantage over the proposed Project (Alternative SCS-B) and represents a higher risk of spills due to construction through an existing oil and gas field that includes gathering pipelines. Therefore, this alternative was eliminated from further consideration.

TABLE 4.3.3-3
Summary Impact Statistics for Alternative SCS-B and Baker Alternative by Acres

Parameter	Alternative SCS-B	Baker Alternative
Total Length (Miles)	64.5	62.1
Land Use (Acres)[1]		
Agricultural Land	101.7	34.5
Barren Land	0.0	1.2
Developed Land	1.8	7.8
Forested	3.0	0.9
Rangeland/Grassland	747.6	781.1
Wetlands	5.3	2.2
Open Water	0.0	0.0
Total	859.4	827.7
Federal Land Ownership (Acres)[2]		
Bureau of Land Management	2.7	163.8
Number of Streams/Rivers crossed[2]	37	47

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[3] Streams/Rivers from ESRI, 2004.

TABLE 4.3.3-4 Summary Impact Statistics for Alternative SCS-B and Baker Alternative by Miles		
	Alternative SCS-B	**Baker Alternative**
Alternative Length (Miles)	850.7	848.6
Land Use		
Agriculture	411.9	400.5
Barren	2.1	2.5
Developed	0.2	0.2
Forest/Woodlands	1.7	1.7
Rangeland/Grassland	375.5	384.5
Wetlands	1.9	1.9
Water	0.3	0.3
Shrubland	56.9	56.9
Stream Crossings (ESRI)		
Artificial Path/Canal/Ditch	10	10
Intermittent	405	413
Perennial	38	37

Source: Keystone 2009.

4.3.3.6 Comparison of Steele City Segment Alternatives

Tables 4.3.3-1 through 4.3.3-4 summarize the key impacts of the alternatives assessed for the Steele City Segment. Except for the Baker Alternative, Steele City Alternative SCS-B is the shortest route and requires less new pipeline construction than the other alternatives under consideration and would therefore have the least overall environmental impact. The Baker Alternative would affect key resources and would have a greater risk to health and safety. In addition, the fewer line miles of construction that are necessary would typically translate to lower overall construction capital costs and lifetime operating costs of the system. In addition, Alternative SCS-B crosses fewer rivers/streams, fewer miles of either developed or agricultural lands, and fewer environmentally sensitive federal lands. As a result, the initial assessment of the Steele City Segment Alternatives indicates that the alternatives considered do not offer an environmental advantage over the Applicant's proposed route (Alternative SCS-B), and they are eliminated from further consideration.

4.3.3.7 Alternatives and Variations in Montana

Keystone applied to MDEQ for a Certificate of Compliance under the MFSA for the proposed construction, operation, and maintenance of the Montana portion of the Keystone XL Pipeline Project. Before MDEQ can approve the Project as proposed or an alternative, it must find and determine the basis of the need for the facility and determine whether or not the facility would serve the public interest, convenience, and necessity.

MFSA regulations also require that MDEQ identify the route that minimizes adverse environmental impacts and uses public land (which may include federal land) whenever the use of public lands is as economically practicable as the use of private land. As a cooperating agency in the preparation of this EIS, MDEQ considered the alternatives described above and also required Keystone to identify and

provide assessments of two additional routes in Montana that would increase the use of public lands in comparison to Alternative SCS-B (the proposed route). The alternatives were established using a route development model based on GIS data (i.e., ground surveys were not conducted) that incorporated a set of weighted environmental factors, including both preferred attributes and less desirable attributes. With that approach, the Canada to North Dakota (CND) and Canada to South Dakota (CSD) alternatives were developed and compared to Alternative SCS-B relative to environmental impacts and the use of public lands. Although both routes were eliminated in the initial screening process, portions of the CSD Alternative cross more public land as compared to the segments of Alternative SCS-B in those areas. As a result, MDEQ further evaluated those portions of the CSD Alternative as "variations" to segments of Alternative SCS-B along with other route variations it developed to avoid or minimize impacts to specific resources, to minimize conflicts with existing or proposed residential and agricultural land uses, and in response to requests submitted by concerned landowners.

MDEQ identified a total of 19 variations in Montana and preliminarily selected 9 variations as preferable to the segments of Alternative SCS-B they would replace. In summary, in its review of the Project for compliance with MFSA, MDEQ selected Alternative SCS-B as modified by the 9 variations as its "tentative preferred route" in Montana. The variations ultimately selected by MDEQ would replace short segments of the overall proposed Project, are relatively close to the proposed route (Alternative SCS-B) in Montana, address specific issues relevant to MDEQ, and will be reviewed in detail by MDEQ under MFSA and the Montana Environmental Policy Act, which has essentially the same requirements as those of NEPA. In addition, both DOS and MDEQ have conducted the appropriate environmental reviews of Alternative SCS-B in Montana as reported in this EIS, including in Appendix I.

4.3.4 Alternative to Using the Cushing Extension

One alternative was identified that would avoid using the Cushing Extension. This alternative, termed the Western Alternative, was initially considered as a potential alternative to the Steele City Segment. Rather than using the control point at the north end of the Cushing Extension of the Keystone Mainline pipeline, the Western Alternative would enter the U.S. at Morgan, Montana and run southwest through Montana, South Dakota, Nebraska, Kansas, and Oklahoma to the control point at the south end of the Cushing Extension. The Western Alternative would parallel the existing Northern Border Pipeline corridor in its northernmost extent but otherwise would involve the development of an entirely new linear utility corridor for the rest of its 1,110 mile length. Since this alternative would not tie in to the control point at the north end of the Cushing Extension, it would increase the required length of new pipeline construction by at least 300 miles. Potential positive attributes of this alternative include the avoidance of the Missouri River crossing just to the east of the Fort Peck Reservoir and avoidance of crossings of reaches of the Niobrara River that have been included within the federal Wild and Scenic River program. The addition of 300 miles of new pipeline corridor beyond that required of the northern intermediate control point at Steele City is a significant disadvantage to this proposed route. The additional pipeline miles add considerable potential environmental impact to the Project due to the new ROW development required. While somewhat offset by paralleling the Northern Border ROW in the north, there would still be additional disturbance in the parallel ROW, and in aggregate, the potential benefit is not enough to offset the additional disturbances associated with 300 miles of additional required pipeline ROW. Therefore, the Western Alternative does not offer an environmental advantage over the proposed Project and was eliminated from further analysis.

4.3.5 Gulf Coast Segment Alternatives

Two geographical alternatives were assessed to meet the purpose and need of the Project's Gulf Coast Segment from the control point at the southern end of the Keystone Mainline pipeline's Cushing Extension to the control point near Nederland, Texas. These alternatives are designated as Gulf Coast

Segment (GCS)-A (proposed Project) and GCS-B. These alternatives are depicted on Figure 4.3.5-1.

4.3.5.1 Alternative GCS-A

GCS-A is the Applicant's preferred alternative. GCS-A would be approximately 480 miles in length, which is approximately 6 miles shorter than GSC-B (see Table 4.3.5-1). This route was initially identified because it parallels an existing natural gas pipeline corridor (Texoma) from Cushing to Nederland. Approximately 82 percent of this alternative would parallel the existing ROWs of other linear facilities, including 16 pipelines and electric transmission lines. While a construction ROW would still be required to build the pipeline and its associated facilities along this route, there could potentially be some reduction in the amount of new clearing required in that ROW and disturbances would for the most part occur in areas that had already been disturbed to some degree by the existing ROWs of the parallel facilities.

This route avoids to the degree feasible currently developed urban areas, including the areas of Longview, Nacogdoches, and Tyler, Texas. The predominant ownership along GCS-A is private land. Less than 1 percent of lands are owned by either the State of Oklahoma or Texas. The alternative was also routed to avoid crossing the Angelina National Forest, which is located in Angelina, Nacogdoches, San Augustine, and Jasper counties in east Texas on the shores of the Sam Rayburn Reservoir. The 153,179-acre Angelina National Forest is one of four national forests in Texas and is dominated by pine cover (USFS). Oil and gas activity and abandoned fields were also considered in routing this alternative. Active and inactive oil and gas fields may have recorded or unrecorded occurrences of contamination along the initial 100 miles from Cushing, Oklahoma. GCS-A avoids the Big Thicket Natural Preserve in Liberty County, Texas by routing the pipeline along the Texas highway. GCS-A crosses more wetlands than GCS-B, for the most part located along the southern portion of the route. A summary of pertinent statistics for Alternative GCS-A is presented in Table 4.3.5-1.

TABLE 4.3.5-1
Summary Impact Statistics for Gulf Coast Segment Alternatives

Parameter	GCS-A	GCS-B
Total Length (Miles)	480	486
Land Use (Acres)[1]		
Agricultural Land	1651.5	1975.3
Barren Land	1.7	5.0
Developed Land	321.8	373.5
Forested	2034.9	1173.3
Rangeland/Grassland	1552.7	2377.5
Wetlands	853.3	573.3
Open Water	7.1	20.3
Total	6422.9	6498.2
Federal Land Ownership (Acres)[2]		
National Park Service	5.2	7.2
Number of Streams/Rivers crossed[3]	246	255

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[3] Streams/Rivers from ESRI, 2004.

4.3.5.2 Alternative GCS-B

Alternative GCS-B would be approximately 486 miles in length, or about 6 miles longer than the GCS-A. Approximately 97.8 percent of this alternative would parallel the existing ROWs of other linear facilities, including pipelines and electric utility transmission lines. GCS-B parallels the Seaway Pipeline for approximately 190 miles south of Cushing before diverting east of Lake Texoma and Durant, Oklahoma. As with GCS-A, a construction ROW would still be required to build the pipeline and its appurtenant facilities. Nonetheless, there could potentially be some reduction in the amount of clearing required and disturbances would once again occur in areas that had already been disturbed to some degree by the ROWs of the existing facilities.

GCS-B would also cross the Big Thicket Natural Preserve. The preserve is a combination of pine and cypress forest, hardwood forest, meadow, and blackwater swamp. In 2001, the American Bird Conservancy designated the Big Thicket National Preserve as a Globally Important Bird Area. This alternative encounters more developed land areas along its route, encounters more agricultural land, and crosses more streams/rivers. Table 4.3.5-1 summarizes acres of land use that would be affected by GCS-B. As a result of its greater length and associated greater area of impact and the crossings described above, the initial assessment of Alternate GCS-B indicates that it does not offer an environmental advantage of the proposed Project and therefore it is eliminated from further analysis.

4.3.5.3 Comparison of Gulf Coast Segment Alternatives

GCS-A is the Applicant's preferred route. This shorter pipeline alternative for the Gulf Coast would likely mean lower overall construction and operating costs, along with fewer overall resource disturbances. Table 4.3.5-1 summarizes the alternatives under consideration for the Gulf Coast Segment. GCS-A bypasses a sensitive NPS land, the Big Thicket Natural Preserve. While GSC-A would cross more wetlands as compared to CGS-B, it would affect less overall agricultural land, developed land, and crosses less streams/rivers. For these reasons, GCS-A was determined to be the environmentally preferred alternative.

4.3.6 Houston Lateral Alternatives

Alternatives identified for the Houston Lateral included Alternative HL-A (the proposed Project) and Alternative HL-B. Figure 4.3.6-1 depicts the alternatives and Table 4.3.6-1 summarizes the key areas affected by the alternatives. While alternatives for the Houston Lateral begin at different locations along the Gulf Coast Segment, the crude oil delivery control point in PADD III for both Houston Lateral alternatives would be near Moore Junction, Texas.

TABLE 4.3.6-1 Summary Impact Statistics for the Houston Lateral Alternatives		
Parameter	**Alternative HL-A**	**Alternative HL-B**
Total Length (Miles)	48.6	77.4
Land Use (Acres)[1]		
Agricultural Land	286.1	438.5
Barren Land	0.0	0.3
Developed Land	27.4	208.5
Forested	27.1	11.7
Rangeland/Grassland	66.6	182.4
Wetlands	236.5	165.5
Open Water	3.9	24.9
Total	647.7	1031.9
Number of Streams/Rivers crossed[2]	12	28

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Streams/Rivers from ESRI, 2004.

4.3.6.1 Houston Lateral Alternative A

Houston Lateral Alternative A is the Applicant's preferred route. Alternative HL-A is a 49-mile-long route and would divert from the Gulf Coast Segment in central-east Liberty County and pass southwest through Chambers County to Harris County near the Moore Junction. This alternative would parallel other utility corridors for 40 percent of the route. Paralleling other ROWs could reduce the amount of clearing required, but disturbances would still be expected due to construction along the ROWs of the existing facilities (see Table 4.3.6-1). Alternative HL-A would likely encounter heavily developed urban areas on the southwest end in the east Houston area. This alternative would likely necessitate the construction of breakout tanks, which temporarily receive and store crude oil as a means of providing a steady supply of oil.

Alternative HL-A extends approximately 4 miles through land designated as being under the jurisdiction of the Coastal Zone Management Act (CZMA) along the Gulf Coast; assuming a 110-foot-wide ROW, there would be approximately 50 acres affected within the coastal zone management area in Harris County. According to the EPA, the CZMA encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources through a comprehensive management program. Any project that may affect land or water in the Texas coastal zone and that requires a federal license or permit must be reviewed for consistency with the Texas Coastal Management Program.

Alternative A would parallel fewer miles of existing utility corridors and impact more acres of wetlands than Alternative B.

4.3.6.2 Houston Lateral Alternative B

Houston Lateral Alternative B, also referred to as the southern alternative, is approximately 77 miles in length with 97 percent of the route paralleling other utility corridors. Alternative HL-B diverts from the Gulf Coast Segment near Nederland in Jefferson County, Texas. The alternative continues west through Jefferson, Liberty, Chambers, and Harris counties before ending near Moore Junction. No break out

tanks would be required for Alternative HL-B. This alternative would extend through heavily developed urban areas at the beginning and end of the proposed route. Table 4.3.6-1 summarizes the area of land use that would be impact for Alternative HL-B. This longer alternative would impact significantly more agricultural land and developed land and streams/rivers crossings.

Alternative B would likely encounter greater regulatory barriers than Alternative HL-A due to its proximity to the Gulf Coast and due to the length of pipeline that would reside within the CZMA. Approximately 31 miles (approximately 417 acres, assuming a 110-foot-wide ROW) of Alternative HL-B would cross land within the Texas Coast Management Program in Harris County and Chambers County. That is a substantially greater area of land that would be affected in the Texas Coastal Management Program as compared to Alternative HL-A. As a result of coastal zone concerns, the greater length of the pipeline, and the larger amount of acreage that would be impacted by pipeline construction, this alternative does not offer an environmental advantage over HL-A and was eliminated from further consideration.

4.3.6.3 Comparison of Houston Lateral Alternatives

Table 4.3.6-1 summarizes the key effects of the alternatives under consideration for the Houston Lateral. Alternative HL-A is the shorter route and would require fewer miles of new pipeline and would have a lesser area of impact. Overall construction capital costs and lifetime operating costs for the Houston Lateral are likely to be less with the shorter pipeline alternative. While Alternative HL-A would intersect more wetlands, it would impact fewer acres of agricultural land and developed land, and fewer streams/rivers crossings. Alternative HL-B would intersect 27 more miles or 367 more acres within a 110-foot-wide ROW of land that is within the authority of the Texas Coastal Management Program and that is encumbered with the restrictions of the CZMA than would Alternative HL-A, the Applicant's preferred route. For these reasons, Alternative HL-B does not offer an environmental advantage over the proposed Project and was eliminated from further analysis.

4.3.7 Summary of Pipeline Route Alternatives Analysis

DOS identified alternatives to the proposed Project within three segments established by control points required to meet the purpose and need of the proposed Project. The three segments are the Steele City Segment, the Gulf Coast Segment, and the Houston Lateral. DOS developed the alternatives based on information provided by the Applicant and the cooperating agencies, and obtained by DOS and its third-party contractor. After identifying reasonable alternatives, DOS evaluated each alternative in comparison to the purpose and need of the Project and the potential environmental impacts of each alternative as compared to the proposed pipeline route. The analysis was based on data provided in the Project application, information obtained from the cooperating agencies, and data obtained through the research of DOS and its third-party contractor.

Based on the assessment of alternatives conducted, DOS determined that none of the identified alternatives offered an environmental advantage over the Applicant's preferred route. Therefore, the DOS preferred route consists of the following alternatives by segment:

- Steele City Segment Alternative B (SCS-B);
- Gulf Coast Segment Alternative A (GCS-A); and
- Houston Lateral Alternative A (HL-A).

4.4 ALTERNATIVE 230-KV ELECTRICAL TRANSMISSION LINE ROUTES

The 230-kV Lower Brule to Witten transmission line would be needed as a result of transmission system reliability requirements due to the expected load demands at full pipeline operational capacity in southern South Dakota. A systems analysis conducted by the Western Area Power Authority (Western) determined that a 230-kV electrical transmission line would be needed between the Lower Brule substation and the Witten substation to achieve desired system reliability under the anticipated load conditions at high throughput. The transmission line would transfer electricity from the proposed Lower Brule Substation near Big Bend Dam in Lyman County, to an existing substation near Witten in Tripp County.

To meet these requirements, the existing Big Bend-Fort Thompson No. 2, 230-kV transmission line turning structure would be converted to a double-circuit structure. Western would construct 2.1 miles of new double-circuit transmission line south of the dam to the new Lower Brule Substation and would own and operate the 2.1 mile line. Ownership of the Lower Brule Substation would be transferred to the Basin Electric Power Cooperative (BEPC). BEPC would construct and operate the new 230-kV transmission line from the Lower Brule Substation to the existing Witten Substation, which is owned by Rosebud Electric Cooperative. The approximately 70-mile-long transmission line would be built, owned, and operated by BEPC.

Western and BEPC developed alternative corridors and alternative routes within those corridors for the project. Those alternatives are described below.

Initially, a 6-mile-wide corridor, Alternative Corridor A, was identified by Western for the Lower Brule to Witten transmission line between an existing substation on the transmission grid and a proposed new substation at Lower Brule. BEPC and Western then identified five preliminary alternative routes for the transmission line within Corridor A (Figure 4.4-1); the five alternatives are the Western Alternative and Alternatives BEPC-A through BEPC-D.

The Western Alternative, the shortest alternative, would cross the most agricultural land, barren land, forested land, open water, and wetlands (Table 4.4-1). The BEPC alternatives range from 69.7 to 72.0 miles in length and cross more rangeland/grassland than the Western Alternative. Alternative BEPC-B crosses the most perennial/intermittent stream crossings while BEPC-D crosses the most developed land and is the longest alternative.

BEPC, Western, and the Lower Brule Reservation also identified Alternative Corridor B, which is also a 6-mile-wide corridor. This corridor follows a similar path from the existing Witten Substation to the proposed Lower Brule Substation but with deviations in the southeast near Winner and the northeast near Reliance. Corridor B was further developed into four preliminary alternative routings for the transmission line (Figure 4.4-1); the four alternatives are Alternatives BEPC-E through BEPC-H.

The Corridor B preliminary alternatives range from 73.9 to 75.2 miles in length (Table 4.4-2). Alternative BEPC-G crosses the most agricultural land, wetlands, and perennial/intermittent stream crossings. BEPC-H crosses the most developed land and forested areas and is the longest of the four alternatives in Corridor B.

The alternatives within both Corridor A and Corridor B cross the Lower Brule Reservation and connect with an existing transmission line near the Big Bend Dam.

The key impacts of the transmission line alternatives are listed in Tables 4.4-1 and 4.4-2 for comparison purposes. In addition, the impacts of construction and operation of the transmission line alternatives are generally addressed in Section 3.0 the EIS. However, DOS, Western, and the other cooperating agencies

do not have sufficient design and construction information to establish an agency preferred alternative for the proposed transmission line project. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line will be conducted after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but rather with later stages of proposed pipeline operation at higher levels of crude oil throughput.

TABLE 4.4-1
Summary of Key Impacts for the Lower Brule to Witten Transmission Line Alternatives in Corridor A

	Alternative				
Characteristic	**Western**	**BEPC-A**	**BEPC-B**	**BEPC-C**	**BEPC-D**
Total Length (Miles)	67.2	69.7	70.1	71.7	72.0
Land Use (Acres)[1]					
Agricultural Land	501.5	389.5	404.3	427.7	398.6
Barren Land	0.5	0.0	0.0	0.0	0.0
Developed Land	40.1	27.4	27.3	69.3	76.9
Forested	1.6	0.7	0.7	0.7	0.7
Rangeland/Grassland	458.9	627.0	620.5	576.6	608.2
Wetlands	10.7	7.0	4.6	7.9	3.2
Open Water	5.2	4.8	4.1	4.1	4.0
Total	1,018.5	1,056.4	1,061.5	1,086.3	1,091.6
Lower Brule Reservation (Acres)[2]	103.1	106.0	106.0	106.0	106.0
Number of Streams/Rivers Crossed[3]					
Perennial	1	4	4	4	4
Intermittent	33	34	36	35	26
Total	34	38	40	39	30

[1]Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[2]Lower Brule Reservations from ESRI Federal Lands, 2004. (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[3]Streams/rivers from ESRI, 2004.

TABLE 4.4-2 Summary of Key Impacts for the Lower Brule to Witten Transmission Line Alternatives in Corridor B				
	Alternative			
Characteristic	**BEPC-E**	**BEPC-F**	**BEPC-G**	**BEPC-H**
Total Length (Miles)	73.9	74.6	74.5	75.2
Land Use (Acres)[1]				
Agricultural Land	346.4	348.8	433.5	374.7
Barren Land	0.0	0.0	0.0	0.0
Developed Land	66.9	61.5	66.5	107.1
Forested	2.4	0.6	1.8	2.6
Rangeland/Grassland	692.7	712.3	611.8	645.8
Wetlands	5.2	4.8	12.2	6.3
Open Water	5.7	2.7	2.5	2.5
Total	1,119.3	1,130.7	1,128.3	1,139.0
Lower Brule Reservation (Acres)[2]	132.8	131.4	131.4	136.7
Number of Streams/Rivers Crossed[3]				
Perennial	3	4	7	7
Intermittent	23	25	31	20
Total	26	29	38	27

[1]Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2]Lower Brule Reservations from ESRI Federal Lands, 2004a. (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[3]Streams/rivers from ESRI, 2004b.

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