Appendix I

SUPPLEMENTAL INFORMATION FOR COMPLIANCE WITH THE
MONTANA ENVIRONMENTAL POLICY ACT AND SUPPORT FOR DECISIONS
UNDER THE MAJOR FACILITY SITING ACT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

<u>Figure</u>

LIST OF ATTACHMENTS

This page intentionally left blank.

I-1.0 INTRODUCTION

As described in Section 1.0 of this U.S. Department of State (DOS) environmental impact statement (EIS), TransCanada Keystone Pipeline, L.P. (Keystone) has applied to the Montana Department of Environmental Quality (MDEQ) for a Certificate of Compliance under the Major Facility Siting Act (MFSA) for the proposed construction, operation, and maintenance of the Montana portion of the Keystone XL Pipeline Project (Project), a 36-inch-diameter crude oil pipeline and associated facilities. Pursuant to 75-20-301 Montana Code Annotated (MCA), before MDEQ can approve the Project as proposed or an alternative, MDEQ must find and determine:

"(1)(a) the basis of the need for the facility;

(b) the nature of the probable environmental impact;

(c) that the facility minimizes adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives;

(d) in the case of an electric, gas, or liquid transmission line or aqueduct:

(i) what part, if any, of the line or aqueduct will be located underground;

(ii) that the facility is consistent with regional plans for expansion of the appropriate grid of the utility systems serving the state and interconnected utility systems; and

(iii) that the facility will serve the interests of utility system economy and reliability;

(e) that the location of the facility as proposed conforms to applicable state and local laws and regulations, except that the department may refuse to apply any local law or regulation if it finds that, as applied to the proposed facility, the law or regulation is unreasonably restrictive in view of the existing technology, of factors of cost or economics, or of the needs of consumers, whether located inside or outside the directly affected government subdivisions;

(f) that the facility will serve the public interest, convenience, and necessity;

(g) that the department or board has issued any necessary air or water quality decision, opinion, order, certification, or permit as required by 75-20-216(3); and

(h) that the use of public lands for location of the facility was evaluated and public lands were selected whenever their use is as economically practicable as the use of private lands.

(2) In determining that the facility will serve the public interest, convenience, and necessity under subsection (1)(f), the department shall consider:

(a) the items listed in subsections (1)(a) and (1)(b);

(b) the benefits to the applicant and the state resulting from the proposed facility;

(c) the effects of the economic activity resulting from the proposed facility;

(d) the effects of the proposed facility on the public health, welfare, and safety;
(e) any other factors that it considers relevant."

This appendix[1] provides supplemental information needed to support the findings that must be made by MDEQ before the Project could be approved in Montana under MFSA. Without this approval, Keystone would not be able to construct the pipeline in Montana. Further, without the approval of MDEQ, Keystone would not be able to exercise the right of eminent domain in Montana, and there is no federal eminent domain authority for crude oil pipelines.

MDEQ has determined that issuance of a Certificate of Compliance under MFSA may result in a significant adverse impact to the environment as defined by the Montana Environmental Policy Act (MEPA). This appendix provides the environmental analyses required by MEPA to supplement the environmental assessments presented in the main body of the EIS, which was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA). The analyses in this appendix focus on environmental concerns in the vicinity of the proposed Project route, alternative routes, and route variations in Montana.

MEPA requires that MDEQ provide a detailed statement on the following:

- The environmental impact of the proposed Project in Montana;
- Any adverse environmental effects that cannot be avoided if the proposal is implemented;
- Alternatives to the Project, including a meaningful analysis of the No Action alternative;
- Any regulatory impacts on the private property rights of the applicant;
- The relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity;
- Any irreversible and irretrievable commitments of resources that would be involved in the Project if it is implemented; and
- The details of the beneficial aspects of the Project, both short term and long term, and the economic advantages and disadvantages of the proposal.

The proposed Project would transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the south central U.S., including an existing oil terminal in Cushing, Oklahoma and existing delivery points in the Port Arthur and east Houston areas of Texas. In total, the Project would consist of approximately 1,707 miles of new 36-inch-diameter pipeline, with approximately 327 miles in Canada and 1,380 miles in the U.S. In Canada, the proposed pipeline would be adjacent to an existing pipeline along much of the route, including at the proposed border crossing near the Port of Morgan, Montana.[2] The alternatives and variations analyzed in the EIS begin at that border crossing.

The Project would initially have a nominal transport capacity of 700,000 barrels per day (bpd) of crude oil. By increasing the pumping capacity in the future, the Project could ultimately transport up to 900,000 bpd of crude oil through the proposed pipeline. Additional information on the proposed Project is presented in Sections 1.1 and 2.0 of the main body of the EIS.

---

[1] References to other appendices are to appendices in the main EIS. References to attachments are to the attachments to this Appendix I.

[2] On March 11, 2010, the National Energy Board (NEB) of Canada announced that it had approved the Project in Canada. The NEB decision and hearing orders are presented in Appendix T.

As defined in the EIS, the proposed Project would consist of three new pipeline segments plus additional pumping capacity on the previously permitted Cushing Extension Segment of the Keystone Pipeline Project (Keystone Cushing Extension; see Section 1.1 of the EIS, Figure 1.1-1). The Keystone Cushing Extension is currently under construction. The three proposed new pipeline segments in the U.S. consist of the following:

- Steele City Segment (from near the Port of Morgan, Montana, to Steele City, Nebraska) that connects to the northern end of the previously approved and currently under construction Keystone Cushing Extension;
- Gulf Coast Segment (from Cushing, Oklahoma, to Nederland, Texas) that connects to the southern end of the Keystone Cushing Extension; and
- Houston Lateral (from the Gulf Coast Segment, in Liberty County, Texas, to Moore Junction, Harris County, Texas.

As proposed, the new pipeline would extend through five states: Montana, South Dakota, Nebraska, Oklahoma, and Texas.

MDEQ assisted DOS as a cooperating agency during preparation of the EIS for the proposed Project. As a result of its involvement in the EIS process, MDEQ will use the DOS EIS, including the Montana-specific information presented in this appendix, to comply with MEPA and MFSA.

Information presented in the main body of the EIS addresses the topics listed below that are also required under MEPA and MFSA; the sections of the EIS where the major topics are addressed are noted in parentheses:

- Executive Summary (Executive Summary);
- Purpose and Need (Section 1.2);
- Description of Alternatives (Section 4.0, including the No Action Alternative);
- Description of the Proposed Project (including construction methods − Section 2.0);
- Potential Environmental Impacts (including direct, indirect[secondary], cumulative impacts, and mitigation measures − Section 3.0);
- Permitting Requirements (Section 1.8);
- Public and Agency Coordination (Sections 1.3 through 1.7);
- Risk Analysis (Section 3.13);
- List of Preparers (Appendix U);
- List of Abbreviations and Acronyms (Table of Contents); and
- References Cited (presented at the end of each section of the EIS).

This appendix provides the supplemental information required to fully comply with MEPA and MFSA in the following sections:

- Analysis of Alternatives in Montana (Section I-2.0);

- Environmental Analysis of the Proposed Keystone XL Project in Montana (supplemental to information in the EIS regarding the nature of environmental impacts, as required by MFSA, and residual impacts remaining after the application of mitigating measures; Section I-3.0);
- Unavoidable Adverse Impacts (Section I-4.0);
- Irreversible and Irretrievable Commitments of Resources (Section I-5.0);
- Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity (Section I-6.0); and
- Regulatory Restrictions (Section I-7.0).

Information regarding the proposed Project and potential alternatives (i.e., design, location, schedule, workforce, and other details needed to conduct an environmental assessment of the proposed Project and alternatives) was obtained from Keystone's application for a Presidential Permit and associated submittals to DOS, Keystone's application for a MFSA Certificate of Compliance and subsequent submittals associated with the application, Keystone's proposed Plan of Development for a right-of-way (ROW) grant from the Bureau of Land Management (BLM), and limited field work undertaken by MDEQ staff. Information on the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this appendix. Information on existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature research and field studies conducted by the third-party environmental contractor, sources of information publicly available in Montana, and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives and variations to the proposed route.

I-2.0 ANALYSIS OF ALTERNATIVES

This section describes the development and analysis of Project alternatives in Montana and variations to Keystone's proposed route (Alternative SCS-B) in Montana in the following subsections:

- Background (Section I-2.1);
- No Action Alternative (Section I-2.2);
- Development of Alternative Routes in Montana (Section I-2.3)
- Analysis of Montana Alternative Routes (Section I-2.4);
- Route Variations (Section I-2.5);
- Tentative Preferred Route in Montana (Section I-2.6); and
- References Cited (Section I-2.7).

I-2.1 BACKGROUND

Section 4.0 of the EIS presents an analysis of alternatives for the proposed Project. The analysis was conducted in accordance with the requirements of the National Environmental Policy Act (NEPA), which has requirements that are essentially the same as those of MEPA. The alternatives assessment presented in the DOS EIS includes identification of potential alternatives to the entire Project and an assessment of whether or not they 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.

The alternatives assessment in this EIS describes the criteria used for identifying potential alternatives and for assessing and comparing the alternatives, including a comparison with the proposed Project. The assessment addresses the No Action Alternative (Section 4.1), which addresses projected beneficial and adverse environmental, social, and economic impacts that would result if the proposed Project is not constructed and operated; System Alternatives (Section 4.2), which entail the use of other pipeline systems or other methods of providing crude oil supplies to the U.S. Gulf Coast market; and Route Alternatives (Section 4.3), i.e., other pipeline routes between the U.S./Canada border near the Port of Morgan, Montana, and the Gulf Coast destination points of the proposed Project.

As described in Section 4.1 of the EIS, DOS eliminated the No Action Alternative from further consideration since it would not meet the purpose and need of the proposed Project and may result in impacts that would be similar to those of the proposed Project if other projects were implemented to meet the crude oil needs of Petroleum Administration for Defense District (PADD) III[3] refineries. MEPA requires that MDEQ analyze the No Action Alternative; that analysis is provided in Section I-2.2 of this appendix.

[3] PADD III (Gulf Coast) consists of the states of Alabama, Mississippi, Louisiana, Arkansas, Texas, and New Mexico.

In Section 4.2 of the EIS, the use of system alternatives was eliminated from further consideration since the alternative modes considered would be less safe, would require construction of substantially more infrastructure, have greater atmospheric emissions (including greenhouse gases), and/or pose greater safety hazards than the proposed Project.

As noted in Section 4.3.2 of the EIS, to be considered, most alternative routes were required to connect to several fixed locations (control points) to meet the Project's purpose and need. These control points, which placed constraints on potential geographic alternatives to achieve the Project's purpose and need in Montana, consist of the following:

- Control Point 1: The international border crossing between Saskatchewan and Montana near the Port of Morgan, Montana, where the southern end of the Canadian portion of the proposed Project would be located; and
- Control Point 2: The northern end of the previously permitted and now under construction Cushing Extension to the Keystone Mainline pipeline near Steele City, Nebraska.

I-2.2 NO ACTION ALTERNATIVE

MDEQ would select the No Action Alternative if it cannot make the findings required for issuance of a Certificate of Compliance under MFSA. Under the No Action Alternative, MDEQ would not issue a Certificate of Compliance to Keystone, and the Project would not be constructed and operated in Montana.

With incorporation of the No Action Alternative, the beneficial and adverse environmental, social, and economic impacts associated with the Project in Montana (discussed in Section 3.0 of the EIS and in Section I-3.0 of this appendix) would not occur. While this alternative would eliminate the environmental impacts associated with the Project, it would not meet Keystone's objectives. As stated in Section 1.2.1 of the EIS, the primary purpose of the Project is to transport crude oil from the WCSB to delivery points in PADD III to meet the growing demand by refineries and markets in PADD III. It may also offset the decreasing domestic crude oil supply while reducing U.S. dependence on less reliable foreign oil sources.

U.S. demand for petroleum products is likely to continue increasing for the foreseeable future. The Energy Information Administration (EIA) estimated that the total U.S. consumption of liquid fuels, including both fossil liquids and biofuels, will increase from the 19.5 million bpd consumed in 2008 to 22.1 million bpd in 2035 in the AEO2010 reference case (EIA 2010). For the total U.S. demand, biofuel consumption accounts for most of the growth, since consumption of petroleum-based liquids is projected to be essentially flat across the country. However, in PADD III, consumption of heavy crude is expected to increase as production from conventional sources decreases. The increase in heavy crude consumption coupled with continued expected declines form Mexican sources of heavy crude make increased access to Canadian crude desirable from both an economic and national security standpoint. Further, limited pipeline capacity constrains the supply of WCSB crude oil to PADD III (Canadian Association of Petroleum Producers 2009, Purvin & Gertz 2009), which represents the largest refining capacity in the U.S. The Project would have a nominal capacity to deliver up to 900,000 bpd of crude oil to delivery points in PADD III near Gulf Coast refineries.

The No Action Alternative would not provide the U.S. with a relatively stable and secure source of North American crude oil for the PADD III market via a new pipeline through Montana. In addition, the U.S. dependence on less reliable foreign oil supplies from the Mideast, Africa, Mexico, and South

America would remain at its current level or increase further unless alternative methods of delivery or alternative pipeline routes are developed to transport crude oil to PADD III. Alternative transportation methods and pipeline routes are discussed in Sections 4.2 and 4.3 of the EIS.

The forecasted demand for crude oil is expected to continue, even with concentrated efforts to develop renewable energy resources and promote energy conservation. As a result, other oil transportation projects could be developed if the Project were not constructed and operated. Over the long term, despite current economic concerns, worldwide demand for crude oil from the WCSB oil sands would continue to increase. Alternative transportation systems to move this oil to markets in the U.S. or elsewhere, such as China or Japan, could emerge if the Project were not constructed. Although it would be speculative to predict the environmental impacts of those actions, incorporation of the No Action Alternative may not necessarily result in less impact.

In addition, 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 decrease the availability of the refined products for end-users.

I-2.3 DEVELOPMENT OF ALTERNATIVE ROUTES IN MONTANA

MFSA regulations require MDEQ to identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. In Section 4.3 of the EIS and in the initial Keystone MFSA application, five alternative routes were considered in Montana: the Express-Platte, SCS-A, SCS-A1A, SCS-B (the proposed Project), and the Baker alternatives. In addition, MDEQ required that Keystone provide assessments of two additional routes using a route development model based on graphic information system (GIS) data (i.e., ground surveys were not conducted) that incorporates a set of weighted environmental factors, including both preferred attributes and less desirable attributes (described below). With that approach, the model-generated routes could be further evaluated and compared to Keystone's proposed route relative to environmental impacts, the use of public lands, and costs.

The model-generated routes used the following control points:

- U.S./Canada Border near the Port of Morgan, Montana to an interconnection with Alternative SCS-A in Williams County, North Dakota;
- U.S./Canada Border near the Port of Morgan to the Missouri River; and
- Missouri River to an interconnection with an alternative in South Dakota.

The model-generated route segments between the control points had to meet both the key criteria used to develop alternatives for the DOS EIS, including avoiding or minimizing use of, to the extent practical, key areas of concern, and any additional avoidance factors identified by MDEQ. For the alternative development process for the main body of the EIS, the following were the primary areas to be avoided or used minimally:

- 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 National Register of Historic Places;
- 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 developing the GIS model alternatives, Keystone, after consultation with MDEQ, used a "fatal flaw" approach which included the criteria listed in MFSA and in MFSA Circular 2. These criteria included use of preferred, excluded, and avoidance areas that were weighted in the GIS model.

The following were in the "preferred areas" category of the GIS model:

- Public lands;
- Existing utility and/or transportation corridors (use of or parallel to);
- Logged areas rather than undisturbed forest, in timbered areas;
- Geologically stable areas;
- Non-erosive soils in flat or gently rolling terrain;
- Roaded areas where existing roads can be used for access to the facility during construction and operations and maintenance;
- Areas where the facility will create the least visual impact;
- Alignments that are a safe distance from residences and other areas of human concentration;
- Lands which can be returned to their original condition through re-contouring; and
- Areas that enhance conservation of topsoil and reclamation.

The following were in the "excluded areas" category in the GIS model:

- National wilderness areas;
- National primitive areas;
- National wildlife refuges and ranges;
- State wildlife management areas;
- Wildlife habitat protection areas;
- National parks and monuments;
- State parks;
- National recreation areas;
- Corridors of rivers in the national wild and scenic rivers system and rivers eligible for inclusion in the system;

- Roadless areas of 5,000 acres or greater in size and managed by federal or state agencies to retain the roadless character;
- Rugged topography (defined as areas with slopes greater than 30 percent);
- Specially managed buffer areas surrounding national wilderness areas and national primitive areas;
- Active faults;
- Large waterbodies;
- Residences;
- Domestic wells; and
- Oil and gas wells.

The following were in the "areas to be avoided" category of the GIS model:

- Wetlands and streams;
- Habitat of listed threatened or endangered species or that of species that are candidates for listing; and
- Irrigated farmland.

The model also included other sensitive areas typically avoided during route refinement, including the following:

- Known paleontological sites;
- Wellhead protection areas and aquifers;
- Known locations of cultural resources; and
- High Consequence Areas as designated by the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS).

The overall constructability of the pipeline and associated facilities was also considered, as was the desire to minimize impacts of the Project while considering costs and optimizing the use of public land. A more detailed description of the methods used in developing the GIS alternatives is included in Keystone's alternatives assessment report submitted to MDEQ; that document (*Keystone XL Steele City U.S. Segment, Montana Route Alternatives Analysis Report; August 2009*) is incorporated into this EIS by reference.

The extent, shape, and prevalence of many resources (e.g., rivers, historic trails, wetlands, and farmlands) preclude completely avoiding impacts to them on any route within the Steele City Segment. In developing the GIS route alternatives, consideration was given to routes that would have all or part of their lengths parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW). 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 the impacts to certain resources, such as sage-grouse habitat, that already have been disturbed by major linear projects. However, such paralleling may concentrate impacts to a few private landowners.

Installing the pipeline within existing ROWs could reduce the amount of new disturbance. However, the owner of an existing ROW may not allow the proposed construction ROW to overlap with an existing pipeline ROW. This may result in two separate but parallel disturbances. In other cases it may be advantageous to select a new pathway that makes better use of public land, if the number of miles of new construction that may be required is economically practicable and impacts to environmental and cultural resources are not substantially greater than those of the proposed route.

The GIS modeling identified the following two alternatives:

- Canada to South Dakota (CSD) Alternative, which initially consisted of two route segments − the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment − based on the control points identified above; and
- Canada to North Dakota (CND) Alternative.

Figure I-2.3-1 depicts these two alternatives along with the other alternatives assessed in Montana. The two segments of the CSD Alternative cross the Missouri River at the same locations. As a result, Keystone combined the two segments in its MFSA application to compare the alternative with the proposed route. In the analyses presented below, the two segments are addressed separately were appropriate and are also considered as a single alternative, the CSD Alternative, for the purposes of comparing the alternative to the proposed route in Montana and in the Steele City Segment of the Project.

The CSD Alternative route crosses the Missouri River at about the same site as the proposed route and extends along the same route as the proposed Project for approximately 22.9 miles. The southern end of the CSD Alternative connects to the proposed route in southern Harding County, South Dakota.

The CND alternative ends in western Williams County, North Dakota where it joins Alternative SCS-A, which extends to the Cushing Extension. Starting in Roosevelt County, Montana, the CND route is in close proximity and essentially parallel to Alternative SCS-A; due to that close proximity and the scale of Figure I-2.3-1, the CND route appears to connect to the route of Alternative SCS-A in Roosevelt County. However, the CND Alternative extends across the Montana/North Dakota border and joins the SCS-A route in western Williams County, North Dakota.

I-2.4 ANALYSIS OF MONTANA ROUTE ALTERNATIVES

The seven alternatives listed below and depicted in Figure I-2.3-1 were considered in Montana:

- The Express-Platte Alternative that is parallel to the Express Pipeline and Platte Pipeline through central Montana, Wyoming, and Nebraska;
- Alternatives SCS-A1A, SCS-A, and CND that extend through northeastern Montana, North Dakota, South Dakota, and Nebraska;
- The proposed route (SCS-B) through eastern Montana, South Dakota, and Nebraska;
- The Baker alternative in southeast Montana, southwest North Dakota, and northwest South Dakota; and
- The CSD Alternative that is generally parallel to the proposed route.

The analysis of alternatives was conducted in several phases. The initial phase considered overall feasibility in relation to the purpose and need of the Project (as described in Section 1.2 of the EIS) and major environmental issues. This initial review resulted in the elimination of some alternatives as described in Section I-2.4.1 (Alternatives Initially Considered and Eliminated). Alternatives selected for further analysis were reviewed as described in Section I-2.4.2 (Comparison of Retained Alternatives).

I-2.4.1 Alternatives Initially Considered and Eliminated

The Canadian portion of the proposed Project route would end in the vicinity of the U.S./Canada border near the Port of Morgan, Montana; Keystone applied for a Presidential Permit for that border crossing. The border crossing of the Express and Platte pipelines is near the Port of Wildhorse, which is substantially west of the proposed border crossing. As described in Section 4.3.3.1 of the EIS, the Express-Platte Alternative for the Steele City Segment is approximately 200 miles longer than the proposed route, would have a greater area of impact, and would affect more than three times as much federal land as the proposed route. For those and other reasons described in Section 4.3.3.1, the Express-Platte Alternative was eliminated from further consideration.

In its initial application to MDEQ, Keystone identified two alternatives that intersect with the proposed route in North Dakota; from there, the proposed route continues on to Steele City. One of these alternatives parallels the Northern Border Pipeline and crosses through the Fort Peck Indian Reservation (Alternative SCS-A). Keystone developed a second alternative that extends north of the reservation in Montana (Alternative SCS-A1A). Aside from paralleling the Northern Border Pipeline and allowing for constructability, it remains unclear how the preferred location criteria listed in Circular MFSA-2 and the use of public lands, including state lands, were factored into development of those two alternatives. Alternative SCS-A is 69.0 miles longer than the proposed route for the Steele City Segment, and SCS-A1A is about 100.6 miles longer than the proposed route along the Steel City Segment. Although these alternatives are considerably shorter than the proposed route in Montana, the overall impacts of each route for the entire Steele City Segment were considered to be greater than those of Keystone's proposed route. Thus, Alternative SCS-A and Alternative SCS-A1A were not carried forward by MDEQ for detailed consideration.

Another alignment, the Baker alternative, was developed by Keystone at MDEQ's request to parallel an existing pipeline, use a high proportion of public land, and be shorter than the applicant's proposed route. This alternative was not carried forward for several reasons:

- The initial segment extends below Lake Baker or in its watershed. This is a popular, developed recreation site at the edge of Baker and one of only a few such sites in the region. Construction would disrupt recreation in the short term in this area. Over the long term, the risk associated with an oil spill was considered to be unacceptably high, despite a very low statistical probability of a leak;
- This alternative alignment crosses approximately 22 more miles of core sage-grouse habitat than the proposed route; and
- This alternative alignment crosses an active oil and gas field along the Cedar Creek Anticline. While the Baker alternative avoids the wells themselves, the route crosses many gathering pipelines. Construction through that area would increase the risk of accidental damage and a resultant gas leak or oil spill. The cost of construction of this alternative was estimated by Keystone to be $3.25 million higher than that of the proposed route because of the extra time needed to work around the existing gathering pipelines. Further, if a leak or spill were to occur

due to damage to one of these gathering lines, Keystone would incur additional environmental and cleanup costs.

In summary, four of the seven alternatives were eliminated from further consideration: the Express-Platte Alternative, Alternative SCS-A, Alternative SCS-A1A, and the Baker Alternative. Section 4.3.3 of the EIS presents additional information on those four alternatives.

I-2.4.2 Comparisons of Retained Alternatives

The remaining three alternatives (the CND Alternative, the CSD Alternative, and the proposed Project [Alternative SCS-B]) were analyzed further as described in this section. The comparisons include length of the alternatives (Section I-1.4.4.1), potential impacts (Section I-2.4.2.2), and estimated construction costs (Section I-2.4.2.3).

Keystone did not appear to examine the preferred Montana routing criteria and preference for the use of public land until after it had selected Alternative SCS-B as its proposed route. The MFSA application noted that state school trust lands and other public lands had specifically been avoided, which was not in compliance with MFSA and MEPA requirements. Thus, MDEQ worked with Keystone and the third-party EIS contractor to develop two new alternatives (the CND and CSD alternatives) in a manner that provided clear documentation of the steps taken and factors considered, as indicated in Sections I-2.1 and I-2.3.

MFSA, in part, requires that MDEQ find and determine that a proposed facility minimizes adverse environmental impacts, considering the state of available technology and the nature and economics of the various alternatives, before the facility is approved. This finding does not prohibit MDEQ from considering costs and impacts outside of Montana. Thus, in the following sections, the CND and CSD alternatives are compared to the proposed Project in Montana and also for the entire Steele City Segment (i.e., from the Montana-Saskatchewan border to Steele City, Nebraska), where appropriate. For this second phase of the analysis of alternatives, overall length of the pipeline was considered (Section I-2.4.2.1), as were potential impacts to key environmental resources (Section I-2.4.2.2) and construction costs (Section I-2.4.2.3). Section I-2.4.2.4 presents conclusions to the analysis of the retained alternatives.

I-2.4.2.1 Lengths of Alternatives

In general, longer alternative routes affect a greater area of land than shorter routes. However, if the construction ROW overlaps an existing pipeline's operating ROW, the amount of new disturbance might be reduced. Without overlap, each mile of an alternative route would typically impact approximately 13.3 acres during construction and 6.0 acres during operation. As a result, there usually are environmental advantages to keeping the length of pipe required to reach the control point as short as possible while considering impacts to natural, cultural, and other environmental resources. However, a shorter route may not optimize the use of public lands as required by MFSA.

Table I-2.4-1 lists the distances of each of the Montana alternatives assessed from the Montana-Saskatchewan border near the Port of Morgan to Steele City, along with the distance in Montana.

TABLE I-2.4-1 Lengths and Construction Areas of Alternatives				
Alternative	Length In Montana (miles)	Estimated Construction Area In Montana (Acres)	Length of Steele City Segment (miles)[1]	Estimated Construction Area of Steele City Segment (Acres)[1]
Canada to North Dakota (CND)	185.4	2,472.0	924.7	12,329.3
Proposed Route (SCS-B)	282.5	3,766.7	850.7	11,342.7
Canada to South Dakota (CSD)[2]	290.5	3,873.3	859.2	11,456.0

[1] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.
[2] Consists of the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment.

As noted in Table I-2.4-1, implementation of the proposed route for the full Steele City Segment would result in the shortest pipeline distance of the three alternatives and would therefore result in less total construction impact than the other alternatives; however, it would not optimize the use of public lands. The CND Alternative is the shortest route through Montana, but it is the longest Steele City Segment route of the three alternatives.

I-2.4.2.2 Potential Impacts

For the second phase of analysis of the alternatives, the potential impacts to three key resources were considered:

- Major Stream Crossings;
- Land Uses; and
- Use of Publicly Owned Lands.

Major Stream Crossings

Table I-2.4-2 lists the number of perennial and intermittent streams crossed in Montana by each alternative.

TABLE I-2.4-2 Major Stream Crossings by Alternatives in Montana[1]				
		Number and Type of Crossings		
Alternative	Segment	Intermittent Streams	Perennial Streams	Total Major Streams
Proposed Route (SCS-B)	Canada to Missouri River	34	7	41
Canada to South Dakota (CSD)	Canada to Missouri River (CMR)	32	7	39
Proposed Route (SCS-B)	Missouri River to South Dakota Border Segment	83	8	91
CSD	Missouri River to South Dakota (MRSD) Border	74	13	87
Canada to North Dakota (CND)	Entire Route	72	10	82
CSD	Entire Route	106	20	126
Proposed Route (SCS-B)	Entire Route	117	15	132

[1] Perennial and intermittent streams from ESRI 2004.

The CND Alternative crosses 50 fewer major streams than the proposed route and 44 fewer major streams than the CSD Alternative in Montana. However, the route of the complete Steele City Segment with the CND alternative has 118 more major stream crossings than Keystone's proposed Steele City segment. The CSD Alternative crosses 11 fewer intermittent streams than the proposed route in Montana, but 5 more perennial streams. Based on this level of analysis, the CND Alternative offers an environmental advantage over both CSD Alternative and the proposed route regarding stream crossings in Montana; the CSD Alternative and the proposed route are expected to have similar overall impacts with regard to stream crossings in Montana.

Land Use

No cities or towns would be directly crossed by the alternatives because all alternatives extend through sparsely populated areas. The counties crossed by the alternatives have population densities that range from about 0.5 to 4.4 people per square mile. Although the CSD Alternative crosses approximately 0.8 mile on the west side of the St. Marie Census Designated Place[4], that area is also sparsely populated (about 8 people per square mile). Therefore, the impact to populated areas is not a discriminator in the assessment of alternatives.

Table I-2.4-3 lists the major types of land uses crossed by each alternative.

[4] A Census Designated Place is an unincorporated area without a separate municipal government that has been established exclusively for census purposes.

TABLE I-2.4-3 Land Uses Crossed by Alternatives in Montana							
	Land Use Crossed (Miles)						
Land Use Type[1]	Proposed Route − Canada to Missouri River Segment	Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	Proposed Route − Missouri River to South Dakota Segment	CSD − Missouri River to South Dakota (MRSD) Segment	Canada to North Dakota (CND)	CSD (Entire Route)	Proposed Route (Entire Route)
Land Cover[1]							
Wetlands	1.0	0.6	1.8	0.7	2.3	1.3	2.8
Forest/Woodlands	0.1	0.0	0.8	3.2	0.0	3.2	0.9
Developed	0.9	2.0	2.2	1.6	6.9	3.6	3.1
Combined Land Unit Classification[2]							
Fallow Land	23.4	20.3	60.0	26.6	96.5	46.9	83.4
Range Land	63.3	70.9	128.0	164.4	85.9	235.3	191.3
Hay Land	0.1	0.0	3.8	5.8	2.9	5.8	3.9
Irrigated Land	2.1	2.2	1.5	0.0	0.1	2.2	3.6
Non-Commercial Forest Land	0.1	0.1	0.2	0.2	0.0	0.3	0.3
Total	89.0	93.5	193.5	197.0	185.4	290.5	282.5

[1] Based on United States Geological Survey (USGS) 2001.
[2] Based on Montana Department of Revenue and Montana Department of Administration 2010.

Most of the land crossed by the three alternatives considered is range land or fallow land; the proposed route crosses about 274.7 miles of those lands as compared to 282.2 miles for the CSD Alternative and 182.4 for the CND Alternative. Because these types of land use can generally continue as currently practiced after reclamation and revegetation are implemented, there would not be a substantial difference in impacts to those land uses among the alternatives considered.

In Montana, the CSD Alternative would affect about 0.5 mile more developed land and 2.3 miles more forest/woodlands than the proposed route; the proposed route extends through about 1.5 more miles of wetlands than the CSD Alternative. The CND Alternative does not cross forest/woodlands, whereas the proposed route crosses about 0.9 mile of forest/woodlands. The CND Alternative crosses about 0.5 mile less wetlands than the proposed route, but 3.8 miles more developed land. Overall, the CSD and CND alternatives do not appear to offer an environmental advantage over the proposed route with regard to land use.

Public Lands

Table I-2.4-4 summarizes the ownership of public land for the alternatives considered in Montana. As noted in Section I-2.3, MDEQ included state and federal lands in the "preferred area" category. This preference is due to the requirement to conform to criteria listed in Section 75-20-301, MCA. However, in developing Alternative SCS-B (the proposed route), Keystone elected to avoid public land to the extent feasible. Most federal lands in Montana are managed by BLM, and the majority of federal lands crossed by each alternative are managed by BLM. BLM typically would prefer an alternative that uses less BLM land if all other environmental factors are roughly equivalent and the Project purpose and need are met.

TABLE I-2.4-4 Public Land Crossed by the Alternatives in Montana							
	Miles of Public Land Crossed						
Agency with Jurisdiction[1]	Proposed Route − Canada to Missouri River Segment	Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	Proposed Route − Missouri River to South Dakota Segment	CSD − Missouri River to South Dakota (MRSD) Segment	Canada to North Dakota (CND)	CSD − Entire Route	Proposed Route − Entire Route
U.S. Bureau of Land Management	22.4	34.6	18.9	77.7	70.1	112.3	41.3
State of Montana	13.0	21.9	6.3	35.3	38.5	57.2	19.3

[1] Data are for public lands listed in Montana Department of Revenue and Montana Department of Administration, 2010.

Both the CND and CSD alternatives cross more state land and more BLM land than the proposed route. Although the CND Alternative crosses more state land in Montana, it follows the route of Alternative SCS-A outside of Montana. This would result in impacts to sensitive public lands not affected by either the CSD Alternative or the proposed route. The CND Alternative would affect public land such as the Little Missouri National Grassland in North Dakota and the Missouri River National Recreational Area in South Dakota and Nebraska. Therefore, the CND Alternative is not considered environmentally preferable with regard to the use of public land.

I-2.4.2.3 Estimated Construction Costs

Table I-2.4-5 lists the estimated construction costs for the alternatives in Montana and for the Steele City Segment. The estimated construction cost per mile includes the pipeline, pump stations, and the electrical power supply for the pump stations. The cost of the pipeline alone would be approximately 30 percent less than the total cost per mile.

TABLE I-2.4-5 Estimated Construction Cost of Alternatives			
	Estimated Construction Cost[1]		
Alternative/Segment	Per Mile of Alternative/Segment	Total Cost in Montana	Total Cost for Steele City Segment[2]
Proposed Route − Canada to Missouri River Segment	$2,630,731	$234,135,059	-
Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	$2,860,000	$267,410,000	-
Proposed Route − Missouri River to South Dakota Segment	$2,630,731	$509,046,449	-
CSD − Missouri River to South Dakota (MRSD) Segment	$2,860,000	$563,420,000	-
Canada to North Dakota (CND)	$2,730,000	$506,142,000	$2,524,431,000
CSD − Entire Route	$2,860,000	$830,830,000	$2,457,312,000
Proposed Route − Entire Route	$2,630,731	$743,181,508	$2,237,962,862

[1] Estimated construction costs includes estimated cost of pipeline construction plus 30 percent for the estimated cost of the pump stations and electrical power supply for the pump stations.
[2] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.

The routes of the CSD and CND alternatives have not been surveyed, and therefore the estimated construction costs for those alternatives are based on elevation maps, GIS data, aerial photographs, and other information that is not as precise as on-the-ground evaluations. In addition, none of the alternatives include the estimated costs of procuring the ROW. For portions of the alternatives across private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, payments to landowners for easements, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The basic costs to acquire ROWs across public land would be similar, but there would be additional costs of complying with the specific requirements imposed on Keystone by the land management agency for use of the ROW. Since those requirements are not known at this time, the cost of ROW acquisition across public lands cannot be estimated.

The estimated construction cost of the CND Alternative is less than that of either the CND Alternative or Alternative SCS-B in Montana but is the highest for the Steele City Segment. The estimated construction cost of the proposed route is about $237.0 million more than the CND Alternative in Montana but $286.5 million less for the Steele City Segment. The estimated construction cost of the CSD Alternative is greater than that of the proposed route in Montana and for the entire Steele City Segment. The proposed route would cost about $87.6 million less to construct in Montana than the CSD Alternative and about $219.3 million less for the entire Steele City Segment.

I-2.4.2.4 Conclusions

CND Alternative

As described in Section I-2.3, the CND Alternative connects to Alternative SCS-A in Williams County, North Dakota; from there, Alternative SCS-A continues to the Cushing Extension. This Steele City Alternative is 65.5 miles longer than the CSD Alternative and 74.0 miles longer than the proposed route, and the area of construction impacts would also be greater as compared to those of the CSD Alternative and the proposed route. The estimated construction cost of the CND Alternative for the Steele City Segment is about $67 million more than that of the SCD alternative and about $286.5 million more than that of the proposed route. Although the CND Alternative crosses more state lands than the proposed route, it crosses substantially less state land than the CSD Alternative. In addition, the CND Alternative and the connected SCS-A Alternative outside of Montana cross more federal land than the proposed route. Therefore, the CND Alternative was eliminated from further consideration.

CSD Alternative Compared to the Proposed Route

After removing the CND Alternative from further consideration, MDEQ conducted a more detailed review of the CSD Alternative and found many unusual angles along the alignment that appeared to be artifacts of the modeling effort. To develop a more realistic alternative pipeline route, MDEQ straightened the CSD alignment where appropriate and also adjusted it to avoid the steepest terrain, multiple crossings of the same stream, residences, and irrigated lands. These adjustments resulted in slightly more private land being crossed as compared to the originally modeled CSD Alternative. This MDEQ-revised CSD Alternative is termed the “modified CSD Alternative” (or “modified segment”) in the remainder of this section to differentiate it from the original model-produced CSD Alternative (or segments of that alternative) presented in Keystone’s MFSA application.

The potential impacts to key resources of the modified CSD Alternative north of the Missouri River (modified CMR segment) were then compared to those of the proposed route north of the river, and the potential key impacts of the modified CSD Alternative from the Missouri River to the Montana-South Dakota border (modified MRSD segment) were compared to those of the proposed route south of the river to the state border. Table I-2.4-6 presents the comparisons.

Summary of Comparisons

From the Canadian border to the Missouri River, the proposed route is about 4.5 miles shorter than the modified CMR segment and crosses 2.3 fewer miles of sage-grouse habitat, about 7.6 fewer miles of range land, about 0.1 mile less irrigated land, about 0.1 mile less irrigated land, about 8.9 fewer miles of state land, and about 12.2 fewer miles of BLM land. The proposed route segment also has 1 less known sage-grouse lek within 4 miles than the modified CMR segment. The modified CMR segment has 14 fewer wells within 0.25 mile, 5 fewer parcels with a dwelling indicated, more gradual slopes, about 3.1 fewer miles of CRP or fallow land, about 0.1 fewer miles of hay land, and about 16.7 fewer miles of private land.

From the Missouri River to state border, the proposed route is about 3.5 miles shorter than the modified MRSD segment and crosses more gradual slopes, about 36.4 fewer miles of range land, about 2.0 fewer miles of hay land, about 29.0 fewer miles of state land, and about 58.8 fewer miles of BLM land. The modified MRSD segment has 4 fewer known sage-grouse leks within 4 miles, 51 fewer wells within 0.25 mile, crosses 28 fewer parcels with a dwelling indicated, crosses 33.4 fewer miles of CRP or fallow land, crosses about 1.5 fewer miles of irrigated land, and crosses 84.4 fewer miles of private land.

Although the modified CSD Alternative would cross substantially more public land in Montana, its implementation would result in a longer construction ROW and a greater total area of construction impacts in Montana and along the Steele City Segment as compared to the proposed route. In addition, the greater length of the modified CSD Alternative would result in about a 10 percent increase in construction cost for the Steele City Segment of the Project.

TABLE I-2.4-6
Comparison of the Canada to South Dakota (CSD) Alternative with the Proposed Route

	Approximate Miles of Land Crossed Except where Noted[1]	
Location and Item	Segment of Canada to South Dakota (CSD) Alternative	Segment of Proposed Route
Canada to Missouri River Segment		
Total Length	93.5	89.0
Montana Dept. of Fish, Wildlife & Parks (MFWP) Designated Core Habitat of Sage-Grouse	22.5	20.2
Number of Sage-Grouse Leks within 4 miles of Centerline	5	4
Number of Wells within 0.25 mile of Centerline	11	25
Number of Parcels Crossed with Dwelling Indicated	8	13
Slopes from 0% to ≤ 5%	71.6	63.6
Slopes > 5% and ≤ 15%	18.9	21.3
Slopes > 15% and ≤ 30%	2.5	3.3
Slopes > 30%	0.3	0.4
Conservation Reserve Program (CRP) or Fallow	20.3	23.4
Range Land	70.9	63.3
Hay Land	0	0.1
Irrigated Land	2.2	2.1
Non-Commercial Forested Land	0.1	0.1
BLM Land	34.6	22.4
State Land	21.9	13.0
Private Land	36.8	53.5
Missouri River to Montana/South Dakota Border		
Total Length	197.0	193.5
MFWP Designated Core Habitat of Sage-Grouse	0	0

TABLE I-2.4-6 Comparison of the Canada to South Dakota (CSD) Alternative with the Proposed Route		
	Approximate Miles of Land Crossed Except where Noted[1]	
Location and Item	Segment of Canada to South Dakota (CSD) Alternative	Segment of Proposed Route
Number of Sage-Grouse Leks within 4 miles of Centerline	25	29
Number of Wells within 0.25 mile of Centerline	50	101
Number of Parcels Crossed with Dwelling Indicated	15	43
Slopes from 0% to ≤ 5%	77.2	78.1
Slopes > 5% and ≤ 15%	102.8	100.6
Slopes > 15% and ≤ 30%	15.7	14.2
Slopes > 30%	1.4	1.1
CRP or Fallow	26.6	60.0
Range Land	164.4	128.0
Hay Land	5.8	3.8
Irrigated Land	0	1.5
Non-Commercial Forested Land	0.2	0.2
BLM Land	77.7	18.9
State Land	35.3	6.3
U.S. Army Corps of Engineers Land	1.0	1.0
National Wildlife Refuge Land	0.2	0.2
Private Land	82.6	167.0

Sources: sources used for data in the table are listed in Section I-2.5.2.
[1] Mileage rounded to nearest tenth.

Conclusions

MFSA regulations require that MDEQ identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. The modified CSD Alternative crosses approximately twice as much state land in Montana as the proposed route (57.2 miles versus 19.3 miles) and nearly three times as much federal land as the proposed route (112.3 miles versus 41.3 miles).

As a result of this comparison, MDEQ determined that it was not reasonable to carry forward the entire modified CSD Alternative because of its additional impacts and costs compared to Keystone's proposed route. However, portions of the modified CSD Alternative cross more public land as compared to the proposed route segments in those areas. As a result, MDEQ considered those portions of the modified CSD Alternative as variations to the proposed route. Section I-2.5 presents descriptions of those variations along with comparisons of key environmental concerns along the variations and the segments of the proposed route they would replace.

I-2.5 ROUTE VARIATIONS

A variation is a relatively short deviation from a proposed route that is developed to resolve or reduce construction impacts to localized, specific resources such as cultural resource sites, wetlands, recreational lands, residences, and terrain conditions. Variations are different from major route alternatives in that alternatives, such as those identified in Section 4.3 of the EIS and in Section I-2.4 of this appendix, are typically substantial distances from proposed pipeline routes, are generally much longer than variations, and are developed to reduce overall environmental impacts while meeting the goals of a project. Although route variations also may be many miles in length, they are typically shorter and nearer to a proposed route than a major route alternative. Many requests for variations are submitted by concerned landowners.

Section I-2.5.1 describes the development of route variations for the Project, and Section I-2.5.2 presents a comparison of the identified route variations with the segments of the proposed route that would be replaced by the variations. For the purposes of the determinations under MFSA, the route variations described below are considered to be modifications or alternatives to Keystone's proposal.

I-2.5.1 Development of Route Variations

During its environmental review process, MDEQ developed route variations to avoid or minimize impacts to specific resources, to increase the use of public lands, or to avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Other variations were developed in response to requests submitted by concerned landowners.

To receive MDEQ approval, the Project must conform to the criteria in Section 75-20-301, MCA, (see Section I-1.0) and the decision standards in Administrative Rules of Montana (ARM) 17.20.1604 and ARM 17.20.1607. Several variations were developed to conform to Section 75-20-301(1)(h), MCA, which requires that the use of public land be given a preference where its use is as economically practicable as the use of private land.

For route variation development, the following were the primary areas to be avoided to the extent practical, or used minimally:

- Residences;
- Wells;
- Irrigated land;
- Cultural Resources;
- Stream crossings;
- Transmission line structures;
- Major elevation changes; and
- Steep slopes.

In addition, forested areas were generally avoided to the extent practical and, where possible, variations were developed to be parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW).

A total of 19 variations were identified in Montana, ranging in length from about 0.4 mile to about 42.0 miles. Each was given the designation of MTV (i.e., Montana Variation) and a number (e.g., MTV-11). All 19 variations and the proposed route are depicted on Figure I-2.5-1; Figures I-2.5-2 through I-2.5-14 depict additional details in the vicinity of the variations and the route segments and the mileposts along the route segments.

I-2.5.2 Comparison of Route Variations with the Proposed Route

Sections I-2.5.2-1 through I-2.5.2-19 provide the primary reasons for developing the variations as well as tabular comparisons of the key environmental characteristics and other data associated with the variations and the sections of the proposed route they would replace (presented in Tables I-2.5.2.1 through I-2.5.2-19). In each table, the following items are listed for the variation and for the route segment:

- Length: the length in miles of the variation and the route segment that would be replaced;
- Land Cover: the distance in miles across developed, forested/woodlands, and wetlands (from the United States Geological Survey [USGS], 2001);
- Combined Land Use Classification: the distance in miles across range land, irrigated land, and hay land, which includes non-irrigated farmland, noncommercial forest land, and summer fallow farmland (from Montana Basemap Service Center, 2010);
- Land ownership: the distance in miles across state, private, BLM, and local government lands as well as across existing ROWs (from Montana Department of Revenue and Montana Department of Administration, 2010);
- Private Properties: the number of private properties crossed (from Montana Department of Revenue and Montana Department of Administration, 2010);
- Road Crossings: the number of U.S. highways, state and secondary highways, and roads crossed (from ESRI, 2003);
- Railroad Crossings: the number of railroads crossed (from ESRI, 2002);
- Stream Crossings: the number of perennial streams (including canals and aqueducts) and intermittent streams crossed (from ESRI, 2004);

  Slope: length in miles of slopes crossed in four categories (from USGS, 2002):

  − slopes less than 5 percent;

  − slopes equal to or greater than 5 percent but less than 15 percent;

  − slopes equal to or greater than 15 percent but less than 30 percent; and

  − slopes equal to or greater than 30 percent.

- Water Wells: the number of water wells within 100 feet of the centerline of the pipeline (from the Montana Bureau of Mines and Geology, 2010);
- Residences: the number of residences within 25 feet and within 500 feet of the edge of the construction ROW (from the Montana Basemap Service Center, 2010 and MDEQ field surveys);
- Structures: the number of structures within 25 feet and within 500 feet of the edge of the construction ROW (from Montana Basemap Service Center, 2010 and MDEQ field surveys). Structures include only commercial and industrial buildings and outbuildings; residences and water wells are listed separated as described above;
- Cultural Resources: the number of potential historical resources within a 300-foot-wide Area of Potential Effect (APE) (from historic Government Land Office maps), and the number of previously recorded archaeological resources by township, range, and section (TRS) (provided by BLM). The archaeological resources search (provided by the Montana State Historic Preservation Office in January 2010) includes the Cultural Resource Annotated Bibliography

System (CRABS), the Cultural Resource Information System (CRIS), and sites identified on state lands. Site specific information on archaeological resources was not available at the time this EIS was prepared, and it is not known if any of the site surveys conducted for the proposed route are included in the dataset.

Stone circles (also termed tipi rings) and areas with the potential for stone circles to occur have been identified along the proposed route; however, no known stone circles have been identified along any of the variations. As required by the Programmatic Agreement (PA; described in Section 3.11.3.2 of the EIS and presented in Appendix Q and Attachment 1), Keystone would conduct cultural resource surveys along the selected route variations to determine whether or not such resources are present. DOS would work with the tribes, the SHPO, and Keystone, in coordination with the other consulting parties in the PA to develop the appropriate mitigation measures if these resources would be impacted by the Project;

- Grouse: the length in miles across sage-grouse core areas, and the number of sage grouse and the number of sharp-tailed grouse leks within 1, 2, 3, and 4 miles of the routes (based on surveys along and near parts of the proposed route by Montana Fish, Wildlife and Parks [MFWP, 2009]); and

- Construction Costs: the estimated cost per mile of pipeline construction and the estimated total pipeline construction cost for the variation and the route segment the variation would replace (provided by Keystone). These estimated costs are only for the cost of the pipe and for construction; they do not include the cost of constructing pump stations and electrical distribution lines and connections.

  The routes of the variations have not been surveyed, and therefore the estimated construction costs for the variations are based on elevation maps, GIS data, aerial photographs, and other information that is not as precise as on-the-ground evaluations. In addition, the estimated costs do not include the cost of procuring the ROW. For portions of the routes across private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, easement remunerations, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The costs to acquire ROWs across public land would include many of the same expenditures, but would also include the additional costs of complying with the specific requirements imposed on Keystone by the land management agency for use of the ROW. Since those requirements are not known at this time, the cost of ROW acquisition across public lands cannot be estimated.

  There would also be increased costs associated with mitigation measures required for areas with sage-grouse leks and nesting areas. However, detailed surveys would be required to accurately document the presence of leks along either the proposed route segment or a variation, or within 4 miles of the routes. Keystone has estimated that mitigation of sage-grouse areas would add approximately $65,000 per mile to the estimated construction cost of the pipeline. This would include habitat mitigation, land purchase, ROW reclamation, and monitoring. Keystone would incur additional costs due to construction delays resulting from the implementation of timing windows for construction in areas where sage-grouse leks are present, or moving the route to avoid being within lek buffer areas. The cost estimates presented in Sections I-2.5.2-1 through I-2.5.2-19 do not include estimates of the cost of mitigation associated with construction through sage-grouse core areas.

- Difference: For each item in the tables, the route segment was used as the reference point for calculating the difference between the value listed for the route segment and the value listed for the variation; i.e., the value listed for each item of the variation was subtracted from the value listed for the route segment. The following are two examples of calculating the difference:

- If the route segment is 4 miles long and the variation is 1 mile long, the difference listed would be +3; i.e., the route segment is 3 miles longer than the variation.

- If there are 2 perennial streams crossed by the route segment and 4 perennial streams crossed by the variation, the difference listed would be -2; i.e., the route segment crosses 2 fewer perennial streams than the variation.

Because route variations were identified in response to the preference to site the Project on public land, to avoid or minimize specific environmental impacts, to avoid land use conflicts, or in response to landowner comments, they may not clearly display an environmental advantage other than reducing or avoiding impacts to specific features or resources. Conversely, the proposed alignment may not conform to regulatory requirements under MFSA. Further, the variations are generally close to the route segments they would replace and extend across similar terrain., the construction methods for the variations would be essentially the same as those of the route segments, and the appearance of the Project along the routes of the variations after construction and reclamation are completed would be similar to the appearance along the segments the variations would replace. As a result, for many resources the impacts associated with implementation of the variations would be essentially the same as the impacts that would result from construction and operation of the route segments that the variations would replace except where noted below (i.e., the potential impacts would be essentially the same for geology, soils and sediments, terrestrial vegetation, wildlife, fisheries, threatened and endangered species, visual resources, socioeconomics, and air quality, as well as for cumulative impacts).

I-2.5.2-1 Route Variation MTV-1

MTV-1 (see Figure I-2.5-2 and Table I-2.5-1) was developed primarily to increase the amount of public land crossed in comparison to the proposed route. In addition, it is downstream rather than upstream of Frenchman Reservoir. MTV-1 is approximately 2 miles longer than the route segment.

MTV-1 crosses fewer wetlands, forested/woodland areas, roads, and streams than the route segment it would replace and extends across a shorter distance of moderate slope. As a result, the estimated cost per mile of pipeline construction is greater for the route segment than for MTV-1. However, due to the greater length of MTV-1, its total estimated construction cost is greater than that of the route segment.

Although MTV-1 is longer than the proposed route segment and would be more expensive to build, implementation of this variation would use more public land, including BLM land, and would move the pipeline down gradient of Frenchman Reservoir, which would serve as a precaution against a possible spill affecting this important body of water. MTV-1 is also farther from sage-grouse habitat and leks and crosses slightly flatter terrain.

As result of these considerations, MDEQ selected MTV-1 in place of the proposed route segment.

TABLE I-2.5-1
Comparison of Montana Route Variation 1 (MTV-1) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-1	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-1	Difference
Length	25.9	27.9	-2.0	Slope			
Land Cover				< 5%	15.5	18.6	-3.1
Developed	0.1	0.6	-0.5	≥ 5% and ≤ 15%	9.2	8.3	+0.9
Forested/ Woodlands	0.1	0.0	+0.1	> 15% and ≤ 30%	0.9	0.9	0.0
Wetlands	0.5	0.2	+0.3	> 30%	0.3	0.1	+0.2
Total	0.7	0.8	-0.1	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	22.9	24.3	-1.4	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	1	0	+1
Hay Land	3.0	3.6	-0.6	Structures			
Total	25.9	27.9	-2.0	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	1	0	+1
State of Montana	4.7	5.2	-0.5	Cultural Resources			
Private Land	16.8	11.5	+5.3	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	4.4	11.2	-6.8	Archaeological Resources in TRS	94	20	+74
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	25.9	27.9	-2.0	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	36	25	+11	Sage-Grouse Leks within 2 miles	1	0	+1
Number of Road Crossings				Sage-Grouse Leks within 3 miles	1	0	+1
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	1	1	0
Minor Roads	29	24	+5	Sharptail Leks within 1 mile	0	0	0
Total	29	24	+5	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	1	1	0	Construction Costs			
Intermittent Streams	11	7	+4	Cost per mile	$1,900,000	$1,880,000	
Total	12	8	+4	Total Construction Cost	$49,210,000	$52,452,000	-$3,242,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-2 Route Variation MTV-2

MTV-2 (Figure I-2.5-3 and Table I-2.5-2) was developed to avoid constructing the pipeline diagonally across the face of a steep valley wall. The variation is approximately the same length as the route segment but extends more directly through the valley.

MTV-2 crosses one more road than the route segment, and the cost of that bore is included in the cost per mile listed in Table I-2.5-2. The route segment extends across a greater distance of moderate and steep slopes, but the cost differences are partially offset by the route segment extending along a greater distance of low slopes. Although the estimated cost per mile of pipeline construction is greater for the variation than for the route segment, the total estimated construction cost of the route segment is greater than that of MTV-2 due to its greater length.

Because MTV-2 extends up a steep slope, whereas the proposed segment angles across the slope, construction of the variation would result in less ground disturbance than construction of the route segment, the potential impacts due to erosion would be less, and revegetation of the ROW would be less difficult. Implementation of the appropriate reclamation and erosion control measures would be important to minimizing impacts with this variation.

Based on these considerations, MDEQ selected MTV-2 in place of the proposed route segment.

TABLE I-2.5-2
Comparison of Montana Route Variation 2 (MTV-2) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	**MTV-2**	**Difference**	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	**MTV-2**	**Difference**
Length	0.67	0.64	+0.03	Slope			
Land Cover				< 5%	0.39	0.36	+0.03
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.10	0.16	-0.06
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.10	0.06	+0.04
Wetlands	0.00	0.00	0.00	> 30%	0.08	0.06	+0.02
Total	0.00	0.00	0.00	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.67	0.64	+0.03	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	Structures			
Total	0.67	0.64	+0.03	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.52	0.48	+0.04	Cultural Resources			
Private Land	0.15	0.16	-0.01	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Archaeological Resources in TRS	3	3	0
Local Government	0.00	0.00	0.00	Grouse			
ROW	0.00	0.00	0.00	Sage-Grouse Core Area crossed	0	0	0
Total	0.67	0.64	+0.03	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	1	1	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	1	2	-1	Sharptail Leks within 1 mile	0	0	0
Total	1	2	-1	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	0	0	0	Cost per mile	$1,900,000	$1,960,000	
Total	0	0	0	Total Construction Cost	$1,273,000	$1,254,400	+$18,600

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-3 Route Variation MTV-3

MTV-3 (Figure I-2.5-4 and Table I-2.5-3) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-3 extends across 11.7 fewer miles of private land but is 2.5 miles longer than the proposed route segment. It crosses four more roads and two more streams than the route segment; however, MTV-3 extends across less steeply sloped areas, which offsets the increased cost of construction across streams and roads. As a result, the estimated cost per mile of pipeline construction is about the same for MTV-3 as for the route segment. However, due to its greater length, the total estimated construction cost of MTV-3 is greater than that of the route segment.

MTV-3 crosses more public land than the proposed segment, including nearly 5 more miles of BLM land than the route segment. It also extends through more sage-grouse core habitat than the route segment and may require a pump station near a sage-grouse lek. Because the potential impact to sage-grouse habitat was considered more important than the use of more public land, MDEQ did not select MTV-3.

TABLE I-2.5-3
Comparison of Montana Route Variation 3 (MTV-3) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-3	Difference
Length	39.5	42.0	-2.5
Land Cover			
Developed	0.4	0.3	+0.1
Forested/ Woodlands	0.0	0.0	0.0
Wetlands	0.4	0.3	+0.1
Total	0.8	0.6	+0.2
Combined Land Unit Classification			
Range Land	28.0	33.0	-5.0
Irrigated Land	0.0	0.0	0.0
Hay Land	11.5	9.0	+2.5
Total	39.5	42.0	-2.5
Land Ownership			
State of Montana	3.5	11.6	-8.1
Private Land	22.5	10.8	+11.7
U.S. Bureau of Land Management	13.5	18.4	-4.9
Local Government	0.0	1.2	-1.2
ROW	0.0	0.0	0.0
Total	39.5	42.0	-2.5
Number of Private Properties	50	29	+21
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	44	48	-4
Total	44	48	-4
Number of Railroad Crossings	1	1	0
Number of Stream Crossings			
Perennial Streams	0	1	-1
Intermittent Streams	19	20	-1
Total	19	21	-2

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-3	Difference
Slope			
< 5%	24.9	29.9	-5.0
≥ 5% and ≤ 15%	12.4	10.9	+1.5
> 15% and ≤ 30%	2.1	1.1	+1.0
> 30%	0.1	0.1	0.0
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	2	0	+2
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	15	0	+15
Cultural Resources			
Historical Resources in 300-ft APE	2	2	0
Archaeological Resources in TRS	65	20	+45
Grouse			
Sage-Grouse Core Area crossed	20.2	22.6	-2.4
Sage-Grouse Leks within 1 mile	1	1	0
Sage-Grouse Leks within 2 miles	1	1	0
Sage-Grouse Leks within 3 miles	3	4	-1
Sage-Grouse Leks within 4 miles	4	4	0
Sharptail Leks within 1 mile	1	0	+1
Sharptail Leks within 2 miles	3	0	+3
Sharptail Leks within 3 miles	5	2	+3
Sharptail Leks within 4 miles	5	3	+2
Construction Costs			
Cost per mile	$1,965,000	$1,965,000	
Total Construction Cost	$77,617,500	$82,530,000	-$4,912,500

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-4 Route Variation MTV-4

MTV-4 (Figure I-2.5-5 and Table I-2.5-4) was developed to address potential terrain alteration and erosion impacts for the area from MP 114.5 to MP 115.3 where the route segment crosses between two badlands bluffs. The picture inset in Figure I-2.5-5 depicts the terrain that the proposed route crosses. Although the badlands are on BLM land, routing in this area may also affect adjacent private land.

MTV-4 was developed as an optional route across the butte. MTV-4 is approximately 0.01 mile longer than the proposed route and could result in less engineering and constructability concerns than along the more rugged terrain of the route segment; however, it would not eliminate the potential to substantially alter terrain due to construction and erosion on the steep, sparsely vegetated, erodible soils of the area.

Aerial photographs indicate that the proposed route segment crosses three drainages and one road, whereas MTV-4 crosses two drainages and one road (see Figure I-2.5-5); these crossings are not included in the ESRI database for roads or the ESRI database for streams and are therefore not included in the comparison table which lists information only from those databases for consistency in the comparisons. However, the estimated cost of constructing the route segment is greater than the cost of MTV-4 due to the greater number of stream and road crossings and the greater distance along steeply sloped areas.

As an alternative to the mitigation provided by MTV-4, pipeline construction through the area of concern could be accomplished using either the horizontal directional drilling (HDD) or horizontal boring method along the proposed route or a smaller variation of the proposed route if geotechnical studies indicate that subsoil conditions are appropriate for use of either of those methods. Keystone will conduct further subsurface investigations to determine the feasibility of boring under this feature instead of trenching through it.

MTV-4 crosses slightly more BLM land than the route segment. In addition, it may be possible for Keystone to follow the proposed route using the HDD method. As result, MDEQ did not select MTV-4 pending the results subsurface investigations along the proposed route segment.

TABLE I-2.5-4
Comparison of Montana Route Variation 4 (MTV-4) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-4	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-4	Difference
Length	0.75	0.76	-0.01	Slope			
Land Cover				< 5%	0.31	0.20	+0.11
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.24	0.40	-0.16
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.16	0.16	0.00
Wetlands	0.0	0.0	0.0	> 30%	0.03	0.00	+0.03
Total	0.0	0.0	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.52	0.50	+0.02	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.23	0.26	-0.03	Structures			
Total	0.75	0.76	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	0.44	0.40	+0.04	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.31	0.36	-0.05	Archaeological Resources in TRS	0	0	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	0.75	0.76	-0.01	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	2	2	0	Sage-Grouse Leks within 2 miles	1	1	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	2	2	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	3	3	0
Minor Roads	1	1	0	Sharptail Leks within 1 mile	0	0	0
Total	1	1	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	3	3	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	0	0	0	Cost per mile	$2,100,000	$2,040,000	
Total	0	0	0	Total Construction Cost	$1,575,000	$1,550,400	+$24,600

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-5 Route Variation MTV-5

MTV-5 (Figure I-2.5-6 and Table I-2.5-5) was developed to reduce the distance of construction through a channel migration zone of East Fork Prairie Elk Creek, which is a perennial stream. MTV-5 crosses the creek approximately 300 feet north (downstream) of the proposed crossing site but is approximately the same length as the route segment it would replace. A residence is approximately 0.8 mile upstream of MTV-5 on an unnamed tributary and is about 300 feet closer to the proposed route as compared to the variation. The East Fork Prairie Elk Creek crossing is discussed in the Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information from the report). Because MTV-5 extends through less of the channel than the route segment it would replace, the estimated construction cost per mile of the variation is less than that of the route segment.

Construction of MTV-5 would result in fewer potential impacts associated with crossing East Fork Prairie Elk Creek. As result, MDEQ selected MTV-5 in place of the proposed route segment.

TABLE I-2.5-5
Comparison of Montana Route Variation 5 (MTV-5) with the Segment of the Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	Proposed Route Segment	**MTV-5**	**Difference**	Item	Proposed Route Segment	**MTV-5**	**Difference**
Length	0.4	0.4	0.0	Slope			
Land Cover				< 5%	0.03	0.04	-0.01
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.28	0.25	+0.03
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.12	0.15	-0.03
Wetlands	0.0	0.0	0.0	> 30%	0.00	0.00	0.00
Total	0.0	0.0	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.4	0.4	0.0	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.0	0.0	0.0	Structures			
Total	0.4	0.4	0.0	Structures within 25 ft	1	0	+1
Land Ownership				Structures within 500 ft	0	1	+1
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	0.4	0.4	0.0	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	1	1	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	0.4	0.4	0.0	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	1	1	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	0	0	0	Sharptail Leks within 1 mile	0	0	0
Total	0	0	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossing	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	1	1	0	Cost per mile	$2,100,000	$2,080,000	
Total	1	1	0	Total Construction Cost	$840,000	$832,000	+$8,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-6 Route Variation MTV-6

MTV-6 (Figure I-2.5-7 and Table I-2.5-6) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-6 also avoids crossing Buffalo Springs Creek and two railroad crossings. In addition, MTV-6 addresses a landowner request to site the pipeline farther from a residence (see Section I-2.5.7, Route Variation MTV-7, for additional details). MTV-6 is 0.3 mile longer than the segment of the proposed route it would replace but by using more public land, it reduces the amount of private land crossed by 6.9 miles.

The proposed route segment crosses more wetland areas, railroads, and streams than MTV-6 and also extends across a greater distance of moderate to steeply sloped areas than the variation. Although MTV-6 crosses more roads than the route segment, many of those roads would be crossed using open-cut construction methods, with costs similar to those of typical pipeline overland pipeline construction. As a result, the estimated cost per mile of pipeline construction is greater for the route segment than for MTV-6.

MTV-6 crosses about 7.9 more miles of state land than the route segment and does not cross BLM land. It also extends across less hay land than the route segment. As result of these considerations, MDEQ selected MTV-6 in place of the proposed route segment.

TABLE I-2.5-6
Comparison of Montana Route Variation 6 (MTV-6) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-6	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-6	Difference
Length	30.7	31.0	-0.3	Slope			
Land Cover				< 5%	6.6	7.2	-0.6
Developed	0.6	1.1	-0.5	≥ 5% and ≤ 15%	22.1	22.0	+0.1
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	1.8	1.7	+0.1
Wetlands	0.4	0.0	+0.4	> 30%	0.2	0.1	+0.1
Total	1.0	1.1	-0.1	Water Wells within 100 ft	1	0	+1
Combined Land Unit Classification				Residences			
Range Land	13.4	17.3	-3.9	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	17.3	13.7	+3.6	Structures			
Total	30.7	31.0	-0.3	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	3	1	+2
State of Montana	0.2	8.1	-7.9	Cultural Resources			
Private Land	29.8	22.9	+6.9	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	49	24	+25
Local Government	0.6	0.0	+0.6	Grouse			
ROW	0.1	0.0	+0.1	Sage-Grouse Core Area crossed	0	0	0
Total	30.7	31.0	-0.3	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	50	44	+6	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	3	3	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	21	42	-21	Sharptail Leks within 1 mile	0	0	0
Total	24	45	-21	Sharptail Leks within 2 miles	1	1	0
Number of Railroad Crossings	2	0	+2	Sharptail Leks within 3 miles	1	1	0
Number of Stream Crossings				Sharptail Leks within 4 miles	1	1	0
Perennial Streams	1	0	+1	Construction Costs			
Intermittent Streams	14	8	+6	Cost per mile	$2,100,000	$2,050,000	
Total	15	8	+7	Total Construction Cost	$64,470,000	$63,550,000	-$920,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-7 Route Variation MTV-7

MTV-7 (Figure I-2.5-7 and Table I-2.5-7) was developed in response to a landowner request to avoid construction near a residence that is about 550 feet from the edge of the construction ROW. MTV-7 is about 675 feet farther from the residence and 0.2 mile longer than the segment of the route segment it would replace. As shown in Figure I-2.5-7, the objectives of this landowner request would also be met by MTV-6.

Because the residence is more than 500 feet from the edge of the proposed construction ROW, it is not listed in Table I-2.5-7. In addition, the land cover database used for Table I-2.5-7 indicates that there is about 0.1 mile of wetland along the MTV-7 route and that there are no wetlands along the route segment it would replace; therefore, that information was presented in the table, which lists wetland information only from that database for consistency in the comparisons. However, aerial photographs show that both MTV-7 and the route segment cross Lone Tree Creek, and that the proposed route segment crosses a ponded area of the creek. Implementation of MTV-7 would result in potential impacts to wetlands that would be similar to those of implementation of the proposed route segment. Aerial photographs indicate that the proposed route segment crosses a slightly longer area of the creek and associated wetlands and therefore the estimated construction cost per mile of the proposed route is greater than that of the variation. Due to the greater length of the variation, the total cost of construction of the variation is greater than that of the proposed route segment.

Both MTV-6 and MTV-7 are farther from the residence than the route segments they would replace. Since MTV-6 was selected due to its increased use of state land, its lower overall impact, and its ability to meet the objective of the landowner (see Section I-2.5.2.6), MDEQ did not select either MTV-7 or the proposed route segment it would replace.

TABLE I-2.5-7
Comparison of Montana Route Variation 7 (MTV-7) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-7	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-7	Difference
Length	1.5	1.7	-0.2	Slope			
Land Cover				< 5%	0.09	0.11	-0.02
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	1.41	1.50	-0.09
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.04	0.10	+0.06
Wetlands	0.0	0.1	-0.1	> 30%	0.0	0.0	0.0
Total	0.0	0.1	-0.1	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.1	0.1	0.0	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	1.4	1.6	-0.2	Structures			
Total	1.5	1.7	-0.2	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	1.5	1.7	-0.2	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	2	2	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	1.5	1.7	-0.2	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	2	2	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	0	0	0	Sharptail Leks within 1 mile	0	0	0
Total	0	0	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	1	1	0	Cost per mile	$2,100,000	$2,070,000	
Total	1	1	0	Total Construction Cost	$3,150,000	$3,519,000	-$369,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-8 Route Variation MTV-8

MTV-8 (Figure I-2.5-8 and Table I-2.5-8) was developed to increase the amount of public land crossed in comparison to the proposed route. This variation would also address the landowner request to avoid crossing a stock pond as described in Section I-2.5.9.

MTV-8 is about 1 mile longer than the portion of the route segment it would replace and crosses about 4.5 fewer miles of private land than the proposed route. MTV-8 crosses a steep valley wall of an unnamed tributary of Clear Creek about 1 mile south of Road 238; the proposed route crosses this tributary where there is not as much relief and the valley has gentler slopes. For MTV-8, construction disturbance associated with a conventional crossing of the steep, incised drainage could be avoided with the use of the HDD method; use of the HDD method would increase the estimated construction cost of the crossing by about $1.5 million (about $1.3 million more than the total estimated cost of the variation listed in Table I-2.5-8).

Although the proposed route crosses more minor roads than the variation, those roads would be crossed using the open cut method, with costs similar to those of open-cut construction in areas without roadways. As a result, the estimated costs per mile are about the same for both MTV-8 and the route segment.

MTV-8 crosses about 5.5 more miles of state land and less irrigated hay land than the route segment. It also avoids crossing BLM land. However, there is local opposition to MTV-8. Further, as described in Section I-2.5.2.9, MTV-9 was developed at the request of a landowner to move a stream crossing, and implementation of MTV-9 would meet the objective of MTV-8. Therefore, MDEQ did not select MTV-8 in place of the proposed route segment.

TABLE I-2.5-8
Comparison of Montana Route Variation 8 (MTV-8) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-8	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-8	Difference
Length	23.4	24.4	-1.0	Slope			
Land Cover				< 5%	8.99	9.61	-0.62
Developed	0.9	0.8	+0.1	≥ 5% and ≤ 15%	12.98	13.80	-0.82
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	1.43	1.02	+0.41
Wetlands	0.2	0.2	0.0	> 30%	0.02	0.00	+0.02
Total	1.1	1.0	+0.1	Water Wells within 100 ft	1	0	+1
Combined Land Unit Classification				Residences			
Range Land	9.2	12.9	-3.7	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	14.2	11.5	+2.7	Structures			
Total	23.4	24.4	-1.0	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	4	0	+4
State of Montana	0.1	5.6	-5.5	Cultural Resources			
Private Land	23.3	18.8	+4.5	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	2	2	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	23.4	24.4	-1.0	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	40	33	+7	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	26	23	+3	Sharptail Leks within 1 mile	1	1	0
Total	26	23	+3	Sharptail Leks within 2 miles	3	3	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	6	4	+2
Number of Stream Crossings				Sharptail Leks within 4 miles	8	7	+1
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	8	8	0	Cost per mile	$1,900,000	$1,900,000	
Total	8	8	0	Total Construction Cost	$44,460,000	$46,360,000	-$1,900,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-9 Route Variation MTV-9

MTV-9 (Figure I-2.5-8 and Table I-2.5-9) was developed in response to a request by a landowner to avoid a stream crossing in the viewshed of a residence and to move the pipeline out of the central portion of a field. The majority of this 24.5-mile-long variation is along the same route as MTV-8 (see Figure I-2.5-8); MTV-9 deviates slightly from the MTV-8 route in the area between MPs 177 and 179 of the proposed route segment. MTV-9 is about 1.1 miles longer than the route segment it would replace.

The increased costs associated with construction across more roads for the proposed route segment are offset by the increased costs for MTV-9 associated with a longer distance of pipe to be constructed along moderate slopes. As a result, the estimated construction cost per mile is the same for each option. However, due to the longer distance of MTV-9, its total construction cost is greater than that of the route segment.

Implementation of MTV-9 would meet the objective of the landowner and would cross about 5.6 more miles of state land and less irrigated hay land than the route segment. It would also avoid crossing BLM land. As a result, MDEQ selected MTV-9 in place of the proposed route segment.

TABLE I-2.5-9
Comparison of Montana Route Variation 9 (MTV-9) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-9	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-9	Difference
Length	23.4	24.5	-1.1	Slope			
Land Cover				< 5%	8.99	9.81	-0.82
Developed	0.9	0.8	+0.1	≥ 5% and ≤ 15%	12.98	13.64	-0.66
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	1.43	0.93	+0.5
Wetlands	0.2	0.2	0.0	> 30%	0.02	0.10	-0.08
Total	1.1	1.0	+0.1	Water Wells within 100 ft	1	0	+1
Combined Land Unit Classification				Residences			
Range Land	9.2	12.7	-3.5	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	14.2	11.8	+2.4	Structures			
Total	23.4	24.5	-1.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	4	0	+4
State of Montana	0.1	5.7	-5.6	Cultural Resources			
Private Land	23.3	18.8	+4.5	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	2	2	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	23.4	24.5	-1.1	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	40	33	+7	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	26	22	+4	Sharptail Leks within 1 mile	1	1	0
Total	26	22	+4	Sharptail Leks within 2 mile	3	3	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	6	4	+2
Number of Stream Crossings				Sharptail Leks within 4 miles	8	7	+1
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	8	8	0	Cost per mile	$1,900,000	$1,900,000	
Total	8	8	0	Total Construction Cost	$44,460,000	$46,550,000	-$2,090,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-10 Route Variation MTV-10

MTV-10 (Figure I-2.5-8 and Table I-2.5-10) was developed in response to a request by a landowner to avoid a stock pond. MTV-10 is about 0.01 mile longer than the route segment it would replace. The stock pond would also be avoided with implementation of MTV-8 or MTV-9 (see Sections I-2.5.2.8 and I-2.5.2.9). Table I-2.5-10 presents a comparison of key environmental characteristics and other data associated with MTV-10 to those of the route segment.

Although the estimated construction cost per mile is the same for each of the options, the estimated total construction cost of the variation is greater than that of the route segment due to its greater length.

MTV-10 does not cross more public land than the proposed route. In addition, implementation of MTV-9, which was selected by MDEQ, would also avoid the stock pond. Therefore MDEQ did not select MTV-10.

TABLE I-2.5-10
Comparison of Montana Route Variation 10 (MTV-10) with the Segment of the Route it Would Replace

	Miles of Land Crossed (except where noted)				**Miles of Land Crossed (except where noted)**		
Item	Proposed Route Segment	**MTV-10**	**Difference**	Item	Proposed Route Segment	**MTV-10**	**Difference**
Length	1.47	1.48	-0.01	Slope			
Land Cover				< 5%	0.27	0.27	0.00
Developed	0.07	0.05	+0.02	≥ 5% and ≤ 15%	0.93	0.99	-0.06
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.27	0.22	+0.05
Wetlands	0.0	0.0	0.0	> 30%	0.0	0.0	0.0
Total	0.05	0.07	+0.02	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.80	0.65	+0.15	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.67	0.83	-0.16	Structures			
Total	1.47	1.48	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	1.47	1.48	-0.01	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	0	0	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	1.47	1.48	-0.01	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	3	3	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	2	2	0	Sharptail Leks within 1 mile	1	1	0
Total	2	2	0	Sharptail Leks within 2 miles	1	1	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	3	3	0
Number of Stream Crossings				Sharptail Leks within 4 miles	3	3	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	0	0	0	Cost per mile	$1,900,000	$1,900,000	
Total	0	0	0	Total Construction Cost	$2,793,000	$2,812,000	-$19,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-11 Route Variation MTV-11

MTV-11 (Figure I-2.5-9 and Table I-2.5-11) was developed in response to a request by a landowner to avoid the Cabin Creek stream crossing and a crossing of irrigated land. The variation is about 0.1 mile shorter than the proposed route segment it would replace.

Neither the variation nor the route segment crosses public land. The combined land unit classification database used to obtain the data presented in Table I-2.5-11 did not list irrigated land along the proposed route segment that would be replaced by MTV-11; that database was used for consistency in the comparisons and therefore, the table does not indicate the presence of irrigated land. However, the landowner has indicated that the proposed route does cross irrigated land.

The proposed route segment crosses one more intermittent stream than the variation, more forested/woodland areas, and irrigated land (not listed in Table I-2.5-11 as described above) that may require more costly reclamation than non-irrigated land. However, MTV-11 extends along a greater distance of moderate to steeply sloped areas and crosses three more roads than the route segment. Therefore, the estimated cost of construction per mile for MTV-11 is greater than that of the proposed route segment. However, due to the greater length of the proposed route, its estimated total cost is greater than that of the variation.

Because MTV-11 meets the request of the landowner and crosses one less perennial stream than the proposed route, MDEQ selected MTV-11 in place of the proposed route segment.

TABLE I-2.5-11
Comparison of Montana Route Variation 11 (MTV-11) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-11	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-11	Difference
Length	3.6	3.5	+0.1	Slope			
Land Cover				< 5%	1.9	1.3	+0.6
Developed	0.1	0.1	0.0	≥ 5% and ≤ 15%	1.7	2.0	-0.3
Forested/ Woodlands	0.2	0.1	+0.1	> 15% and ≤ 30%	0.0	0.2	-0.2
Wetlands	0.1	0.0	+0.1	> 30%	0.0	0.0	0.0
Total	0.4	0.2	+0.2	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	1.4	2.0	-0.6	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	2.2	1.5	+0.7	Structures			
Total	3.6	3.5	+0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	1	0	+1
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	3.6	3.5	+0.1	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	0	0	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	3.6	3.5	+0.1	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	7	7	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	4	7	-3	Sharptail Leks within 1 mile	0	0	0
Total	4	7	-3	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	1	0	+1	Construction Costs			
Intermittent Streams	1	1	0	Cost per mile	$1,900,000	$1,940,000	
Total	2	1	+1	Total Construction Cost	$6,840,000	$6,790,000	+$50,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-12 Route Variation MTV-12

MTV-12 (Figure I-2.5-10 and Table I-2.5-12) was developed to address a landowner's request to avoid crossing the central portion of a field. As shown on Figure I-2.5-10, MTV-12 crosses the field farther west than the proposed route. The variation is 0.05 mile longer than the route segment it would replace, and neither the variation nor the route segment crosses irrigated land.

Since construction and reclamation across the field would be similar for each route, the estimated construction cost per mile is similar for each of the two options. However, as indicated on Figure I-2.5-10, MTV-11 would likely require construction through a drainage area and that would slightly increase the actual cost of construction. In addition, the estimated total cost of the variation is greater than that of the route segment due to its greater length.

If implemented, this variation would likely cross the heads of draws and result in greater impacts than the route segment. As result, MDEQ did not select MTV-12.

TABLE I-2.5-12
Comparison of Montana Route Variation 12 (MTV-12) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-12	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-12	Difference
Length	0.88	0.93	-0.05	Slope			
Land Cover				< 5%	0.47	0.43	+0.04
Developed	0.02	0.02	0.00	≥ 5% and ≤ 15%	0.41	0.50	-0.09
Forested/ Woodlands	0.00	0.04	-0.04	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.06	-0.04	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.88	0.93	-0.05	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	Structures			
Total	0.88	0.93	-0.05	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	Cultural Resources			
Private Land	0.88	0.93	-0.05	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Archaeological Resources in TRS	0	0	0
Local Government	0.00	0.00	0.00	Grouse			
ROW	0.00	0.00	0.00	Sage-Grouse Core Area crossed	0	0	0
Total	0.88	0.93	-0.05	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	1	1	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	1	1	0	Sharptail Leks within 1 mile	0	0	0
Total	1	1	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	0	0	0	Cost per mile	$1,900,000	$1,900,000	
Total	0	0	0	Total Construction Cost	$1, 672,000	$1,767,000	-$95,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-13 Route Variation MTV-13

MTV-13 (Figure I-2.5-11 and Table I-2.5-13) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-13 is about 1.2 miles longer than the route segment it would replace but would use 8.3 fewer miles of private land.

The proposed route crosses more wetlands and roads than MTV-13, but crosses two fewer streams than the proposed route segment. MTV-13 extends through less forested/woodland areas and a greater distance of moderate to steeply sloped areas than the proposed route segment.

The proposed route segment crosses more roads and a greater distance of forested/woodland areas, wetlands, and steep slopes than the variation. Although MTV-13 crosses two more intermittent streams and a longer distance of moderately sloped areas, the greater cost of construction through those areas only partially offsets the greater cost of constructing the route segment through the areas noted above. As a result, the estimated construction cost per mile of the proposed route segment is greater than that of MTV-13.

This variation crosses 2.2 more miles of state land and 7.3 more miles of BLM land than the route segment. There is less hay land along the variation, and the terrain along the variation is less steep. However, there are more known sage-grouse leks near the variation. Because of concern about potential effects to sage-grouse habitat, MDEQ did not select MTV-13 in place of the proposed route segment.

TABLE I-2.5-13
Comparison of Montana Route Variation 13 (MTV-13) with the Segment of the Route it Would Replace

Item	Proposed Route Segment	MTV-13	Difference	Item	Proposed Route Segment	MTV-13	Difference
	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Length	18.8	20.0	-1.2	Slope			
Land Cover				< 5%	5.27	3.97	+1.30
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	11.39	13.87	-2.48
Forested/ Woodlands	0.2	0.0	+0.2	> 15% and ≤ 30%	2.05	2.11	-0.06
Wetlands	0.3	0.1	+0.2	> 30%	0.09	0.01	+0.08
Total	0.5	0.1	+0.4	Water Wells within 100 ft	0	1	-1
Combined Land Unit Classification				Residences			
Range Land	10.5	15.0	-4.5	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	2	0	+2
Hay Land	8.3	5.0	+3.3	Structures			
Total	18.8	20.0	-1.2	Structures within 25 ft	1	0	+1
Land Ownership				Structures within 500 ft	4	0	+4
State of Montana	0.0	2.2	-2.2	Cultural Resources			
Private Land	18.6	10.3	+8.3	Historical Resources in 300-ft APE	2	0	+2
U.S. Bureau of Land Management	0.2	7.5	-7.3	Archaeological Resources in TRS	8	58	-50
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	18.8	20.0	-1.2	Sage-Grouse Leks within 1 mile	0	2	-2
Number of Private Properties	30	24	+6	Sage-Grouse Leks within 2 miles	2	3	-1
Number of Road Crossings				Sage-Grouse Leks within 3 miles	5	4	+1
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	7	7	0
Minor Roads	17	14	+3	Sharptail Leks within 1 mile	1	0	+1
Total	17	14	+3	Sharptail Leks within 2 miles	1	3	-2
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	2	6	-4
Number of Stream Crossings				Sharptail Leks within 4 miles	6	7	-1
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	9	11	-2	Cost per mile	$1,900,000	$1,880,000	
Total	9	11	-2	Total Construction Cost	$35,720,000	$37,600,000	-$1,880,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-14 Route Variation MTV-14

MTV-14 (Figure I-2.5-12 and Table I-2.5-14) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-14 is about 0.1 mile longer than the route segment but crosses about 0.5 mile less private land.

The cost of construction across a larger number of roadway crossings along MTV-14 would be offset by the increased number of stream and wetland crossings and the greater distance along moderately sloped areas of the proposed route segment. As a result, the estimated cost of construction per mile is the same for both options.

As compared to the route segment, MTV-14 crosses slightly more state land (0.8) mile, slightly less BLM land (0.2 mile), and fewer streams. It also parallels an existing pipeline. However, the variation is also closer to sage-grouse habitat and a residence. Because of concern about potential effects to sage-grouse habitat, MDEQ did not select MTV-14 in place of the proposed route segment.

TABLE I-2.5-14
Comparison of Montana Route Variation 14 (MTV-14) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-14	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-14	Difference
Length	8.4	8.5	-0.1	Slope			
Land Cover				< 5%	3.4	3.7	-0.3
Developed	0.1	0.2	-0.1	≥ 5% and ≤ 15%	4.9	4.5	+0.4
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.1	0.3	-0.2
Wetlands	0.1	0.0	+0.1	> 30%	0.0	0.0	0.0
Total	0.2	0.2	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	5.3	5.2	+0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	3.1	3.3	-0.2	Structures			
Total	8.4	8.5	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	1	-1
State of Montana	0.0	0.8	-0.8	Cultural Resources			
Private Land	7.7	7.2	+0.5	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.7	0.5	+0.2	Archaeological Resources in TRS	8	6	+2
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	8.4	8.5	-0.1	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	15	14	+1	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	1	3	-2
Major Roads	2	2	0	Sage-Grouse Leks within 4 miles	4	4	0
Minor Roads	5	9	-4	Sharptail Leks within 1 mile	0	0	0
Total	7	11	-4	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	1	1	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	1	1	0	Construction Costs			
Intermittent Streams	9	1	+8	Cost per mile	$2,000,000	$2,000,000	
Total	10	2	+8	Total Construction Cost	$16,800,000	$17,000,000	-$200,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-15 Route Variation MTV-15

MTV-15 (Figure I-2.5-12 and Table I-2.5-15) was developed in response to a request by a landowner to avoid construction in the vicinity of two residences. The residence nearest the proposed Project is approximately 600 feet from the edge of the construction ROW and therefore the residences are not listed in Table I-2.5-15.

The variation is about the same length as the proposed route but approximately 1,600 feet west of the nearest of the two residences. This landowner request would also be addressed by MTV-14, which is farther from the residences than MTV-15 (see Section I-2.3.14 and Figure I-2.5-12).

Neither the variation nor the route segment crosses public land. The proposed route would cross more wetlands and streams and fewer roads than MTV-15. Although MTV-15 extends along a greater distance of moderately sloped land than the proposed route, the increased cost of construction in those areas would not offset the cost associated with the greater distance across wetlands and the greater number of stream crossings along the route segment. As a result, the estimated construction cost per mile of the proposed route segment is greater than that of the variation.

Implementation of MTV-15 would meet the objective of the landowner by moving the pipeline farther from the two residences. It would also result in fewer streams and slightly less distance of wetlands crossed as compared to the route segment. As result, MDEQ selected MTV-15 in place of the proposed route segment.

TABLE I-2.5-15
Comparison of Montana Route Variation 15 (MTV-15) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-15	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-15	Difference
Length	2.9	2.9	0.0	Slope			
Land Cover				< 5%	0.96	0.56	+0.40
Developed	0.1	0.1	0.0	≥ 5% and ≤ 15%	1.91	2.12	-0.21
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.01	0.17	-0.16
Wetlands	0.1	0.0	+0.1	> 30%	0.0	0.0	0.0
Total	0.2	0.1	+0.1	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	2.0	2.4	-0.4	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.9	0.5	+0.4	Structures			
Total	2.9	2.9	0.0	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	2.9	2.9	0.0	Historical Resources in 300-ft APE	1	0	+1
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	2	2	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	2.9	2.9	0.0	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	6	6	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	1	1	0
Major Roads	1	1	0	Sage-Grouse Leks within 4 miles	3	3	0
Minor Roads	1	3	-2	Sharptail Leks within 1 mile	0	0	0
Total	2	4	-2	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	8	0	+8	Cost per mile	$2,000,000	$1,960,000	
Perennial Streams	8	0	+8	Total Construction Cost	$5,800,000	$5,684,000	-$116,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-16 Route Variation MTV-16

MTV-16 (Figure I-2.5-13 and Table I-2.5-16) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-16 is about 0.6 mile longer than the route segment but crosses about 1.7 miles less private land.

The proposed route crosses more distance of wetlands and extends along more moderate to steely sloped areas. However, there are greater costs associated with the larger number of road and stream crossings of MTV-16. As a result, the estimated construction cost per mile of the MTV-16 is greater than that of the route segment.

MTV-16 crosses 1.6 more miles of state land and 0.7 mile more BLM land than the route segment. However, it crosses more streams, hay land, and roads and is closer to known sage-grouse leks. Because of concern about potential effects to sage-grouse habitat, MDEQ did not select MTV-16 in place of the proposed route segment.

TABLE I-2.5-16
Comparison of Montana Route Variation 16 (MTV-16) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-16	Difference
Length	7.5	8.1	-0.6
Land Cover			
Developed	0.0	0.0	0.0
Forested/ Woodlands	0.1	0.1	0.0
Wetlands	0.1	0.0	+0.1
Total	0.2	0.1	+0.1
Combined Land Unit Classification			
Range Land	6.3	6.2	+0.1
Irrigated Land	0.0	0.0	0.0
Hay Land	1.2	1.9	-0.7
Total	7.5	8.1	-0.6
Land Ownership			
State of Montana	0.7	2.3	-1.6
Private Land	6.8	5.1	+1.7
U.S. Bureau of Land Management	0.0	0.7	-0.7
Local Government	0.0	0.0	0.0
ROW	0.0	0.0	0.0
Total	7.5	8.1	-0.6
Number of Private Properties	13	11	+2
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	7	9	-2
Total	7	9	-2
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	4	-3
Total	1	4	-3

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-16	Difference
Slope			
< 5%	1.9	2.9	-1.0
≥ 5% and ≤ 15%	4.9	4.7	+0.2
> 15% and ≤ 30%	0.6	0.4	+0.2
> 30%	0.0	0.0	0.0
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources			
Historical Resources in 300-ft APE	0	0	0
Archaeological Resources in TRS	1	0	+1
Grouse			
Sage-Grouse Core Area crossed	0	0	0
Sage-Grouse Leks within 1 mile	0	2	-2
Sage-Grouse Leks within 2 miles	2	2	0
Sage-Grouse Leks within 3 miles	4	6	-2
Sage-Grouse Leks within 4 miles	7	12	-5
Sharptail Leks within 1 mile	0	1	-1
Sharptail Leks within 2 miles	1	1	0
Sharptail Leks within 3 miles	1	1	0
Sharptail Leks within 4 miles	1	1	0
Construction Costs			
Cost per mile	$2,000,000	$2,020,000	
Total Construction Cost	$15,000,000	$16,362,000	-$1,362,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-17 Route Variation MTV-17

MTV-17 (Figure I-2.5-13 and Table I-2.5-17) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-17 is about 0.2 mile longer than the route segment it would replace but crosses about 0.8 mile less private land.

The estimated construction cost per mile of each option is the same, although the total estimated cost of construction of MTV-17 is greater than that of the route segment due to its greater length.

MTV-17 crosses about 1 more mile of state land than the route segment and does not cross BLM land. It also crosses slightly less hay land than the route segment. As result, MDEQ selected MTV-17 in place of the proposed route segment.

TABLE I-2.5-17
Comparison of Montana Route Variation 17 (MTV-17) with the Segment of the Route it Would Replace

	Miles of Land Crossed (except where noted)				**Miles of Land Crossed (except where noted)**		
Item	Proposed Route Segment	**MTV-17**	**Difference**	Item	Proposed Route Segment	**MTV-17**	**Difference**
Length	1.9	2.1	-0.2	Slope			
Land Cover				< 5%	0.9	0.6	+0.3
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	1.0	1.5	-0.5
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.0	0.0	0.0
Wetlands	0.1	0.1	0.0	> 30%	0.0	0.0	0.0
Total	0.1	0.1	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	1.5	1.9	-0.4	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.4	0.2	+0.2	Structures			
Total	1.9	2.1	-0.2	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	1.0	-1.0	Cultural Resources			
Private Land	1.9	1.1	+0.8	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	0	0	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	1.9	2.1	-0.2	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	4	3	+1	Sage-Grouse Leks within 2 miles	1	1	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	2	2	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	3	3	0
Minor Roads	1	1	0	Sharptail Leks within 1 mile	0	0	0
Total	1	1	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	1	1	0
Number of Stream Crossings				Sharptail Leks within 4 miles	1	1	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	1	1	0	Cost per mile	$2,000,000	$2,000,000	
Total	1	1	0	Total Construction Cost	$3,800,000	$4,200,000	-$400,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-18 Route Variation MTV-18

MTV-18 (Figure I-2.5-14 and Table I-2.5-18) was developed to increase the amount of public land crossed and to reduce the number of stream crossings in comparison to the proposed route. MTV-18 is about 0.9 mile longer than the proposed route segment it would replace, crosses 3.5 miles less private land, and has 3 fewer intermittent stream crossings.

Although MTV-18 crosses three fewer streams than the route segment, it crosses eight more roads and extends through more moderate to steeply sloped areas. Therefore, the estimated construction cost per mile of MTV-18 is greater than that of the proposed route segment.

MTV-18 crosses 1.9 more miles of state land and crosses 2.5 more miles of BLM land compared to the route segment. Because MTV-18 makes only minor additional use of public land and there are few other advantages to justify its added cost, MDEQ did not select MTV-18 in place of the proposed route segment.

TABLE I-2.5-18
Comparison of Montana Route Variation 18 (MTV-18) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-18	Difference	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	MTV-18	Difference
Length	14.3	15.2	-0.9	Slope			
Land Cover				< 5%	6.4	6.1	+0.3
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	6.8	8.2	-1.4
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	1.0	0.9	+0.1
Wetlands	0.0	0.0	0.0	> 30%	0.1	0.0	+0.1
Total	0.0	0.0	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	11.4	14.1	-2.7	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	2.9	1.1	+1.8	Structures			
Total	14.3	15.2	-0.9	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	2	0	+2
State of Montana	0.0	1.9	-1.9	Cultural Resources			
Private Land	13.8	10.3	+3.5	Historical Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.5	3.0	-2.5	Archaeological Resources in TRS	3	3	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	14.3	15.2	-0.9	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	28	21	+7	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	1	-1
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	1	2	-1
Minor Roads	5	13	-8	Sharptail Leks within 1 mile	0	0	0
Total	5	13	-8	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	1	-1
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	8	5	+3	Cost per mile	$2,000,000	$2,020,000	
Total	8	5	+3	Total Construction Cost	$28,600,000	$30,704,000	-$2,104,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5.2-19 Route Variation MTV-19

MTV-19 (Figure I-2.5-14 and Table I-2.5-19) was developed to avoid a high, unstable valley wall and a tributary at the proposed crossing site of South Fork Coal Bank Creek, which is a perennial stream. The stream crossing site of MTV-19 is approximately 1,300 feet east (downstream) of the proposed crossing site, and the variation is about 0.1 mile longer than the route segment it would replace. MTV-19 is discussed in more detail in the Montana Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information presented in the report). The objective of this variation would also be met by MTV-18 (see Section I-2.5.2.18).

Neither the variation nor the route segment crosses public land. The estimated cost of construction per mile is the same for each option. However, due to its longer distance, the total estimated construction cost of MTV-19 is higher than that of the route segment.

If implemented, MTV-19 would avoid an unstable valley wall and would be environmentally preferable to the proposed crossing of South Fork Coal Bank Creek. Therefore, MDEQ selected MTV-19 in place of the proposed route segment.

TABLE I-2.5-19
Comparison of Montana Route Variation 19 (MTV-19) with the Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted) Proposed Route Segment	**MTV-19**	**Difference**	Item	Miles of Land Crossed (except where noted) Proposed Route Segment	**MTV-19**	**Difference**
Length	0.5	0.6	-0.1	Slope			
Land Cover				< 5%	0.37	0.27	+0.10
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.15	0.30	-0.15
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.00	0.01	-0.01
Wetlands	0.0	0.0	0.0	> 30%	0.00	0.00	0.0
Total	0.0	0.0	0.0	Water Wells within 100 ft	0	0	0
Combined Land Unit Classification				Residences			
Range Land	0.5	0.6	-0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.0	0.0	0.0	Structures			
Total	0.5	0.6	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	Cultural Resources			
Private Land	0.5	0.6	-0.1	Historical Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Archaeological Resources in TRS	0	0	0
Local Government	0.0	0.0	0.0	Grouse			
ROW	0.0	0.0	0.0	Sage-Grouse Core Area crossed	0	0	0
Total	0.5	0.6	-0.1	Sage-Grouse Leks within 1 mile	0	0	0
Number of Private Properties	2	2	0	Sage-Grouse Leks within 2 miles	0	0	0
Number of Road Crossings				Sage-Grouse Leks within 3 miles	0	0	0
Major Roads	0	0	0	Sage-Grouse Leks within 4 miles	0	0	0
Minor Roads	1	1	0	Sharptail Leks within 1 mile	0	0	0
Total	1	1	0	Sharptail Leks within 2 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharptail Leks within 3 miles	0	0	0
Number of Stream Crossings				Sharptail Leks within 4 miles	0	0	0
Perennial Streams	0	0	0	Construction Costs			
Intermittent Streams	1	1	0	Cost per mile	$2,000,000	$2,000,000	
Total	1	1	0	Total Construction Cost	$1,000,000	$1,200,000	-$200,000

Source: see Section I-2.5.2 for information on the items listed, the data sources used, and the calculations of differences.

I-2.6 TENTATIVE PREFERRED ROUTE IN MONTANA

MDEQ identified and assessed potential alternatives for the proposed Keystone XL Project in Montana. Those assessments included consideration of the No Action Alternative (Section 4.1 of the EIS and Section I-2.2), the route and system alternatives presented in Sections 4.2 and 4.3 of the EIS, and the route alternatives identified in Section I-2.3 (see Section I-2.4 for assessments of alternatives). During the screening process it was determined that the identified alternatives were not preferable to Alternative SCS-B (the proposed route) and were therefore eliminated from further evaluation. However, in Section I-2.5.2, MDEQ identified 19 variations to Alternative SCS-B that would increase the use of public land where economically as practicable as the use of private land (as required by MFSA), avoid or minimize impacts to specific resources, avoid or minimize conflicts with existing or proposed residential and agricultural land uses, or respond to requests submitted by concerned landowners.

After evaluating the 19 variations, MDEQ determined that 9 of the variations were preferable to the segments of the proposed route they would replace (see Sections I-2.5.2.1 thorough I-2.5.2.19 and Figures I-2.5-1 through I-2.5-14). The variations selected consist of the following:

- MTV-1;
- MTV-2;
- MTV-5;
- MTV-6;
- MTV-9;
- MTV-11;
- MRV-15;
- MTV-17; and
- MTV-19

As a result, MDEQ has selected Alternative SCS-B, as modified by the variations listed above, as the tentative preferred alternative route in Montana. Figure I-2.6-1 depicts that route. This route is approximately 286.0 miles long in Montana, with approximately 93.5 miles of variations replacing proposed route segments.

I-2.7 REFERENCES CITED

Canadian Association of Petroleum Producers. 2009. Crude Oil Forecast, Markets and Pipeline Expansions, June 2009.

Energy Information Administration (EIA). 2010. Annual Energy Outlook Early Release Overview 2010. Available at http://www.eia.doe.gov/oiaf/aeo/overview.html#production

ESRI 2002. Railroads database for Montana.

ESRI 2003. Streetscarto database for Montana.

ESRI 2004. Detailed streams database for Montana.

Montana Basemap Service Center. 2010. Montana Spatial Data Infrastructure, Structures Framework; accessed online at: http://giscoordination.mt.gov/structures/msdi.asp.

Montana Bureau of Mines and Geology. 2010. Ground Water Information Center, Montana Tech of the University of Montana.

Montana Department of Revenue and Montana Department of Administration. 2010. Montana Cadastral and Computer Assisted Mass Appraisal System Project.

Montana Fish, Wildlife & Parks (MFWP). 2009. Untitled. Sage-grouse and Sharp-tailed Grouse Lek Locations: Spring 2009 surveys along a portion of the Keystone XL Route B. Provided December 9, 2009, by Pat Gunderson, MFWP, Region 6.

Purvin & Gertz. 2009. Western Canadian Crude Supply and Markets. A report prepared for TransCanada Keystone Pipeline GP LMTD.

U.S. Geological Survey (USGS). 2001. National Land Cover Dataset.

USGS. 2002. 30-Meter National Elevation Dataset.

I-3.0 ENVIRONMENTAL ANALYSIS OF THE PROPOSED KEYSTONE XL PROJECT IN MONTANA

The overall approach used to assess the impacts of the Project is presented in Section 3.0 of the EIS. The sections of the EIS listed below present discussions of the potential impacts of the Project that comply with MEPA requirements and provide supporting information for the determinations under MFSA:

- Geology (Section 3.1);
- Soils and Sediments (Section 3.2);
- Threatened and Endangered Species (Section 3.8);
- Cultural Resources (Section 3.11);
- Risk Analysis and Environmental Consequences (Section 3.13); and
- Cumulative Impacts (Section 3.14).

The DOS EIS also provides information required by MEPA and supporting information for the determinations under MFSA for Water Resources; Wetlands; Terrestrial Vegetation; Wildlife; Fisheries; Land Use, Recreation, and Visual Resources; Socioeconomics; and Air Quality and Noise. This appendix provides supplemental information for those resource areas in the following sections:

- Water Resources (Section I-3.1);
- Wetlands (Section I-3.2);
- Terrestrial Vegetation (Section I-3.3);
- Wildlife (Section I-3.4);
- Fisheries (Section I-3.5);
- Land Use, Recreation, and Visual Resources (Section I-3.6);
- Socioeconomics (Section I-3.7); and
- Air Quality and Noise (Section I-3.8).

In some cases, information from the DOS EIS has been repeated in this appendix to provide continuity of the discussion of existing conditions and the potential environmental impacts of the proposed Project.

As stated in Section 3.0 of the EIS, the environmental consequences of constructing and operating the proposed Project could be adverse or beneficial and would vary in duration and magnitude. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts could continue for approximately 3 years following construction. Impacts were considered long term if the resources would require more than 3 years to recover. Permanent impacts would occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions during the life of the proposed Project, such as with construction of aboveground structures. An impact resulting in a substantial adverse change in the environment would be considered significant.

The sections below address the affected environment, construction and operations impacts, and mitigation, where appropriate. Keystone has indicated that it would implement certain measures to reduce environmental impacts. These measures have been evaluated and additional measures that might be necessary to further reduce impacts are recommended. In addition, MDEQ has developed its Environmental Specifications to provide additional mitigation to potential impacts; those specifications are included in this appendix as Attachment 1.

Conclusions in this appendix are based on analyses of environmental impacts and the following assumptions:

- Keystone would comply with all applicable laws and regulations;
- The proposed facilities would be constructed as described in Section 2.0 of the EIS;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its application to MDEQ for a MFSA certificate and in supplemental filings to that application;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its Environmental Report and supplemental filings to DOS, including its Construction, Mitigation, and Reclamation (CMR) Plan (presented in Appendix B to the EIS); and
- Keystone would implement the required measures presented in the MDEQ Environmental Specifications presented in Attachment 1 to this appendix.

As noted in Section I-1.0, Information regarding the proposed Project (e.g., design, location, schedule, workforce, miles of specific types of land crossed, and other details needed to conduct an environmental assessment of the proposed Project) was obtained from three main sources: (1) Keystone's application for a MFSA Certificate of Compliance and subsequent submittals associated with the application, (2) Keystone's application for a Presidential Permit and associated submittals to DOS, and (3) Keystone's proposed Plan of Development for a ROW grant from the Bureau of Land Management (BLM). Information from those sources is not specifically cited in the following sections.

In addition, limited field work was conducted by MDEQ staff. Information on the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this impact analysis section. Information on existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature research and field studies conducted by the third-party environmental contractor, from MDEQ sources of information publicly available in Montana, and from MDEQ files and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives.

I-3.1 WATER RESOURCES

Section 3.3 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation on water resources, including information for Montana. Section I-3.1.1 provides site-specific information on selected waterbody crossings in Montana in accordance with the provisions of MEPA and MFSA, and Section I-3.1.2 addresses floodplains along the proposed route in Montana.

I-3.1.1 Waterbody Crossing Assessments

I-3.1.1-1 Background

Prior to making a decision under MFSA and the Montana Water Quality Act (75-5-318, MCA), MDEQ must conduct a review of stream crossings for Keystone's proposed route and make a determination on its Joint Application 318 Authorization. Under MFSA, that decision must be made concurrently with a decision on Keystone's application for a MFSA Certificate of Compliance. The third-party environmental contractor for DOS and MDEQ conducted on-site inspections of selected crossing sites on Keystone's proposed route in Montana and submitted a report of the inspections to MDEQ (*Keystone XL Pipeline Montana Stream Crossing Inspections Report* [SCIR]). That report provides information on the proposed crossing methods, the process used to select crossing sites for field inspection, office and field methods used, and the results of analyses for each crossing site assessed. It also describes the procedures that Keystone would incorporate into design and construction of the crossings to minimize impacts and potential site-specific mitigation measures for consideration by MDEQ. MDEQ has adopted the SCIR by reference as part of the EIS for the Project.

The information presented below summarizes key aspects of the SCIR, the measures that Keystone would incorporate into the Project to avoid or minimize impacts, and the mitigation measures that MDEQ would require as a part of its Environmental Specifications for the Project (see Attachment 1 to this appendix) to minimize the impact of stream crossings in Montana. In addition, a draft of the MDEQ requirements for the 318 Authorization is presented in Attachment 2 to this appendix.

I-3.1.1-2 Waterbody Crossings for Analysis

The proposed pipeline would cross a total of 389 waterbodies in Montana. Of that total, MDEQ selected 55 crossing sites for detailed review because they met at least one of the following criteria:

- The proposed route crosses a perennial stream;
- The proposed crossing site is within a designated floodplain of the state;
- The proposed route crosses a waterbody containing fish designated as Species of Concern to the state or which is known to include the habitats of those fish species; or
- The proposed route crosses a stream of special interest to the state.

Of the 55 crossings in Montana that required further review, 20 are perennial streams and 35 are intermittent streams. All 20 perennial stream crossings were inspected in the field. MDEQ required that all 35 proposed crossings of intermittent streams receive a desk top review because of their listing as a potential concern. Proposed intermittent stream crossings were inspected in the field only if they either contain fish Species of Concern or are known to include the habitats of those fish species, or if they are streams of special interest to the state.

Using these criteria, 16 of the reviewed 35 intermittent streams were identified for site inspections. The remaining 19 intermittent stream crossings were evaluated using the in-office analytical procedures described below.

I-3.1.1-3 Analysis of Intermittent Streams Not Field Inspected

Desktop analyses of the proposed crossings were conducted to provide context, background, and support for the field investigations. The analyses included a review of available literature and addressed flood flow and geomorphic characterization of the proposed crossing sites. Flood flow frequency analyses were conducted for each proposed crossing site using a regional regression equation (Omang 1992) to calculate the discharge for the 2-, 5-, 10-, 50-, and 100-year storm recurrence intervals. The nearest gauge station was included in the analysis using Federal Emergency Management Agency's (FEMA) Bulletin 17B method (FEMA 1981). Checks were conducted on arbitrarily selected stations by using either a second flood flow calculation or an exceedance probability curve from historical annual peak flow data. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

The geomorphic assessments were conducted using GIS and several sources of data: aerial photographs from 2005; USGS topographic maps in 1:24,000 scale from 1940 to 1995; geologic maps in 1:100,000 scale from the Montana Bureau of Mines and Geology; and digital surface water data from the USGS National Hydrograph Database. Data were obtained for the channels to be crossed and for the surrounding floodplains and valleys. Channel characterization included measurements of the width, form, gradient, and sinuosity of each channel. Valley characteristics examined were width, gradient, geology, and the presence of landslides or floodplain features such as relict channels. Infrastructure in the vicinity of each crossing, including the presence of in-stream structures, was also catalogued.

The literature review consisted of online searches in Montana's Natural Resource Information System and other state and national agency databases for previous channel migration zone studies. It also included review of reports on hydrology, hydraulics, sediment transport, bridge scour, ice jams, and turbidity.

I-3.1.1-4 Field Methods

Site specific information collected in the field included characterization of stream form and geometry, alluvial substrate, soils, vegetation, evidence of current and previous instability, and natural and artificial disturbance affecting the crossing site. Field maps and valley cross-sections were developed for each proposed crossing site; this included a topographic, geologic, and soils map for each site, as well as current and historic air photos.

Valley cross-sections along the proposed route were developed using USGS 30-minute digital terrain models. This reach-level information was used to place the proposed crossing location in context with the surrounding topography, geology, soils, and hydrology, and to identify natural or artificial disturbances adjacent to the crossing that may affect the crossing site. The results of the flood frequency analyses were used as a check on field interpretations of the locations of the extents of the bankfull channel and recurrence intervals on identified floodplains. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

On-site evaluations of each of the crossing sites focused on the following considerations:

- Likelihood that the pipeline crossing as currently designed would withstand stream scour, incision, and lateral stream movement over the life of the Project;

- Likelihood that the proposed crossing method would minimize turbidity during construction and operation; and
- Assessments of the potential environmental effects of the proposed design of the crossings and consideration of potential mitigation of those effects.

I-3.1.1-5 Existing Conditions, Potential Impacts, and Mitigation

The studies conducted for the SCIR indicated that several proposed crossing sites have indicators of bank or other geomorphologic instability or the presence of geomorphologic features that could lead to future instability. Indicators of instability that could lead to future incision or lateral migration were present at 27 of the 35 crossing sites listed in Table I-3.1-1. Examples of these indicators include areas with nearly vertical banks, areas with actively slumping or undercut banks, areas with side channels on floodplains adjacent to the bank-full channel, and areas with perennial or intermittent in-stream impoundments.

TABLE I-3.1-1
Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration Due to Pipeline Construction

Stream	Concern			Consider Adaptive Management Plan	Consider Alternative Crossing Technique
	Turbidity	Incision	Channel Migration		
Corral Coulee (A)	No	Yes	Yes	Yes	No
Corral Coulee (B)	No	Yes	Yes	Yes	No
Frenchman Creek	No	Yes	Yes	Yes	Yes
Hay Coulee	No	No	No	Yes	No
Rock Creek	No	Yes	Yes	Yes	Yes
Willow Creek	No	Yes	Yes	Yes	Yes
Lime Creek	No	Yes	Yes	Yes	No
Brush Fork	No	Yes	Yes	Yes	No
Bear Creek	No	Yes	Yes	Yes	No
Unger Coulee	No	Yes	Yes	Yes	No
Buggy Creek	No	Yes	Yes	Yes	No
Spring Creek	No	Yes	Yes	Yes	No
Cherry Creek	No	Yes	Yes	Yes	No
Spring Coulee	No	Yes	Yes	Yes	No
East Fork Cherry Creek	No	Yes	Yes	Yes	No
Espeil Coulee	No	Yes	Yes	Yes	No
Milk River	No	No	No	No	No
Missouri River	No	No	No	No	No
West Fork Lost Creek	No	No	No	Yes	Yes
Tributary to West Fork Lost Creek	No	No	No	Yes	Yes

TABLE I-3.1-1
Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration Due to Pipeline Construction

Stream	Concern: Turbidity	Concern: Incision	Concern: Channel Migration	Consider Adaptive Management Plan	Consider Alternative Crossing Technique
East Fork Prairie Elk Creek	No	Yes	Yes	Yes	Yes
Redwater River	No	Yes	Yes	Yes	Yes
Buffalo Springs Creek	No	Yes	Yes	Yes	Yes
Berry Creek	No	Yes	Yes	Yes	Yes
Clear Creek	No	Yes	No	Yes	Yes
Side Channel Yellowstone River	No	No	No	No	No
Yellowstone River	No	No	No	No	No
Cabin Creek (A)	No	Yes	Yes	Yes	Yes
Cabin Creek (B)	No	Yes	Yes	Yes	Yes
Dry Fork Creek	No	Yes	Yes	Yes	Yes
Pennel Creek	No	Yes	Yes	Yes	Yes
Little Beaver Creek	No	Yes	Yes	Yes	Yes
North Fork Coal Bank Creek	No	No	No	Yes	No
South Fork Coal Bank Creek	No	Yes	Yes	Yes	No
Boxelder Creek	No	Yes	Yes	Yes	Yes

For crossings where a field assessment was not conducted, the SCIR provides potential mitigation measures based on the desktop analysis. Potential mitigation measures include adjustments in proposed cover depths along the crossing approaches, site reclamation measures, post-construction management plans, and potential preventative protection measures. In some cases potential adjustments in cover depth would exceed the cover depth maximums included in Keystone's Construction Mitigation and Reclamation Plan (CMR Plan, presented in Appendix B of the EIS). In general, cover depths at stream crossing approaches and the width that these cover depths are carried laterally are important in providing a buffer to maintain the integrity of the pipeline if the stream were to migrate during operation of the Project. Additionally, the approach buffer would provide construction workspace for implementation of preventative protection measures, if advisable.

As a potential mitigation measure, the management plan described in the SCIR provides for adaptive management procedures to be implemented if indications of potentially troublesome geomorphologic changes in bank, channel, or floodplain configurations are identified during routine pipeline inspections. If such indicators are observed during routine inspections, an assessment would be conducted to identify mechanisms contributing to the instability and the appropriate mitigation measures would be identified and implemented to reduce instability. Possible mitigation measures include spur dikes, engineered wood structures, bendway weirs, live crib walls, and rock toes. Those procedures would reduce the potential for long-term impacts to the surface waters of Montana crossed by the proposed route.

Preventative protection measures applicable to the crossings evaluated include spur dikes, engineered wood structures, longitudinal stone toes, longitudinal stone toes with spurs, trench fill revetment, vegetated gabion basket, and soil- and grass-covered riprap. If insufficient workspace is available for placement of preventative protection measures in the floodplain, instream applications to mitigate channel migration or scour would be needed. Applicable preventative instream protection measures include spur dikes, vanes, bendway weirs, engineered-wood structures, longitudinal stone toes, longitudinal stone toes with spurs, vegetated gabion basket, live crib walls, and soil- and grass-covered riprap.

For crossing sites studied in the field, the SCIR provides potential mitigation measures, such as alternative cover depths and additional post-construction site reclamation measures. The report also includes potential draft management plans that could be instituted for monitoring the sites after construction is completed. For a few crossings, the report presents potential alternative crossing locations (route variations, as described Section I-2.4) that would reduce the potential for problems resulting from long-term channel geomorphologic instability. These suggested variations were identified to reduce the impact of crossing the waterbody or to address landowner concerns.

Prior to final design along the permitted Project route in Montana, Keystone would conduct additional engineering assessments of all waterbody crossings. The results of the assessments would be used to design and construct crossings to minimize the short- and long-term impacts of the crossings. At each crossing, the assessment would consider the potential for vertical scour based on substrate type, streamflow during a 100-year flood, the channel cross section, and other factors. Keystone would consider field data and a more in-depth analysis for each stream with a possible scour depth greater than 5 feet. In evaluating the potential for lateral migration, Keystone would include a review of the vertical scour analysis, a linear discriminant analysis, an analysis based on examining evidence of lateral migration, inspection of current and historic aerial photographs, and other relevant factors. The results from the vertical scour and lateral migration assessments would be incorporated into the engineering and design of the crossings, including the method of crossing, depth of crossing, and extra depth extents of the crossing. Additional information on the specific methods and procedures Keystone would incorporate into the Project to minimize the impact of waterbody crossings in Montana is presented in Keystone's MFSA application and supplemental submittals to the application.

Implementation of the measures proposed by Keystone to minimize the impacts of waterbody crossings along with the appropriate mitigation measures presented above and in the SCIR, including incorporation of applicable route variations, would help ensure that maintenance activities that would further disturb the stream channel during operations are minimized.

I-3.1.2 Floodplains

I-3.1.2-1 Background

Floodplains are relatively low, flat areas of land that surround waterbodies and hold overflows during flood events. Floodplains form where overbank floodwaters spread out laterally and deposit fine-grained sediments. The combination of rich soils, proximity to water, riparian forests, and the dynamic reworking of sediments during floods creates a diverse landscape with high habitat quality.

Changing climatic and land use patterns in much of the western U.S. has resulted in region-wide incision of many stream systems. As these stream systems incise channel cuts deeper into the surrounding floodplains, high floodplain terraces are created along valley margins. These floodplain terraces are common throughout Montana and receive floodwaters less frequently than the adjacent low floodplain next to the rivers.

From a policy perspective, the FEMA defines a floodplain as being any land area susceptible to being inundated by waters from any source (FEMA 2005). FEMA prepares Flood Insurance Rate Maps that delineate the flood hazard areas, such as floodplains, for communities. These maps are used to administer floodplain regulations and to mitigate flood damage. Typically, these maps indicate the locations of the 100-year floodplains, which are the areas with a 1-percent chance of flooding occurring in any single year.

Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Each agency is to provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of federal lands, and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

I-3.1.2-2 Floodplains Along the Proposed Route

In Montana, low floodplain terraces occur at many stream crossings. For smaller intermittent and ephemeral drainages, these are typically narrow and infrequently flooded. At crossings of rivers and larger perennial streams, floodplains are generally wider and may flood more frequently than the smaller streams and drainages. Designated floodplains crossed by the proposed route are listed in Table I-3.1-2.

TABLE I-3.1-2
Designated Floodplain Areas Crossed by the Proposed Keystone XL Pipeline Route in Montana

County	Approximate Mileposts	Watercourse Associated with Floodplain
Valley	81 – 84	Milk River
Valley/McCone	87 – 90	Missouri River
McCone	146 – 147	Redwater River
Dawson	193 – 196	Yellowstone River

I-3.1.2-3 Potential Impacts

The pipeline would be constructed under river channels with potential for lateral scour as described in Section I-3.1.1.5. In floodplain areas adjacent to waterbodies, Keystone would restore the contours to as close to previously existing contours as practical and would revegetate the construction ROW in accordance with its CMR Plan (Appendix B) and the requirements of the MDEQ Environmental Specifications (Attachment 1 to this appendix). Therefore, after construction the pipeline would not obstruct flows over designated floodplains. In addition, there would be no aboveground facilities (pump stations or valves) in floodplains in Montana.

As a result, the Project would not affect floodplains in Montana.

I-3.1.3 References Cited

Federal Emergency Management Agency (FEMA). 1981. Guidelines for Determining Flood Flow Frequency.

Federal Emergency Management Agency (FEMA). 2005. National Flood Insurance Program, Flood Insurance Definitions. Available at: http://www.fema.gov/business/nfip/19def2.shtm.

Omang, R.J. 1992. Analysis of the Magnitude and Frequency of Floods and the Peak-Flow Gauging Network in Montana: U.S. Geological Survey Water-Resources Investigations Report 92-4048, 70 p.

I-3.2 WETLANDS

Section 3.4 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation on wetlands, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.2.1 Affected Environment

Wetland types in the vicinity of the proposed Project in Montana include emergent wetlands, scrub/shrub wetlands, and forested wetlands; waters in the vicinity of the proposed route include ephemeral, intermittent, and perennial streams and open water (Cowardin et al. 1979). Keystone provided information on specific wetlands along the proposed corridor in Montana in its application for a MFSA Certificate of Compliance (Keystone 2008). Information presented in this appendix describing wetland communities that would be crossed by the proposed route is based on the Keystone reports and additional information in the public record or available from resource agency files.

Emergent wetlands with fowl bluegrass (*Poa palustris*), and foxtail barley (*Hordeum jubatum*) dominate areas that typically contain spring snowmelt water for several weeks. In areas where water persists for several months each spring, shallow-marsh vegetation typically includes common spikerush (*Eleocharis palustris*) and wheat sedge (*Carex atherodes*). In areas where water persists throughout the year deep-marsh vegetation typically includes cattails (*Typha latifolia* and *T. angustifolia*) and hardstem bulrush (*Schoenoplectus acutus*). Scrub-shrub wetlands are characterized by woody vegetation less than 15 feet tall, which may include shrubs, sapling trees, or stunted trees. Scrub-shrub vegetation may include willows (*Salix* spp.), redosier dogwood (*Cornus sericea*), greasewood (*Sarcobatus vermiculatus*), fourwing saltbush and shadscale saltbush (*Atriplex canescens* and *A. confertifolia*). Forested wetlands are characterized by woody vegetation 15 or more feet tall, with common Montana trees including: boxelder (*Acer negundo*), plains cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*) and peachleaf willow (*Salix amygdaloides*). Common wetland shrubs within forested wetlands include redosier dogwood, Drummond's willow and narrowleaf (sandbar) willow (*Salix drummondiana* and *S. exigua*), silver buffaloberry (*Shepherdia argentea*), and snowberry (*Symphoricarpos* spp.). Exotic trees or shrubs within forested wetlands and riparian areas include Russian olive (*Elaeagnus angustifolia*) and, in limited areas, tamarisk (*Tamarix* spp.). Riparian forests include stands of cottonwood or mixed cottonwood-conifer forests. For the purposes of this analysis, riparian forest areas greater than 300 feet by 30 feet with an average canopy height of 50 feet or more and with more than 20 trees per acre were considered forested wetlands.

A total of 5.3 miles of wetlands would be crossed by the proposed route in Montana (see Table I-3.2-1). Section 3.4.2 of the EIS provides information on wetlands crossed by the Project that are considered of special concern or value, occur within conservation areas and reserves, are wetland easements or wildlife areas, represent sensitive landscapes, or have sensitive wetland vegetation communities.

TABLE I-3.2-1 Wetlands Crossed by the Proposed Project in Montana			
Wetland Type	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [1]	Number of Wetlands Crossed
Emergent Wetlands	4.2	60	259
Forested Wetlands [1]	0.9	13	27
Scrub-shrub Wetlands	0.2	2	7

Source: Keystone 2009a.
[1] For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.

I-3.2.2 Potential Impacts and Mitigation

Construction of the pipeline would affect wetlands and their functions primarily during and immediately following construction activities, but permanent changes are also possible. Potential construction- and operations-related effects on wetlands are discussed in Section 3.4.3 of the EIS. The proposed lengths, estimated areas, and numbers of wetlands crossed by the proposed route are summarized in Table I-3.2-1; a list of the wetlands and waterbodies crossed by the proposed route is presented in Appendix E of the EIS. Jurisdictional and non-jurisdictional wetlands would be delineated prior to the issuance of required permits. Impacts to wetlands that are non-jurisdictional under the Clean Water Act (CWA) Section 404 would not require mitigation by the U.S. Army Corps of Engineers.

Keystone's CMR Plan requires that it restore the ROW to near pre-construction conditions, including elevation, grade, and soil structure. As a result, the wetland vegetation communities would, in general, eventually transition back into communities that are functionally similar to those of the wetlands prior to construction. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 3 to 5 years). Following restoration and revegetation, there would be few permanent effects on emergent wetland vegetation because these areas naturally consist of and would remain as herbaceous communities. Herbaceous wetland vegetation in the permanent ROW generally would not be mowed or otherwise maintained, although the Keystone CMR Plan (Appendix B of the EIS) allows for annual maintenance of a 30-foot-wide strip centered over the pipeline. As a result, the impact of construction of the proposed Project on emergent wetlands in Montana would range from short term to long term in duration and be of minor magnitude, and the impact during operation would be minor but would last for the life of the Project.

In forested and scrub-shrub wetlands (Table I-3.2-2), the effects of construction would extend beyond the 3- to 5-year period needed for emergent wetlands due to the longer period needed to regenerate a mature forest or shrub community. Tree species that typically dominate forested wetlands in the vicinity of the Project in Montana (primarily cottonwood and green ash) have regeneration periods of 10 to 30 years or more. Willows and other non-sagebrush riparian shrubs would be expected to regenerate within 5 to 15 years. Trees and shrubs would not be allowed to grow within the maintained ROW except within some portions of the ROW associated with HDD crossings. Therefore, removal of forested and scrub-shrub wetland habitats due to pipeline construction would result in minor to moderate impact to those wetlands for the life of the Project. The maintained ROW would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands and would result in a moderate impact to those wetlands.

TABLE I-3.2-2
Forested and Scrub-Shrub Wetlands Crossed by the Proposed Project in Montana

County	Milepost	Associated River or Stream	Wetland Classification[1,2]	Reported Vegetation
Phillips	25.63	Unnamed	PFO	Not available[3]
Phillips	25.66	Unnamed	PFO	Not available
Valley	25.87	Frenchman Creek	PSS	Willows
Valley	25.92	Frenchman Creek	PSS	Willows
Valley	36.16	Unnamed (Intermittent)	PFO	Not available
Valley	36.18	Unnamed (Intermittent)	PFO	Not available
Valley	40.97	Unnamed	PFO	Not available
Valley	55.24	Buggy Creek	PFO	Young cottonwoods
Valley	55.29	Buggy Creek	PFO	Young cottonwoods
Valley	66.85	Cherry Creek	PFO	Mature trees
Valley	66.89	Cherry Creek	PFO	Mature trees
Valley	66.95	Cherry Creek	PFO	Mature trees
Valley	66.96	Cherry Creek	PFO	Mature trees
Valley	67.02	Cherry Creek	PFO	Mature trees
Valley	67.07	Cherry Creek	PFO	Mature trees
Valley	82.12	Unnamed	PSS	Not available
Valley	82.18	Unnamed	PSS	Not available
Valley	82.45	Unnamed	PSS	Not available
Valley	82.56	Unnamed	PFO	Not available
Valley	82.70	Milk River	PFO	Mature cottonwoods
McCone	89.73	Missouri River	PFO	Trees and shrubs
McCone	122.16	Unnamed	PFO	Not available
Dawson	158.83	Cottonwood Creek	PFO	Not available
Dawson	158.90	Cottonwood Creek	PFO	Not available
Dawson	159.57	Unnamed (Intermittent)	PFO	Not available
Dawson	159.60	Unnamed (Intermittent)	PFO	Not available
Dawson	177.19	Unnamed (Intermittent)	PFO	Not available
Dawson	177.22	Unnamed (Intermittent)	PFO	Not available
Dawson	195.64	Yellowstone River	PFO	Mature cottonwoods
Fallon	221.87	Unnamed	PFO	Not available
Fallon	231.04	Unnamed (Intermittent)	PSS	Not available
Fallon	261.06	Unnamed	PSS	Not available

Source: ENTRIX 2009, Keystone 2009a.
[1] PFO = Palustrine forested wetland; PSS = Palustrine scrub-shrub wetland.
[2]. For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.
[3] Information on vegetation was not reported in the sources used to prepare this table.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase in soil temperature at the soil surface above the pipeline of from 5 to 8 ˚F in Montana from November to May (Keystone 2009b). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the Project would cause increases in soil temperature over the pipeline of from 5 to 12 ˚F, with the largest increases occurring during March and April in Montana. While many herbaceous annual plants do not produce root systems that would penetrate much below 6 inches, some plants – notably native prairie grasses, trees, and shrubs – have root systems penetrating well below 6 inches. Keystone also found that in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in wetland plant species (Keystone 2009b).

Operation of the Project also would cause slight increases in water temperatures where the pipeline crosses through wetlands. The effects would be most pronounced in small ponds and wetlands since any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands over the pipeline may remain unfrozen a few days later than surrounding wetlands and may thaw a few days sooner than surrounding wetlands. The seasonal increase in temperature over the pipeline would last for the life of the Project but would result in a minor impact to wetlands along the proposed route.

I-3.2.3 References Cited

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. (FWS/OBS-1979.) U.S. Department of the Interior. U.S. Fish and Wildlife Service. Office of Biological Services. Washington, DC. 131 pp.

ENTRIX, Inc. 2009. Keystone XL Pipeline Montana Stream Crossing Inspections Report. December 18, 2009 Final Report. Prepared by ENTRIX, Inc. for the Keystone XL Project EIS. 153 pp.

Keystone. 2008. TransCanada Keystone L.P. Keystone XL Project. Montana Major Facility Siting Act Application. Submitted to Montana Department of Environmental Quality.

Keystone. 2009a. Keystone XL Project Joint Application for Proposed Work in Montana's Streams, Wetlands, Floodplains, and Other Water Bodies (401) Certification. TransCanada Keystone Pipeline, LP. April 2009 Draft.

Keystone. 2009b. Keystone XL Project Supplemental Environmental Report. TransCanada Keystone Pipeline, LP. Document No.: 10623-006, July 2009. Wetlands

I-3.3 TERRESTRIAL VEGETATION

Section 3.5 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation on terrestrial vegetation, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.3.1 Affected Environment

Land cover across the proposed Project in Montana is dominated by native range and agricultural lands (Table I-3.3-1). Terrestrial vegetation occurring along the proposed route in Montana, as determined from data sources different from those used in this appendix, is also described in Section 3.5.2 of the EIS.

TABLE I-3.3-1
Land Cover Types Crossed by the Proposed Pipeline Route

Cover Type	Length Through Cover Type (miles)	Area in Construction ROW (acres)[1]	Percent of Total Area in Construction ROW[1]
Open water	0.3	4.0	0.1
Developed land (e.g. road, buildings, cleared areas)	3.3	44.0	1.2
Wetlands	0.2	2.7	0.1
Riparian	7.5	100.0	2.6
Greasewood flats	1.0	13.3	0.3
Agricultural (crop and hay lands)	74.8	997.3	26.5
Badlands	14.5	193.3	5.1
Conifer forest	1.8	24.0	0.6
Wooded draws	1.9	25.3	0.7
Sagebrush steppe	32.1	428.0	11.4
Native range (mixed-grass prairie)	145.1	1,934.7	51.4
Total	282.5	3,766.6	100.0

Source: Montana Natural Heritage Program (MNHP) 2009a database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix

[1] Acreage based on a construction ROW width of 110 feet.

Native rangeland vegetation communities primarily consist of mixed-grass prairie dominated by blue grama (*Bouteloua gracilis*)[5], green needlegrass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*); sagebrush communities dominated by silver sagebrush (*Artemisia cana*), big sagebrush (*Artemisia tridentata*), and rubber rabbitbrush (*Ericameria*

[5] Common names of plants are used in this section. Scientific names for plants are used after their initial mention in text or tables following nomenclature in the U.S. Department of Agriculture, Natural Resources Conservation Service's PLANTS database (USDA NRCS 2009)

nauseosus); and greasewood (*Sarcobatus vermiculatus*) or Nuttall's saltbush (*Atriplex nuttallii*) in alkali flats.

Mixed-grass prairies have floristic components of tall-grass and short-grass prairies and are characterized by grasses of the short-grass prairie (e.g., blue grama) and some grasses of the tall-grass prairie including wheatgrasses (*Elymus* spp., and *Pascopyrum smithii*)) and bluestem species (*Andropogon gerardii* and *Schizachyrium scoparium*). The primary upland shrub communities that occur throughout the Project area are big sagebrush on dry uplands with heavier soils and silver sagebrush on sites with higher levels of available soil moisture. Sagebrush shrub communities are susceptible to fire and may have a natural fire return interval of 100 to 200 years depending on topography and exposure, while sagebrush communities on more mesic sites may have a natural fire interval of decades (USFWS 2008). Post-fire reestablishment of sagebrush communities may require 20 to 50 years.

Most of the forests in eastern Montana occur along streams and rivers, in rugged topography (breaks) or where rolling hills are dissected by drainages. Riparian communities along many perennial streams are dominated by an overstory of green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*) and plains cottonwood. Upland forest communities include isolated, small patches of quaking aspen (*Populus tremuloides*) on cool, moist microsites (mostly confined to the Bitter Creek area in north-central Montana), and Rocky Mountain juniper (*Juniperus scopulorum*) and ponderosa pine (*Pinus ponderosa*) on breaks and on areas with shallow sandstone bedrock. Native forest communities are an integral component of the prairie landscape throughout Montana and the Great Plains and provide important breeding, feeding, and security habitat for many types of wildlife. Native forest communities also support a distinct assemblage of plant species not found on upland sites and are important sources of plants of ethnobotanical importance (cultural and spiritual) to Indian tribes.

Indian tribes have traditionally used many plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, Gilmore 1977). Although the dependence on plants for many aspects of survival in the natural environment has become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Indian tribes. The plants themselves are important and in some cases are sacred to indigenous peoples; however, it is not only the plants that possess spiritual qualities. Places where important plants grow and have been collected for millennia can have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the Project area include species from all native vegetation communities (Table I-3.3-2). A large proportion of plants used by Native Americans grow in wetlands and riparian areas. Although these habitats are a small percentage of the land area, they are disproportionately important as sources for plants of ethnobotanical importance. In addition to plants that are used by the Indian tribes in the vicinity of the proposed route, plants such as prairie coneflower are widely used by the non-Indian population as herbal supplements and collected for sale outside of the general area of the proposed Project. Locally, collection and sale of echinacea is an important source of income for residents of the Fort Peck Reservation. Although the proposed route would not directly affect Reservation lands, residents of the Fort Peck Reservation collect plants of ethnobotanical importance outside of the Reservation on land that may include land within the construction ROW.

TABLE I-3.3-2 **Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route[1]**		
English Common Name (Scientific Name)	Habitat	Use
Northern sweetgrass (*Hierochloe hirta*)	Moist meadows and margins of wetlands	Incense, perfume, smoked with tobacco
Cattail (*Typha latifolia/angustifolia*)	Emergent in wetlands	Down used to dress wounds; starchy roots eaten
Field (wild) mint (*Mentha arvensis*)	Wetlands	Used as a flavoring and tea; dried leaves used to treat chest pains
Cow parsnip (*Heracleum maximum*)	Riparian areas and wooded draws	Stems eaten; used in Sun Dance ceremony
Stinging nettle (*Urtica dioica*)	Riparian areas and margins of wetlands	Decoction made from root; fibers used as cordage
Horsetail (*Equisetum arvense/hyemale*)	Moist meadows and margins of wetlands	Used for polishing; children's whistles
Seaside arrow-grass (*Triglochin maritima*)	Saline wetlands	Seeds parched and eaten
Arumleaf arrowhead (*Sagittaria cuneata*)	Emergent in perennial wetlands	Roots eaten
Baltic rush (*Juncus arcticus)*)	Wet meadows and wetlands	Used to make a brown dye
Plains cottonwood (*Populus deltoides*)	Riparian area along major rivers and streams	Used as center post for Sun Dance Medicine Lodge; firewood; inner bark eaten
Chokecherry (*Prunus virginiana*)	Riparian areas and wooded draws	Fruit eaten
Silver buffaloberry (*Shepherdia argentea*)	Riparian areas and wooded draws	Fruit eaten; used to make red dye
Golden currant (*Ribes aureum*)	Riparian areas and wooded draws	Fruit eaten
Red baneberry (*Actaea rubra*)	Riparian areas and wooded draws	Roots used as remedy for colds and for women after child birth
Hawthorn (*Crataegus* spp)	Riparian areas and wooded draws	Fruit eaten and wood used for objects requiring hard wood
Willow (*Salix* spp.)	Riparian areas	Twigs boiled as decoction to cure fever or as a pain killer
Red-osier dogwood (*Cornus sericea*)	Riparian areas and wetlands	Inner bark smoked with tobacco and used to make tea
Silverberry (*Elaeagnus commutata)*	Moist uplands	Fruits used as famine food; seeds used as beads
Western water hemlock (*Cicuta douglasii*)	Wetlands	Used as medicine to induce vomiting and as a treatment for sores
Juniper (*Juniperus* spp.)	Uplands in prairie grasslands	Berries steeped in water to make medicine for various ailments
Blue grama (*Bouteloua gracilis*)	Dry native prairie	Used to forecast weather
Wild onion (*Allium* spp.)	Prairie grasslands	Bulbs and leaves eaten
Indian ricegrass (*Achnatherum hymenoides*)	Prairie grasslands	Large seeds eaten
Sedges (*Carex* spp.)	Prairie grasslands and wetlands	Used to line moccasins in winter
Yellow bell	Prairie grasslands	Bulbs eaten

TABLE I-3.3-2 Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route[1]		
English Common Name (Scientific Name)	Habitat	Use
(*Fritillaria pudica*)		
Sego lily (*Calochortus nuttallii*)	Prairie grasslands	Bulbs eaten
Wild rose (*Rosa* spp.)	Prairie grasslands, riparian areas and wooded draws	Fruits eaten
Saskatoon (*Amelanchier alnifolia*)	Riparian areas and wooded draws	Fruits eaten
Winterfat (*Krascheninnikovia lanata*)	Prairie grasslands	Leaves used to make tea and as hair rinse
Spring beauty (*Claytonia* spp.)	Prairie grasslands and shrublands	Corms eaten
Prairie sagewort (*Artemisia frigida*)	Prairie grasslands and shrublands	Leaves boiled and used for various ailments
White sage (*Artemisia ludoviciana*)	Prairie grasslands and shrublands	Leaves used as incense in purification ceremonies
Shrubby cinquefoil (*Dasiphora fruticosa*)	Shrublands	Dry flakey bark used as tinder
Wild licorice (*Glycyrrhiza lepidota*)	Riparian areas and edges of moist meadows	Decoction from roots used for various ailments
Pasque flower (*Pulsatilla patens*)	Prairie grasslands	Crushed leaves used as poultice
Wild strawberry (*Fragaria virginiana*)	Grasslands	Fruits eaten; roots used as a medicine for diarrhea
Large Indian breadroot (*Pediomelum esculenta*)	Prairie grasslands	Tubers eaten and made into flour
Prairie clover (*Dalea* spp.)	Prairie grasslands and shrublands	Bruised leaves steeped in water and applied to wounds
Prairie coneflower (*Echinacea angustifolia*)	Prairie grasslands and shrublands	Roots of plants used to treat tooth aches
Narrowleaf stoneseed (*Lithospermum incisum*)	Prairie grasslands and shrublands	Seeds and tops used as incense; root used to make violet dye
Scarlet globemallow (*Sphaeralcea coccinea*)	Prairie grasslands and shrublands	Plant chewed and applied to cuts and sores
Plains prickly pear cactus (*Opuntia polyacantha*)	Prairie grasslands and shrublands	Fruit and stems eaten; juice applied to sores

Sources: Johnston 1987, Hart and Moore 1976, Gilmore 1977.
[1] Table does not list all plants used by Indian tribes in the vicinity of the proposed Project.

Riparian areas are transitional between wetland and upland habitats, generally lacking the amount or duration of water present in wetlands. Riparian habitats in the vicinity of the proposed route identified as conservation priorities include wooded draws, dominated by green ash, and broadleaf riparian, dominated by plains cottonwood (MFWP 2005). The proposed route crosses significant Montana riparian habitats near the confluence of the Milk and Missouri rivers, and near the Yellowstone River. Wooded draws are present in central and southeastern Montana along the proposed route.

Noxious weeds and invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. Montana has experienced the rapid introduction and spread of noxious weeds and invasive plants on all types of land ownership. Ground disturbing activities such as agriculture, construction, and development of transportation corridors increase the spread of weeds due to transport by heavy machinery and vehicles during construction or through post-construction revegetation using contaminated seed sources. Up to 32 noxious weed species could occur within the construction ROW in Montana, including 4 aquatic or wetland weeds, 22 upland weeds, and 6 weeds that may occur in either wetland or upland habitats (USDA NRCS 2009); Table 3.5.4-1 in the main body of the EIS lists the noxious weed species along the proposed route, including species in Montana.

Fourteen plants tracked by the Montana Natural Heritage Program as Species of Special Concern, six of which are also managed as Sensitive Species by the BLM, may be present in the vicinity of the proposed route in Montana (Table I-3.3-3). Surveys for special-status plants along the construction ROW have not been completed; however, the proposed route crosses suitable habitats and known ranges for these plants.

TABLE I-3.3-3
Plants of Special Concern Potentially Present in the Vicinity of the Proposed Pipeline Route in Montana

Common Name and Species	Occurrence and Conservation Status[1]	Habitat
Raceme milkvetch (*Astragalus racemosus*)	Fallon and Carter counties; S2	Sagebrush and grassland communities on heavy soils derived from shale with high levels of alkalinity
Poison suckleya (*Suckleya suckleyana*)	Known from one extant population in Dawson County and three historic collections; S1	Drying mud along ponds and streams, often on alkali soils
Crawe's sedge (*Carex crawei*)	BLM sensitive. One occurrence near the Project area; S2	Wet gravelly or sandy soils along streams and ponds
Nine-anther dalea (*Dalea enneandra*)	Five occurrences in eastern Montana; S1	Gravelly soils of grasslands and slopes
Showy prairie gentian (*Eustoma exaltatum*)	One occurrence in Montana in McCone County; S1	Wet meadows and pond margins
Bractless blazing star (*Mentzelia nuda*)	BLM sensitive. At the periphery of range in Montana; S1	Sandy or gravelly soils on open hills and roadsides
Chaffweed (*Anagallis minima*)	BLM sensitive. Three occurrences in eastern Montana: S2	Vernally wet, sparsely vegetated soils along ponds and stream margins
Texas toadflax (*Nuttallanthus texanus*)	Known from occurrence near Glendive and Alzada; S1	Open sandy or acidic soil of grasslands and woodlands
Broadbeard beardtongue (*Penstemon angustifolius*)	BLM sensitive. At the periphery of range in Montana; S1S2	Sandy soils of prairie grasslands, often most abundant in blowouts
Hotspring phacelia (*Phacelia thermalis*)	Known from a small number of sites in northeastern Montana; disjunct from its primary range in Idaho and California; S1	Variable habitat, often on disturbed sites
Prairie phlox (*Phlox andicola*)	BLM sensitive, at periphery of range in Montana; S2	Sandy soils in grasslands and ponderosa pine woodlands, often associated with sparsely vegetated blowouts
Sand cherry (*Prunus pumila*)	Known from two collections in Fallon and McCone counties; S1	Sandy and rocky soils in prairie grasslands
Persistent-sepal yellowcress (*Rorippa calycina*)	BLM sensitive, regional endemic, known from four records in Montana; S1	Moist sandy to muddy margins of streams, ponds, and reservoirs near the high-water line
American bittersweet (*Celastrus scandens*)	Known from one site in Dawson County, at periphery of range in Montana; S1	Riparian woodlands and thickets

Source: MNHP 2009b, BLM 2009
[1] S1 = State critically imperiled; S2 = State imperiled; S1S2 = State status uncertain, critically imperiled to imperiled.

I-3.3.2 Potential Impacts and Mitigation

Most land crossed by the proposed route in Montana is native range and land managed for agriculture (e.g., cropland, non-native pasture, and hay land). Approximately 21 percent of the length of the proposed route crosses other land cover categories (see Table I-3.3-1). Potential construction- and operations-related impacts and mitigation methods for terrestrial vegetation along the entire route are discussed in Section 3.5.5 of the EIS.

The primary impacts on vegetation from construction and operation of the proposed Project in Montana would result from cutting, clearing, or removing the existing vegetation within the construction ROW. In addition, those activities would increase the potential for invasion by noxious weeds in the construction ROW. Impacts on croplands would likely be short term and limited to the then-current growing season; however, Keystone would compensate landowners or tenants for the loss of crops. Impacts on pastures, rotated croplands, and native rangeland generally range from short term to long term, with vegetation typically becoming reestablished within 1 to 5 years after construction; however, re-established vegetation may differ from adjacent native plant communities in diversity, canopy structure, and productivity. The rate of development of reestablished plant communities (i.e., ecological succession) would be influenced by localized factors such as climatic conditions, levels of grazing and trampling, seed mixes, and soil amendments. The impacts to these vegetation communities would range from short term to long term in duration and would be of minor to moderate magnitude.

Clearing trees within upland and riparian forest communities would result in long-term impacts on these vegetation communities due to the length of time needed for the communities to mature to pre-construction conditions. Forest and shrub communities within the 10-foot-wide riparian and the 30-foot-wide upland permanent ROW centered on the pipeline would experience impacts for the life of the Project, as would areas where trees would be removed and prevented from reestablishing as a result of the periodic mowing and brush clearing required for pipeline operation and inspections. Routine maintenance involving vegetation clearing would occur every 1 to 3 years.

Most shrubs would be expected to reestablish within the non-maintained portion of the ROW within 5 to 15 years. However, longer periods may be required for the development of pre-construction levels of biodiversity and productivity. The native-species composition of post-construction plant communities may not develop to pre-construction levels for 30 to 50 years or longer. Shrubs and warm-season grasses are slow to colonize sites that have developed vigorous stands of cool-season wheatgrasses and other species typically used in reclamation seed mixes. Seed mixes for reclamation are primarily developed to rapidly establish ground cover to minimize erosion and invasion of noxious weeds. The dominance of rapidly germinating and vigorous grasses is effective in stabilizing soils but can also inhibit the development of plant communities with diversities of native forbs, shrubs, and warm-season grasses comparable to undisturbed native prairie communities. These impacts would range from long term to permanent (i.e., lasting for at least the life of the Project) and would be of minor to moderate magnitude. However, during operation the effect on plant communities established along the ROW after the completion of construction would be minimal because these areas would be allowed to recover following construction and typically would not require maintenance mowing.

In an assessment of temperature increases of soil surrounding the pipeline, Keystone determined that operation of the proposed Project would cause an increase in soil temperatures at the soil surface over the pipeline of from 5 to 8 ˚F in Montana, from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the study indicated that operation of the Project would cause increases in soil temperature over the pipeline of from 5 to 12 ˚F, with the largest increases occurring during March and April in Montana. While many herbaceous annual plants do not produce root systems that would penetrate much below 6 inches, some plants, notably native prairie grasses, trees, and shrubs, have root systems penetrating well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 40 ˚F warmer than the ambient surrounding soil temperatures (Keystone 2009). Keystone also found that in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in annual crops, and that in some cases increased soil temperatures may lead to increased soil drying and decreased plant-available soil water; however, this effect has not been documented to occur at similar pipelines (Keystone 2009).

After removal of vegetation cover and disturbance to the soil, re-establishment of native vegetation communities can be delayed or prevented by infestations of noxious weeds and invasive plants. A total of 47 noxious weed sources have been identified along the proposed route in Montana; approximately 4.6 miles of the route would extend through those sources (Table I-3.3-4). Section 3.5.4 of the EIS addresses noxious weeds, including potential impacts and the procedures that Keystone would incorporate into the Project to minimize the spread of noxious weeds. As described in that section of the EIS, Keystone has committed to control the introduction and spread of noxious weeds by implementing the construction and restoration procedures detailed in its CMR Plan (Appendix B to the EIS). Keystone would also incorporate the MDEQ Environmental Specifications (Attachment 1 to this appendix) into the Project.

TABLE I-3.3-4
Noxious Weed Sources Occurring Along the Proposed Pipeline Route in Montana

Number of Counties	Weed Type	Length of Pipeline through the sources (miles)	Number of Sources Crossed
Four of six	Bindweeds (*Convolvulus* spp.)	0.98	5
One of six	Common tansy (*Tanacetum vulgare*)	0.09	1
One of six	Hawkweeds (*Hieracium* spp.)	0.01	1
Three of six	Knapweeds (*Centaurea* spp.)	1.24	21
Two of six	Leafy spurge (*Euphorbia esula*)	2.02	13
Two of six	Plumeless Thistles (*Carduus* spp.)	0.20	5
One of six	Thistles – Canada and Bull (*Cirsium* spp.)	0.01	1
Montana total		*4.55*	47

Source: Keystone 2009.

Sensitive plants potentially affected by construction through native vegetation communities include raceme milkvetch, prairie clover, bractless blazing star, Texas toadflax, broadbeard beardtongue, prairie phlox, and sand cherry. Sensitive plants potentially affected by construction through wetlands and riparian communities include poison suckleya, Crawe's sedge, showy prairie gentian, chaffweed, persistent-sepal yellowcress, and American bittersweet. Based on the availability of potential suitable habitats, known population distributions, and the protective measures in the Keystone CMR Plan that would be incorporated into the Project; construction of the proposed Project would result in some reduction of available suitable habitat for sensitive plants and may result in the loss of some individual plants. However, viability of the plants over their range would not be adversely affected. As a result, the impact to sensitive species would be long term but minor.

I-3.3.3 References Cited

Bureau of Land Management (BLM). 2009. Montana/Dakotas Special Status Species List. Instruction Memorandum No. MT-2009-039, email transmission April 24, 2009.

Gilmore, M. 1977. Uses of plants by the Indians of the Missouri River region. University of Nebraska Press. Lincoln and London.

Hart, J. and J. Moore. 1976. Montana - Native plants and early people. The Montana Historical Society and Montana Bicentennial Administration.

Johnston, A. 1987. Plants and the Blackfoot. Occasional Paper No. 15. Lethbridge Historical Society. Lethbridge, Alberta.

Keystone. 2009. TransCanada Keystone XL Project Environmental Report. Revised July 6, 2009. Document No.: 10623-006. Submitted to U.S. Department of State and Bureau of Land Management by TransCanada Keystone Pipeline, L.P.

Montana Fish, Wildlife & Parks (MFWP). 2005. Montana's Comprehensive Fish and Wildlife Conservation Strategy. Montana Fish Wildlife & Parks, 1420 East sixth Avenue, Helena, MT.658 pp.

Montana Natural Heritage Program (MNHP). 2009a. Montana Land Cover/Land Use Theme. Based on classifications originally developed by the University of Idaho and the Montana Natural Heritage Program for the Pacific Northwest ReGAP project. Helena, Montana.

MNHP. 2009b. Montana field guide and tracker database. Available on line at: http://mtnhp.org.

U.S. Fish and Wildlife Service (USFWS). 2008. Greater Sage-Grouse Interim Status Update. October 31, 2008. U.S. Fish and Wildlife Service, Mountain-Prairie Region, Wyoming Ecological Services Office in collaboration with the Montana and Utah Ecological Services Office in the Mountain-Prairie Region; the Upper Columbia, Snake River, and Oregon Fish and Wildlife Offices in the Pacific Region, and the Nevada Fish and Wildlife Office in the California and Nevada Region. Online at: http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/ Accessed June 29, 2009.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS). 2009. The PLANTS Database. U.S. Department of Agriculture. National Plant Data Center. Baton Rouge, LA. Available online at: <http://plants.usda.gov>. Accessed between May and November 2009.

I-3.4 WILDLIFE

Section 3.6 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation on wildlife, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.4.1 Affected Environment

There is a diversity of wildlife habitat in the vicinity of the proposed Project in eastern Montana. The combination of native prairie, sagebrush steppe, riparian forest, and wetlands supports a high diversity of wildlife including mule deer[6] (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), swift fox (*Vulpes velox*), striped skunk (*Mephitis mephitis*), American badger (*Taxidea taxus*), black-tailed prairie dog (*Cynomys ludovicianus*), North American porcupine (*Erethizon dorsatum*), ground squirrels (*Spermophilus* spp.), greater sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus jamesi*), gray partridge (*Perdix perdix*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), burrowing owl, mourning dove (*Zenaida macroura*), long-billed curlew (*Numenius americanus*), upland sandpiper (*Bartramia longicauda*), Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit (*Anthus spragueii*), horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and other passerines typically found on rangelands and croplands (also see Sections 3.6 and 3.8 of the EIS.).

Grassland and sagebrush communities in the vicinity of the proposed Project provide habitat for sharp-tailed grouse and greater sage-grouse and contain strutting grounds (leks) and nesting habitat. Native prairie grasslands are sought exclusively for breeding by Baird's sparrow, burrowing owl, clay-colored sparrow (*Spizella pallida*), long-billed curlew, Sprague's pipit, and upland sandpiper. Many of the remaining native grasslands have been reduced and fragmented and are present as discontinuous blocks surrounded by cultivated fields. Because of the loss of native prairie and sagebrush communities in the United States and Canada, resource agencies and conservation groups are concerned about the viability of species that are obligate users of these habitats.

The vegetation on large portions of land in the vicinity of the proposed route in Montana has been converted from native plants to agricultural fields, primarily on floodplains and upland benches. Most farmland is planted in small grains or is in the Conservation Reserve Program (CRP). Wildlife species associated with farmland and adjacent native habitats include American goldfinch (*Spinus tristis*), brown-headed cowbird (*Molothrus ater*), gray partridge, ring-necked pheasant (*Phasianus colchicus*), sharp-tailed grouse, mule deer, white-tailed deer and red fox (*Vulpes vulpes*).

Northern harriers (*Circus cyaneus*), red-tailed hawks, and American kestrels (*Falco sparverius*) are the most common raptors in the vicinity of the proposed route. Northern harriers prefer to nest in marshy areas near water but forage in all habitats. Typically, Swainson's and red-tailed hawks nest in trees, and prairie falcons and peregrine falcons nest on cliffs. Ferruginous hawks nest in trees, shrubs, and on rocky outcrops. Potential Swainson's and red-tailed hawk nesting sites occur in cottonwood trees

---

[6] For animals discussed in this section, common names are used in the text with the scientific name as per nomenclature of the NatureServe Explorer database (NatureServe 2009) provided after the first reference of the common name.

along drainages, in woody draws, and shelterbelts. There are few cliffs suitable for peregrine and prairie falcon nests in the vicinity of the proposed route. Rough-legged hawks (*Buteo lagopus*) are common winter residents in the area, migrating from arctic and sub-arctic regions of North America. Gyrfalcons (*F. rusticolus*) and snowy owls (*Bubo scandiacus*) are also periodic winter visitors, particularly during severe winters in northern Canada.

Wetlands are present along perennial and ephemeral drainages, in association with reservoirs and stock ponds, and in poorly drained depressions. Wildlife commonly associated with wetlands includes black-crowned night heron (*Nycticorax nycticorax*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), boreal chorus frog (*Pseudacris maculata*) and northern leopard frog (*Rana pipiens*). The Missouri and Yellowstone rivers provide habitat for American white pelican (*Pelecanus erythrorhyncus*), least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), North American beaver (*Castor canadensis*), American mink (*Neovison vison*), common muskrat (*Ondatra zibethicus*), northern painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentine*), and spiny softshell (*Apalone spinifera*).

Other amphibians and reptiles present in the vicinity of the proposed route use a variety of habitats and include: Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), plains spadefoot (*Spea bombifrons*), tiger salamander (*Ambystoma tigrinum*), garter snakes (*Thamnophis* spp.), gopher snake (*Pituophis catenifer*), eastern racer (*Coluber constrictor*), western hog-nosed snake (*Heterodon nasicus*), western (prairie) rattlesnake (*Crotalus viridis*), greater short-horned lizard (*Phrynosoma hernandesi*) and common sagebrush lizard (*Sceloporus graciosus*).

The following sections address the existing conditions for prairie grouse (Section I-3.4.1.1) and special status wildlife (Section I-3.4.1.2) in Montana.

I-3.4.1.1 Prairie Grouse

Prairie grouse in Montana include the greater sage-grouse and sharp-tailed grouse. Both of these grouse congregate at strutting grounds or "leks," where males perform courtship displays and where breeding occurs. Prairie grouse exhibit a high degree of fidelity to lek locations and return to the same location each spring, although leks may shift in location over time. Disturbances at or near leks can disrupt breeding activities and limit reproductive success. Important habitats for both of these grouse, including habitats for lek sites, occur in and near the proposed construction ROW in Montana.

Greater Sage-Grouse

The greater sage-grouse is a game species in Montana. It is designated as a sensitive species by the BLM and is a species of concern in Montana. Greater sage-grouse is of conservation concern because of long-term population declines due to the loss and degradation of sagebrush habitat (Knick and Connelly 2009, Schroeder et al. 2004). The greater sage-grouse has been petitioned several times for federal listing consideration as a threatened or endangered species. In April 2004, the USFWS determined that listing the greater sage-grouse under the Endangered Species Act (ESA) may be warranted and initiated a status review. The 12-month finding of the status review determined that listing was not warranted (70 FR 2244). However, this determination was ruled arbitrary and capricious by the U.S. District Court of Idaho. USFWS initiated a status review to reevaluate this finding, and on 5 March 2010 announced that listing the greater sage-grouse (rangewide) was warranted, but precluded by higher priority listing actions (USFWS 2010; 75 FR 55, March 23, 2010)

Sage-grouse are sagebrush-obligate birds that prefer sagebrush stands with a canopy cover of at least 20 percent and a height of 8 inches or higher. Research conducted in Montana found that breeding habitat usually occurs in sagebrush habitat with 20 to 50 percent sagebrush canopy cover (Montana Sage

Grouse Work Group [MSGWG] 2005). Optimum sagebrush densities for sage-grouse are more than 4,000 plants per hectare (Pyke 2009). Leks are typically located in areas of bare ground or low-density vegetation such as ridge tops. Nesting typically occurs within 2 to 4 miles of the lek and in areas with a sagebrush canopy cover of between 15 to 30 percent. Although sagebrush habitat is crucial for all seasons and life stages, wet meadows and riparian areas are critical for the brood-rearing. Wet meadows and riparian habitats provide a diversity of insects for chicks to feed on and a variety of forbs for juveniles and hens. Sage-grouse winter in tall and large expanses of dense sagebrush with an average canopy cover of 20 percent and a height of 10 inches (MSGWG 2005). The proposed route passes through mapped sage-grouse habitat (MFWP 2001a).

Sharp-Tailed Grouse

The plains variety of sharp-tailed grouse is a game species in Montana, with no special conservation status. Sharp-tailed grouse are primarily a grassland species and their preferred habitats are grasslands and mixed-shrubs (Connelly et al. 1998, Montana Natural Heritage Program [MNHP] 2009a). Sharp-tailed grouse numbers have declined across much of the Great Plains and intermountain west due to habitat loss (Connelly et al. 1998). Populations in Montana have been more secure than in other areas of their range (Connelly et al. 1998). Many populations depend on cropland to varying degrees. Leks are often located on elevated areas with less vegetation than surrounding areas. Structural diversity of habitat (grasses, forbs, and shrubs) provides high-quality nesting habitat, although sharp-tailed grouse may nest in cultivated hayfields (grass and alfalfa) and wheat stubble. Nests are often located within 2 miles of leks (Connelly et al 1998). The diet of the sharp-tailed grouse includes a variety of forbs, fruits, grains, buds, and insects. In winter, sharp-tailed grouse use riparian areas, deciduous hardwood shrub draws, and deciduous and open coniferous woods. Potential sharp-tailed grouse habitat (mixed-grass prairie, riparian, conifer forest, crop and hay lands) occurs along most of the proposed route (MFWP 2001b).

Lek Surveys

Aerial lek surveys of the Project route completed by Keystone (2009) found no new sage-grouse or sharp-tailed grouse leks within 0.6 mile of the proposed centerline in Montana or within 2 miles of proposed pump station locations; however, those surveys were not comprehensive. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the route in Montana); data from that survey indicate that 36 sage-grouse leks and 36 sharp-tailed grouse leks were active within 4 miles of the proposed route (Table I-3.4-1). The Keystone survey along that part of the route did not document activity at several of the known active leks near the route. In addition, it is likely that additional sage-grouse and sharp-tailed grouse leks are present within areas not surveyed by MFWP in the vicinity of the proposed route (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009).

TABLE I-3.4-1
Prairie Grouse Lek Sites Observed During Surveys in the Vicinity of the Proposed Project Route

Species	Leks Within Specified Distances of ROW Centerline			
	1 mile	2 miles	3 miles	4 miles
Greater sage-grouse	5	11	24	36
Sharp-tailed grouse	8	19	29	36

Source: MFWP 2009a, 2009b, 2009c.

I-3.4.1.2 Special-Status Wildlife

Special-status wildlife are animals listed as threatened, endangered, or candidate species under the ESA of 1973; species managed as “sensitive” by the BLM; and species of special concern tracked by the Montana Natural Heritage Program. Animals of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Special-status wildlife species that are potentially present in the vicinity of the Project in Montana include four federally protected species and 67 species listed as conservation concerns by BLM and Montana (15 mammals, 42 birds, seven reptiles, and three amphibians). Federally protected and BLM sensitive species are addressed in the main body of the EIS in Section 3.8. Montana wildlife of concern that are not federally listed or designated BLM sensitive species and are analyzed in this section are listed in Table I-3.4-2. Because of the large number of Montana species of concern, the descriptions presented below are aggregated into the following groups based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles. The greater sage-grouse is a conservation concern for BLM and Montana, but for the purposes of this discussion that species is presented with the sharp-tailed grouse in the prairie grouse section above.

TABLE I-3.4-2
Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Mammals of Conservation Concern		
Arctic shrew (*Sorex arcticus*)	Known only from extreme northeast Montana (Sheridan County), alternate routes could include occupied habitat; S1S3.	Primarily found in moist sites, such as wet meadows, swamps, and marshes; also, sandy flats of floodplains.
Dwarf shrew (*Sorex nanus*)	Predicted distributions include eastern Montana, south of the Missouri River; S2S3	A variety of habitats from short-grass prairie and sagebrush to alpine tundra.
Eastern red bat (*Lasiurus borealis*)	The distribution in Montana is not well documented, expected to occur across eastern Montana; S2S3	Wooded riparian areas, solitary and roosts in tree foliage
Hoary bat (*Lasiurus cinereus*)	Potentially present throughout the Project area; S3	Forested areas
Merriam’s shrew (*Sorex merriami*)	Predicted distribution includes portions of eastern Montana, south of the Missouri River ;S2	Arid sagebrush-grassland habitats
Preble’s shrew (*Sorex preblei*)	Known to occur in Valley and Dawson counties and elsewhere in western and central Montana; S3	Arid to semi-arid grassland and sagebrush habitats from plains to subalpine zones.
Birds of Conservation Concern		
American bittern (*Botaurus lentiginosus*)	Not likely breeding in Project area; S3B	Freshwater wetlands with tall emergent vegetation and perennial water
American white pelican (*Pelecanus erythrorhyncus*)	It is unlikely that the Project would affect nesting or foraging habitat; S3B	Colonial nester on islands of lakes and reservoirs; forages over large areas in rivers, lakes, and ponds.
Black-billed cuckoo (*Coccyzus erythropthalmus)*	Potentially present in riparian habitats in Project area; S3B.	Species prefers thick, forested areas, usually near water.
Black-crowned night heron (*Nycticorax nycticorax*)	Breeding not documented in the Project area; S3B	Shallow marshes with cattail and bulrush, often in grassland matrix

TABLE I-3.4-2
Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Black-necked stilt (*Himantopus mexicanus*)	Breeding is documented in Phillips County and is transient in the Project area; S3B	Nest in medium to large wetland complexes consisting of open marsh and meadows, including alkali areas.
Bobolink (*Dolichonyx oryzivorus*)	Breeding documented for counties in Project area; S2B	Meadows with dense grass cover
Caspian tern (*Hydroprogne caspia*)	It is unlikely that the Project would affect nesting habitat; S2B	Islands in large lakes or reservoirs with rocky or sandy shores for nesting
Common tern (*Sterna hirundo*)	It is unlikely that the Project would affect nesting habitat; S3B	Nests on sparsely vegetated islands in large lakes and reservoirs
Forster's tern (*Sterna forsteri*)	It is unlikely that the Project would affect nesting habitat; S3B	Large marshes with extensive reed beds or muskrat houses for nesting.
Grasshopper sparrow (*Ammodramus savannarum*)	Breeds in counties of the Project area; S3B	Open prairies with intermittent shrubs
Great blue heron (*Ardea herodias*)	Occurs throughout Montana and breeds in counties in the Project area; S3	Colonial nester in riparian. cottonwood forests
Greater sage-grouse (*Centrocercus urophasianus*)	Breeds in counties of the Project area; S2	Breeds using lek system, uses sagebrush habitat for nesting and wintering
Horned grebe (*Podiceps auritus*)	Breeds in counties of the Project area; S3B.	Breeds on shallow freshwater ponds and marshes with beds of emergent vegetation.
Pinyon jay (*Gymnorhinus cyanocephalus*)	Breeding not documented in counties of the Project area; S3	Colonial nester in juniper and pine trees.
Veery (*Catharus fuscescens*)	Breeding is documented in counties of the Project area; S3B.	Shaded, moist deciduous forest habitats.
Yellow-billed cuckoo (*Coccyzus americanus*)	Breeding not recorded for counties of the Project area; S3B	Willow and cottonwood riparian forests
Reptiles and Amphibians of Conservation Concern		
Common sagebrush lizard (*Sceloporus graciosus*)	Potentially present throughout Project area; S3	Sagebrush and grassland communities and open juniper and ponderosa pine forests
Smooth greensnake (*Liochlorophis vernalis*)	Known only from Daniels, Roosevelt, and Sheridan counties: alternate routes could include occupied habitat; S2	Grasslands, wetlands, and fringes of woodlands.

Sources: Adams 2003, BLM 2009, Lenard et al. 2003, Maxell et al. 2003, Werner et al. 2004, Foresman 2001, MNHP 2009a, MNHP and MFWP 2009, Reichel and Flath 1995, van Zyll de Jong 1985.

[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)
S1 – Critically imperiled
S2 – Imperiled because of rarity or factors that make it vulnerable to extinction
S3 – Rare, uncommon, or threatened, but not immediately imperiled
B – Breeding

Grassland Birds

Bobolink

The bobolink (*Dolichonyx oryzivorus*) is a bird of native and agricultural grasslands that prefers areas of dense, relatively tall grass with intermediate amounts of litter; including hayfields, wet meadows, and abandoned cropland (Ehrlich et al. 1988, MNHP 2009a). Nests are well concealed on the ground in dense cover. Diet consists of seeds, insects and insect larvae (MNHP 2009a). The breeding distribution of this bird in Montana includes grassland habitats across the entire state.

Grasshopper Sparrow

Grasshopper sparrows (*Ammodramus savannarum*) prefer open prairies with intermittent brush and patches of bare ground, including grassland, cultivated fields, old fields, and open savanna (Ehrlich et al. 1988, MNHP 2009a). Nests are on the ground, usually in a depression, and concealed by overhanging vegetation (Ehrlich et al. 1988). Diet consists primarily of insects during summer and invertebrates, grasses, and seeds during winter (MNHP 2009a). This bird is distributed across Montana.

Wetland and Water Birds

American White Pelican

American white pelicans nest and forage in aquatic and wetland habitats, including rivers, lakes, reservoirs, and marshes. They are colonial nesters with four nesting colonies in Montana, including a colony on Medicine Lake in the vicinity of the proposed Project. Nesting colonies usually are on islands, where they are isolated from mammalian predators. Pelican nesting colonies in Montana are shared with double-crested cormorants (*Phalacrocorax auritus*) and California gulls (*Larus californicus*) (MNHP 2009a).

Horned Grebe

The predicted breeding range of horned grebe (*Podiceps auritus*) in Montana includes areas in the vicinity of the Project north of the Missouri River (MNHP 2009a). Confirmed or suspected breeding has been recorded for Phillips, Roosevelt, Valley, and Sheridan counties (MNHP 2009a). Breeding habitat includes shallow freshwater ponds and marshes with beds of emergent vegetation (Stedman 2000).

Black-necked Stilt

The black-necked stilt (*Himantopus mexicanus*) is a large shorebird, associated with wetlands. In Montana, stilts nest on medium to large wetland complexes with open marshes and meadows, often in alkali areas (MNHP 2009a). They forage in shallow water, feeding on invertebrates and small fish (Robinson et al. 1999). Breeding has been documented at Bowdoin National Wildlife Refuge in Phillips County (MNHP 2009a).

Black-crowned Night Heron

The black-crowned night-heron, a colonial nester, occupies shallow marshes and other wetlands for breeding and foraging. There are over 30 known nesting locations in Montana. This bird often nests on islands that may afford them protection from predators, and often nests in association with the white-faced ibis (*Plegadis chihi*) and Franklin's gull (*Larus pipixcan*) (MNHP 2009a).

Great Blue Heron

Great blue herons (*Ardea herodias*) nest primarily in cottonwoods in riparian zones, but also use drier, coniferous sites. They are widespread in the vicinity of the proposed route and forage in streams, lakes, marshes, and other wetlands. Great blue herons generally nest in the largest available trees.

American Bittern

The American bittern (*Botaurus lentiginosus*) is a secretive marsh-dwelling heron with an estimated breeding distribution across Montana, although records are sparse (MNHP 2009a). Most breeding records are from the northern portion of Montana and within managed wetlands, such as wildlife refuges (MNHP 2009a). Breeding habitat is freshwater wetlands with tall, emergent vegetation, and to a lesser extent sparsely vegetated wetlands. The diet of bitterns includes insects, amphibians, fish, crayfish, and small mammals.

Caspian Tern

Caspian terns (*Hydroprogne caspia*) are migratory and begin arriving in Montana from late April to mid-May. Limited breeding has been documented in Montana, where they may occasionally nest on the same island as double-crested cormorants. The Caspian tern nests at about 10 locations in Montana, including islands in Fort Peck Reservoir and Medicine Lake National Wildlife Refuge in the vicinity of the proposed Project.

Common Tern

Common terns (*Sterna hirundo*) are colonial nesters, generally nesting on sparsely vegetated islands in large bodies of water, such as Medicine Lake National Wildlife Refuge. Nesting habitat includes sandy, pebbly, or stony substrate with emergent vegetation covering more than 25 percent of the shoreline.

Forster's Tern

Forster's tern (*Sterna forsteri* breeds in large marshes, often greater than 100 acres and usually with substantial amounts of open water and large stands of dense emergent vegetation (MNHP 2009a). Nests are deeply hollowed, compactly woven platforms on floating mats of vegetation or on clumps of vegetation close to open water. Sometimes nests may consist of an unlined scrape in mud or sand (Ehrlich et al. 1988). Diet consists of insects, fish, and frogs (Ehrlich et al. 1988).

Forest Birds

Pinyon Jay

Pinyon jays (*Gymnorhinus cyanocephalus*) are sporadically present in open woodlands and prairies in eastern Montana year-round, although there is limited evidence of breeding in the vicinity of the Project (Lenard et al. 2003). They breed and roost in colonies usually in juniper or pine trees (Ehrlich et al. 1988).

Veery

The veery (*Catharus fuscescens*) inhabits damp, deciduous forests and riparian habitats and prefers forest with denser understory (Moskoff 2005). It also may use shrubby habitats with small trees.

The veery forages on the ground, consuming insects and fruit, and nests on or near the ground (Moskoff 2005). The veery has a statewide predicted distribution (MNHP 2009a); its occurrence in eastern Montana would be limited to riparian habitats.

Black-billed Cuckoo

The black-billed cuckoo (*Coccyzus erythropthalmus*) prefers thick-forested areas, usually near water. Although nesting has not been documented in the vicinity of the Project, evidence of nesting in counties crossed by the proposed route has been reported (MNHP 2009a).

Yellow-billed Cuckoo

Yellow-billed cuckoo (*Coccyzus americanus*) breeding habitat includes open woodland with thick undergrowth and deciduous riparian woodland, where yellow-billed cuckoos often nest in cottonwood and willow communities. The western subspecies of the yellow-billed cuckoo requires patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory (MNHP 2009a). There is no direct evidence of breeding in Montana in publicly available records; however, observed breeding behavior indirectly suggests that nesting may occur in Montana.

Bats

Eastern Red Bat

The eastern red bat (*Lasiurus borealis*) is distributed from southern Canada southward throughout the continental U.S., Central America, and most of South America (Foresman 2001). Red bats are expected to occur throughout eastern Montana (MNHP 2009a). They are solitary and roost in foliage, most often along forest edges where they feed primarily on large insects near the top of the tree canopy (Foresman 2001).

Hoary Bat

The hoary bat (*Lasiurus cinereus*), a summer resident in Montana, is a tree species that roosts in foliage (Foresman 2001). The distribution of hoary bat includes the entire continental United States. The hoary bat is solitary during the breeding season, but concentrations may form during migration (van Zyll de Jong 1985). Most hoary bats are thought to winter in the southern United States and Mexico.

Shrews

Arctic Shrew

The arctic shrew (*Sorex arcticus*) is distributed across Canada from the southern Yukon southward through British Columbia to Nova Scotia (Foresman 2001). Southern range extensions occur in North and South Dakota and eastward through Michigan. In Montana, the arctic shrew has been collected at Medicine Lake National Wildlife Refuge (Sheridan County). This shrew appears to prefer moist sites, such as wet meadows, swamps, and marshes, but has been observed on sandy flats of floodplains (MNHP 2009a). Arctic shrews are often sympatric with masked shrews (*Sorex cinereus*) (Foresman 2001), and they likely feed primarily on insects and other invertebrates similar to other shrews.

Dwarf Shrew

The dwarf shrew (*Sorex nanus*) is distributed through north-central Montana, southward through Wyoming, Utah, Colorado, New Mexico, and Arizona, and eastward into southwestern South Dakota (Foresman 2001). The predicted distribution in Montana includes eastern Montana, south of the Missouri River. The dwarf shrew is found in a variety of habitats including rocky areas, meadows in alpine tundra and subalpine coniferous forest, rocky slopes and meadows in lower-elevation forest with a mixed shrub component, sedge marsh, subalpine meadow, arid sagebrush slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland (MNHP 2009a). While little is known of the food habits of dwarf shrew in the wild, in captivity they feed on vertebrate carcasses, as well as spiders and insects.

Merriam's Shrew

The distribution of Merriam's shrew (*Sorex merriami*) is not well known, but it has been collected in the Great Basin, Columbia Plateau, and parts of the Great Plains and southeastern Rocky Mountains (Foresman 2001). Merriam's shrews have been documented in several central and eastern Montana counties, including Phillips, McCone, and Prairie counties where they were found in dry sagebrush or sagebrush-grassland habitats. They feed primarily on caterpillars, beetles, and crickets.

Preble's Shrew

The Preble's (*Sorex preblei*) shrew occurs from eastern Washington to eastern Montana and southward to northeastern California, northern Nevada, Utah, and southwestern Wyoming (Foresman 2001). Specimens have been collected sporadically across Montana, and occurrence has been documented in Valley and Dawson counties. This shrew appears to prefer arid and semi-arid grass and sagebrush habitats in Montana, sometimes in openings surrounded by subalpine coniferous forest. Food habits are probably similar to other shrews, consisting mostly of insects and small invertebrates (MNHP 2009a).

Reptiles

Common Sagebrush Lizard

Common sagebrush lizards occur throughout the western United States. In Montana, they are present in the lower Missouri River basin and lower Yellowstone basin (Werner et al. 2004). This lizard occurs in sagebrush-steppe habitats, sometimes in the presence of sedimentary rock outcrops (limestone and sandstone), and in areas with open stands of limber pine (*Pinus flexilis*) and Utah juniper (*Juniperus osteosperma*) (MNHP 2009a).

Smooth Greensnake

The smooth greensnake (*Liochlorophis vernalis*)has the most restricted distribution of any snake occurring in Montana, and it is known only from Daniels, Roosevelt, and Sheridan counties. Very little is known about its breeding biology and general ecology in Montana (Werner et al. 2004). Habitat used by the smooth greensnake includes grasslands, wetlands, and fringes of wooded areas.

I-3.4.2 Potential Impacts and Mitigation

Potential impacts of the Project on wildlife and wildlife habitats are described in Section 3.6.2 of the main body of the EIS along with the procedures Keystone would incorporate into the Project to minimize impacts. Those procedures are described in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented in Attachment 1 of this appendix).

The proposed Project would result in loss, alteration, and fragmentation of wildlife habitat used for hiding, foraging, breeding, nesting, and thermal cover. Construction would directly remove or degrade habitat, and wildlife dependent on the lost habitat would die or be displaced to adjacent habitats. Depending on variables such as species, behavior, density, and habitat, adjacent wildlife populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

In addition to direct loss of habitat, some wildlife would be displaced from adjacent habitats during construction due to the increase in human activity and noise associated with construction. Wildlife vary in their response to noise and human activities. Wildlife that may be most sensitive to displacement during construction activities are breeding birds, including nesting raptors (e.g., red-tailed hawk) and greater sage-grouse and sharp-tailed grouse that are on leks.

Construction activities could result in direct mortality to some wildlife with limited mobility such as mice, voles, reptiles, amphibians, and young birds if they are present within the construction ROW during the active construction period. More mobile species such as swift fox and adult birds would move into adjacent habitats. There is a potential for the loss of migratory birds or their nests where construction occurs through native prairie, rangelands, CRP fields, pastures, and riparian areas during the nesting season. Losses could be minimized by timing construction to avoid the period when birds are nesting and rearing young (May 1 through mid-August) or by avoiding known nest sites; however, it may not be practicable to entirely avoid impacts to all migratory birds. According to Executive Order 13186 (Protection of Migratory Birds), adverse effects on migratory birds and their habitats must be minimized to the extent practicable and should include restoration and enhancement of habitat, development and implementation of migratory bird conservation plans, and other measures to minimize mortality to migratory birds. Increased traffic during construction would result in slight increases in direct wildlife mortality from vehicle-wildlife collisions.

The construction of new roads, upgrading of existing roads, and the use of those roads generally result in adverse impacts to a wide range of wildlife (Madson 2006, Montana Board of Oil and Gas Conservation [MBOGC] 1989, Wyoming Game and Fish Department [WYG&F] 2004), including elk and deer (Canfield et al. 1999), carnivores (Claar et al. 1999), small mammals (Hickman et al. 1999), birds (Hamann et al. 1999), and amphibians and reptiles (Maxell and Hokit 1999). In addition to the direct loss of habitat, negative impacts from roads include direct mortality from vehicle-animal collisions, legal and illegal killing of wildlife, displacement of wildlife, increased stress, and fragmentation of habitat. In Montana, Keystone would use existing public and private access roads to the extent possible and all except three access roads would be temporary (i.e., used only during construction). After construction, the new, temporary access roads would be restored in accordance with the Keystone CMR Plan. As a result, the increased presence and use of roads would primarily occur during construction and would result primarily in a temporary and minor impact on wildlife in Montana.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase in soil temperatures at the soil surface over the pipeline of from 5 to 8 ˚F in Montana from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the Project would cause increases in soil temperature over the pipeline of from 5 to 12 ˚F, with the largest increases during March and April in Montana. The heat generated by the pipeline would warm the soils up to 11 feet from the centerline of the pipeline. Slight increases in soil temperatures could result in earlier plant growth in spring and increased moisture stress to vegetation during the growing season. The vegetation community composition and seasonal development sequence of vegetation on the ROW along the ROW, and consequently, available habitat for wildlife, could be altered by these changes in soil temperatures.

Total wildlife habitat loss due to construction would be small in the context of available habitat and because Keystone would restore the ROW after construction in accordance with its CMR Plan. However, the effects of habitat loss on wildlife depend on the amount, quality, and spatial arrangement of habitats adjacent to and near the ROW. Approximately 3,764 acres of land would be disturbed during construction (Table I-3.4-3), not including access roads. Mixed-grass prairie and sagebrush steppe cover types account for approximately 62 percent of the disturbed area. These habitats are particularly important to grassland- and sagebrush-dependent wildlife. Although riparian and wooded draw cover types comprise only 3 percent of the construction ROW, these habitats are disproportionately important to wildlife (Ohmart and Anderson 1986). Agricultural crop and hay lands account for 27 percent of the construction ROW. Agricultural lands provide habitat for a variety of generalist animals and animals adapted to disturbed conditions such as mule deer, white-tailed deer, red fox, raccoon, common raven, and gray partridge.

TABLE I-3.4-3
Estimated Montana Wildlife Habitat Impacted by the Proposed Project in Montana

Cover Type	Length Through Cover Type (miles)	Area in Construction ROW (acres)[1]	Percent of Area in Construction ROW[1]
Open water	0.3	4.0	0.1
Developed land (e.g., roads, buildings, cleared areas)	3.3	44.0	1.2
Agricultural (crop and hay lands	74.8	997.3	26.5
Wetlands	0.2	2.7	0.1
Riparian	7.5	100.0	2.6
Wooded draws	1.9	25.3	0.7
Badlands	14.5	193.3	5.1
Native range (mixed-grass prairie)	145.1	1,934.70	51.4
Sagebrush steppe	32.1	428.0	11.4
Greasewood flats	1.0	13.3	0.3
Conifer forest	1.8	24.0	0.6
Total	282.5	3,766.6	100.0

Source: MNHP 2009b database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix.
[1]Acreage based on a construction ROW width of 110 feet.

Habitat loss, alteration, and fragmentation would occur until vegetation is reestablished; however, the habitat may remain degraded after revegetation due to maintenance of the permanent ROW, and the spread of noxious and invasive weeds. For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats in the 30-foot-wide maintained portion of the permanent ROW would last for the life of the Project since that area would be maintained free of trees and large shrubs. In the portion of the construction ROW outside of the maintained ROW, the loss would be long term because trees and shrubs would require from 5 to 30 years or more to reestablish.

Loss of shrublands would be long term (from 5 to 30 years or longer) within reclaimed areas of the construction ROW. While reclamation would reestablish vegetation on the ROW, it is likely that some areas dominated by native species would be converted to non-native species. Such conversion would likely reduce the value of the habitat for wildlife. If disturbances removed important habitats (nesting habitat), habitat loss and displacement could affect local and regional sagebrush-dependent species.

Construction, including establishment of new access roads, would increase habitat fragmentation by reducing the size of contiguous patches of habitat and through loss of habitat or changes in habitat structure. Habitat fragmentation effects are discussed in general and as they relate to specific types of wildlife within Section 3.6.2 of the EIS. Fragmentation effects are most important relative to cumulative impacts and are discussed in the Cumulative Impacts section of the EIS (Section 3.14).

Construction through native grassland and shrub communities would remove vegetation including sagebrush and native grasses, temporarily creating an unvegetated strip along much of the construction ROW. Subsequent revegetation may not provide habitat features comparable to pre-Project conditions. Typically, seed mixes for reclamation include non-native species that quickly become established. Sagebrush often does not quickly become established on ROWs and other disturbed sites, especially if these sites are seeded with grasses and other species that more rapidly germinate and grow. Maintenance of the permanent ROW would include removal of trees and shrubs; however, Keystone would allow sagebrush up to 2 feet in height to grow along the permanent ROW.

After revegetation of the ROW, seeded grasses would become attractive to livestock and wildlife. Cattle, sheep, and horses often graze more intensively on newly reclaimed areas than on adjacent rangeland. Livestock access to the ROW prior to development of a self-sustaining vegetation cover would inhibit successful reclamation of productive wildlife habitat, thereby extending the time required for habitat linkages to re-establish across the ROW.

Removal of vegetation from the ROW would also increase the potential for noxious weeds and other invasive species to colonize. Noxious weeds and other undesirable plants could then spread onto adjacent habitats not directly disturbed by construction. Noxious weeds can displace native plant species important to wildlife and degrade overall habitat values. However, to minimize the spread of noxious weeds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications. Therefore, as described in Section 3.5 of the EIS and in Section I-3.3 of this appendix, the impact of the spread of noxious weeds into adjacent habitats due to construction of the proposed Project is expected to be minor.

During construction, pipelines can present a significant temporary barrier to wildlife movement. An open trench and welded pipe not yet buried can prevent movement across the ROW. To minimize impacts to wildlife movements due to the presence of an open trench during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) in the trench to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that may fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. As a result, the impact on wildlife, including small mammals, amphibians, and reptiles, would be temporary and likely minor unless construction coincided with migratory movements. To further reduce that impact, the following mitigation method was recommended by several agencies:

- During construction, when trenches are open, conduct daily inspections to locate and remove animals that have been trapped in the open trench.

During operation in Montana, Keystone would use existing roads for most access to the permanent ROW and would maintain only three new access roads for the life of the Project. There would be occasional use of the new permanent access roads and the existing access roads and occasional human activity along the permanent ROW as a part of maintenance activities. In addition, although the permanent ROW would not have an associated access road, off-road vehicle users may travel on it in some areas; such use would not be legal without permission from Keystone and the property owner. The increased human access to those areas could increase displacement of wildlife that is sensitive to human presence. Further, increased access to land via the permanent ROW could increase hunting mortality on local game populations, although all hunting would be subject to rules and regulations administered by the state. Because there is not expected to be a substantial increase in human activity associated with the ROW in Montana, impacts to wildlife are expected to be minor but would last for the life of the Project.

Normal operation of the Project would result in minor effects on wildlife. Direct impacts from maintenance activities, such as ROW maintenance or pipeline repair that would require excavating the pipeline, would be the same as those for construction but would affect a small area. The expected increase in wildlife-vehicle collisions due to use of the new and existing access roads would be negligible, and the impact on wildlife in adjacent areas due to the presence of the new roads and use of those roads and the existing access roads would be minor but would last for the life of the Project. During operation, burrowing animals may be attracted by the warmth generated by the pipeline, especially during winter. Migratory waterfowl may be attracted to the permanent ROW during early spring if it becomes snow-free earlier than surrounding habitats. Changes from surrounding soil temperature at the ground surface would be most noticeable during spring. Operation of the pipeline would increase soil temperatures at depths near the pipeline by as much as 40 °F, and by as much as 10 to 15 °F at a depth of 6 inches; soil temperatures at the surface may increase by 4 to 8 °F during the spring (Keystone 2009).

I-3.4.2.1 Deer and Pronghorn Winter Range

Winter range is particularly important for ungulates (mule deer, white-tailed deer, and pronghorn) because of the lack of high-quality forage in winter, cold temperatures, and the increased energy demand. Depending on winter conditions, ungulates in the vicinity of the proposed route could be susceptible to adverse effects of construction and maintenance of the permanent ROW across winter ranges. Table I-3.4-4 presents the locations where the route would cross the winter ranges for these animals. In Montana, the route would cross a total of about 49.9 miles of white-tailed deer winter range in 11 locations, 119.4 miles of mule deer winter range in 19 locations, and 80.2 miles of pronghorn winter range in 14 locations.

TABLE I-3.4-4
Montana Winter Ranges for White-tailed Deer, Mule Deer, and Pronghorn Crossed by the Project

Range Type	Location		Total Length Crossed (miles)	Acreage Affected During Construction[1]
	Beginning Milepost	Ending Milepost		
White-tailed deer winter range	54.38	57.42	3.0	40.5
	65.77	68.17	2.4	32
	79.79	84.92	5.1	68.4
	87.31	91.03	3.7	49.6
	121.3	124.35	3.1	40.7
	137.73	142.86	5.1	68.4
	152.97	171.01	18.0	240.5

TABLE I-3.4-4 Montana Winter Ranges for White-tailed Deer, Mule Deer, and Pronghorn Crossed by the Project				
Range Type	Location		Total Length Crossed (miles)	Acreage Affected During Construction[1]
	Beginning Milepost	Ending Milepost		
	193.56	196.93	3.4	44.9
	244.51	247.23	2.7	36.3
	248.48	248.57	0.1	1.2
	279.12	282.28	3.2	42.1
Total			49.9	664.7
Mule deer winter range	9.13	28.2	19.03	253.7
	28.44	29.7	1.3	17.3
	32.81	33.8	1.0	13.6
	34.29	35.2	0.9	11.8
	35.77	36.6	0.8	10.4
	37.25	65.8	28.5	380.3
	66.96	67.0	0.1	1.1
	88.54	89.4	0.8	11.1
	89.72	130.9	40.5	539.5
	131.44	131.7	0.3	3.6
	152.97	161.9	8.9	118.8
	202.92	204.2	1.2	16.4
	211.98	225.7	13.2	175.7
	244.51	247.2	2.7	36.3
	248.48	248.6	0.1	1.2
	256.71	259.9	3.2	42.8
	260.95	264.8	3.8	50.9
	269.02	280.2	11.2	148.8
	280.69	281.6	0.1	12
Total			119.4	1,845.3
Pronghorn winter range	11.39	12.38	1.0	13.2
	12.68	13.82	1.1	15.2
	14.08	20.27	6.2	82.5
	21.55	26.85	5.3	70.7
	38.75	65.77	27.0	360.3
	74.63	82.67	8.0	107.2
	83.73	83.74	0.0	0.1
	111.66	129	17.3	231.2

TABLE I-3.4-4 Montana Winter Ranges for White-tailed Deer, Mule Deer, and Pronghorn Crossed by the Project				
Range Type	Location		Total Length Crossed (miles)	Acreage Affected During Construction[1]
	Beginning Milepost	Ending Milepost		
	162.17	163.12	0.1	12.7
	163.91	164.33	0.4	5.6
	219.19	219.49	0.3	4
	254.97	255.69	0.7	9.6
	258.25	258.89	0.6	8.5
	267.97	280.18	12.2	162.8
Total			80.2	1,083.6

Source: MFWP 2009b.
[1] Acreage based on a ROW width of 110 feet.

I-3.4.2.2 Prairie Grouse

Greater Sage-Grouse

Approximately 190 miles of the proposed route extend through areas with sage-grouse habitat (MFWP 2001a). Of this distance, 94 miles are classified as moderate to high-quality habitat and 96 miles are classified as marginal habitat for greater sage-grouse. MFWP (2009b) has mapped core sage-grouse habitat[7] in Montana, where sage-grouse densities are highest and/or where leks and associated sage-grouse habitat occur. The proposed route would pass through approximately 20 miles of core sage-grouse habitat. One 2.75-mile-long permanent access road and one pump station would also be constructed within core sage-grouse habitat.

The revised Montana GAP[8] vegetation data indicate that the proposed route would cross approximately 34 miles of sagebrush steppe habitat in Montana, with the potential for directly removing 446 acres of this habitat and indirectly affecting a larger buffer area around sage-grouse leks (Table I-3.4-5). The route would also cross within 1 mile of at least 5 greater sage-grouse leks and within 4 miles of at least 36 greater sage-grouse leks in Montana. Using a 4-mile buffer around only the known greater sage-grouse leks that occur within 4 miles of the route, the proposed Project route would cross approximately 111.7 miles of greater sage-grouse buffer zone in 9 locations (Table I-3.4-5).

---

[7] MFWP (2009b) indicates that sage-grouse core areas are habitats associated with (1) Montana's highest densities of sage-grouse (25 percent quartile), based on male counts, and/or (2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution. The data are intended for display of sage grouse core areas in Montana and initial resource review and conservation planning.
[8] The Gap Analysis Program, or GAP, is a scientific program intended to identify species that are not adequately represented on existing conservation lands. For this EIS, information was used from the recently updated ecological land cover mapping developed as a part of the Gap Analysis.

TABLE I-3.4-5 Greater Sage-Grouse Lek 4-Mile Buffer Zones Crossed by the Project in Montana			
Location by Milepost		**Buffer Zone Length Crossed (miles)**	**Buffer Zone Acreage Affected During Construction[1]**
Beginning Milepost	**Ending Milepost**		
17.0	25.3	8.3	111.3
43.2	49.9	6.7	89.8
50.2	61.8	11.6	155.4
67.1	72.1	5.0	66.6
87.7	121.9	34.2	455.4
207.7	220.0	12.3	164.4
229.3	243.6	14.3	191.3
247.1	264.5	17.4	232.1
280.4	282.3	1.9	26.0
Totals	**9 locations**	**111.7**	**1,492.3**

Source: MFWP 2009a, 2009b, 2009c.
[1] Acreage based on a ROW width of 110 feet.

Studies of the effects of energy development on greater sage-grouse indicate a variety of adverse impacts to sage-grouse from sources of disturbance, such as construction and operation of facilities, road construction and use, and development of transmission lines (Naugle et al. 2009). However, many studies evaluated impacts resulting from different and higher-density types of disturbance and development than the proposed Project (i.e., a single pipeline as compared to oil and gas field developments). Although similar types of impacts would be expected to result from construction of the Project, the magnitude would be expected to be different.

Sage-grouse would be especially vulnerable to pipeline construction activities in spring when birds are concentrated on strutting grounds (leks) and where the pipeline and access roads are constructed through sagebrush communities with leks and nesting sage-grouse. Partial field surveys and public databases indicate that at least 36 known sage-grouse leks are present within 4 miles of the proposed route, and at least 5 leks are present within 1 mile of the route (MFWP 2009a, 2009b, and 2009c). Construction near leks could displace breeding birds from leks or disturb nests, resulting in a decrease in local reproduction. Traffic on roads near active leks could cause vehicle collision mortality.

Disruption of courtship and breeding behavior could be minimized by scheduling construction after birds have left the leks (usually by mid May). Mortality to sage-grouse and loss of nests, eggs, and young could be avoided by scheduling construction through occupied sagebrush steppe habitats after young sage-grouse have become mobile and are able to fly (usually by mid-August). Sage-grouse chicks are precocious and capable of leaving the nest immediately after hatching, but they are not sufficiently mobile to avoid construction related impacts until after they can fly.

After construction, reestablishment of sagebrush on the ROW may take 30 or more years. During this period, vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush have proven difficult to reestablish on reclaimed lands (Schuman and Booth 1998, Vicklund et al. 2004). Growth of big sagebrush on reclaimed land has been shown to benefit from the application of mulch, compacting soil after seeding, and reduced competition with herbaceous species (lower seeding rate of grasses and forbs) (Schuman and Booth

1998). Management of a 30-foot-wide area of the permanent ROW to prevent shrub and tree growth could prevent reestablishment of sagebrush communities for at least the life of the Project. A maintained path over the pipeline that is free of shrubs could facilitate predator movement along the ROW and increase predation risk for grouse nesting or foraging on or near the ROW. Maintenance of the ROW and the three new permanent access roads may also encourage recreational use of the ROW. Recreational use (motorized vehicles, wildlife viewing, etc.) of the area during the breeding season could have an adverse effect on sage-grouse reproduction.

In Montana, the new permanent access roads would be constructed within 4 miles of at least 3 greater sage-grouse leks; 1 new access road would be constructed within 2 miles of at least 1 greater sage-grouse lek. The 4-mile distance from the 6 new pump stations would include at least 8 greater sage-grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations, and since the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sage-grouse leks.

If construction and future activities and use were to disturb the 36 or more leks and associated nesting habitat near the ROW during the breeding season, local and regional populations of greater sage-grouse could decline. Limiting construction to periods outside the breeding season would protect nesting grouse and offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the Project on greater sage-grouse. These measures are summarized below and are included in the MDEQ Environmental Specifications for the Project (see Attachment 1 to this appendix), along with other mitigation measures.

- Conduct surveys of greater sage-grouse leks prior to construction using appropriate methods to detect leks within 4 miles of the edge of the construction ROW;
- Avoid construction within 4 miles of active greater sage-grouse leks from March 1 to June 15;
- Contact BLM and MFWP to determine what mitigation measures are needed for a lek found within the construction ROW;
- Implement reclamation measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeded rates for non-native grasses and forbs) that favor the establishment of big sagebrush in disturbed areas where compatible with the surrounding land use and habitats;
- Prior to construction, conduct studies along the route to identify areas that support stands of big sagebrush and silver sagebrush and incorporate these data into reclamation activities to prioritize reestablishment of sagebrush communities;
- Monitor establishment of sagebrush on reclaimed areas annually for at least 4 years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities and implement additional seeding or plantings of sagebrush if necessary;
- Establish criteria to determine when reclamation of sagebrush communities has been successful based on reference communities that provide suitable habitat for greater sage-grouse with optimum sagebrush densities greater than 4,000 plants per hectare (as recommended in Pyke 2009);
- Use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed;
- Where facilities would permanently remove sagebrush communities, implement compensatory mitigation nearby to restore, enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species;

- Monitor densities of native forbs and perennial grasses on reclaimed areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities;
- Restrict or appropriately manage livestock grazing of reclaimed areas until successful reclamation of sagebrush communities has been achieved as described above (i.e., at least 4 years of restrictions); and
- Implement measures to prevent colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass (*Bromus tectorum*).

With incorporation of the Keystone CMR Plan and the mitigation measures described above, construction and operation of the Project would not likely affect greater sage-grouse courtship activities on leks and would likely result in a minor impact on nesting birds. However, construction would likely result in an incremental loss of big sagebrush habitat that is currently used for foraging and nesting by greater sage-grouse for 30 years or longer.

Sharp-Tailed Grouse

The proposed route crosses approximately 55.8 miles of sharp-tailed grouse habitat (Table I-3.4-6). Effects to sharp-tailed grouse resulting from disturbance due to construction and maintenance activities would be similar to those described for the greater sage-grouse. Although energy development has been occurring in the Great Plains, the effects of this development on sharp-tailed grouse have received little attention. One short-term study in the Little Missouri Grasslands of North Dakota (Williams 2009) found no differences in reproductive success due to oil and gas development; however, that same study recommended protecting leks and surrounding habitats, since leks are the focal point for reproduction.

In Montana, the 3 new permanent access roads would be constructed within 4 miles of at least 6 sharp-tailed grouse leks; 1 of the new access roads would be constructed within 1 mile of at least 1 sharp-tailed grouse lek. The 4-mile distance from the six new pump stations would include at least 7 sharp-tailed grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations, and since the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sharp-tailed grouse leks.

Disturbance of leks and nesting habitat may result in reduced reproduction of sharp-tailed grouse present in the vicinity of the ROW. At least 8 known sharp-tailed grouse leks are within 1 mile of the proposed route and at least 19 leks are within 2 miles of the route (Table I-3.4-6). However, MFWP has not monitored or surveyed sharp-tailed grouse leks as intensively as greater sage-grouse leks. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the route in Montana) and identified 16 new sharp-tailed grouse leks near the ROW (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009). It is likely that more sharp-tailed grouse leks are present near the ROW and some may be within 2 miles of the proposed route.

Sharp-tailed grouse have broader habitat tolerances than do sage-grouse (Connelly et al. 1998, Schroeder et al. 2004); consequently, effects to sharp-tailed grouse from habitat loss and alteration are expected to be minor, and reclaimed grassland and grassland-shrub habitats would likely provide suitable habitat for sharp-tailed grouse. The maintained ROW could attract recreational use (motorized vehicles, wildlife viewing, and photography); increased recreational use during the breeding season could reduce local sharp-tailed grouse reproduction. The maintained ROW may also facilitate predator movement along the ROW, increasing predation risk for sharp-tailed grouse nesting or foraging on or near the ROW.

TABLE I-3.4-6 Sharp-tailed Grouse Lek 2-Mile Buffer Zones Crossed by the Project in Montana			
Location by Milepost		Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected During Construction[1]
Beginning Milepost	Ending Milepost		
49.6	65.0	15.4	71.6
94.6	110.8	16.2	216.1
159.2	160.5	1.3	17.3
175.9	181.8	5.9	78.8
188.1	190.3	2.2	28.7
209.5	213.2	3.7	49.2
213.3	217.7	4.4	58.4
229.7	233.5	3.8	50.7
254.7	257.6	2.9	38.3
Totals	9 locations	55.8	609.1

Source: MFWP 2009a, 2009b, 2009c.
[1] Based on a ROW width of 110 feet.

If construction and future activities and use were to disturb the 19 or more leks and associated nesting habitat near the ROW during the breeding season, local populations of sharp-tailed grouse could decline. Limiting construction activities to periods outside the breeding season would protect nesting grouse and offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the Project on sharp-tailed grouse. Those measures include the mitigation measures identified for the greater sage-grouse above (except for the surveys and construction restrictions specific to greater sage-grouse) as well as the additional measures summarized below and presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix).

- Conduct surveys of sharp-tailed grouse leks prior to construction using appropriate methods to detect leks within 2 miles of the edge of the construction ROW; and
- Avoid construction within 2 miles of active sharp-tailed grouse leks from March 1 to June 15.

With incorporation of the Keystone CMR Plan into the Project and implementation of the mitigation measures described above, construction and operation of the Project would not likely affect sharp-tailed grouse courtship activities on leks and would have a minor impact on nesting birds. However, construction may result in subtle fragmentation effects that could affect individual grouse (e.g., increased risk of predation) in areas next to the maintained ROW.

I-3.4.2.3 Special Status Wildlife

The impacts of the proposed Project in Montana on species of concern are discussed by the following groups that were established based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles.

Grassland Birds

Grassland bird populations in the Great Plains have declined in abundance primarily due to loss of habitat (Madden et al. 2000). Breeding bird surveys indicate that almost 70 percent of the 29 grassland-dependent birds have negative population trends (U.S. Department of the Interior 1996). Grassland birds of concern that would be affected by habitat losses associated with construction include the bobolink and grasshopper sparrow.

The route would cross approximately 145.1 miles of mixed-grass prairie habitat (Table I-3.4-3). If construction were to take place during the nesting and brood-rearing period, some mortality to birds of concern would likely occur. Fragmentation of grassland habitats could increase mortality risk to grasslands birds from predation and nest parasitism by brown-headed cowbirds. Grasslands in the vicinity of the proposed route vary in plant composition and structural features. Madden et al. (2000) indicate that a mosaic of successional types is necessary to maximize diversity of grassland birds. It is likely that the post-construction vegetation within the restored ROW would initially be less diverse than adjacent undisturbed grassland habitats. Some grassland birds would adapt to the reclaimed vegetation while others may be displaced by the vegetation change. Construction could destroy bobolink and grasshopper sparrow nests if they are present within the construction ROW. Construction would also result in a short-term to long-term loss and long-term alteration of native grassland habitat used for foraging and nesting by these species.

Although no specific mitigation measures have been proposed for the bobolink and grasshopper sparrow, Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit the bobolink and grasshopper sparrow. The impact of the proposed Project on these grassland birds is expected to be short term and potentially moderate in magnitude for direct construction-related impacts and long term in duration and minor to moderate in magnitude for habitat-related impacts.

Wetland and Water Birds

The proposed route would cross about 5.3 miles of wetlands and riparian forests (see Section I-3.2) and about 3.3 miles of riverine and open water habitats (see Section 3.4 of the EIS). Montana birds of concern associated with large wetland complexes and water bodies discussed in this section include the American bittern, American white pelican, black-crowned night heron, black-necked stilt, Caspian tern, common tern, Forster's tern, great blue heron, and horned grebe. No large wetlands or water bodies that provide nesting habitat for these species would be directly affected by construction. The great blue heron is a colonial nester in cottonwood forests along major perennial streams and no nesting colonies were documented along the proposed route; however, potential heron nesting habitat may be present within 0.9 mile of forested wetlands that would be crossed by the route. The American white pelican, Caspian tern, common tern, and Forster's tern also are colonial nesters, nesting in water bodies and wetlands, often on islands. Several of these species forage widely in the vicinity of the proposed route (e.g., great blue heron and white pelican).

Avoidance and mitigation measures to reduce impacts to wetlands would minimize adverse effects to these species. Many of these sensitive water birds nest colonially on large wetland complexes with open water. There are no large wetland complexes that would be crossed by the route. Risk to these wetland and water birds is relatively small as these species are most common in the northeast corner of Montana near Medicine Lake, an area that is not crossed by the proposed route. Keystone would incorporate the procedures in its CMR Plan and in the MDEQ Environmental Specifications to avoid or minimize impacts to wetlands as described in Sections 3.4 and 3.7 of the EIS, and use of the horizontal directional drilling (HDD) method of pipeline installation under large water bodies would also minimize impacts to wetland and water birds.

Although no specific mitigation measures have been proposed for wetland birds and water birds, Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit wetland birds and water birds. The impact of the proposed Project on these species is expected to be primarily short term during construction and minor in magnitude.

Forest Birds

The proposed route would cross about 11.2 miles of forested habitats (i.e., riparian, wooded draws, and conifer forest) (Table I-3.4-3). Special-status birds associated with forested habitats include the black-billed cuckoo, pinyon jay, veery, and yellow-billed cuckoo. Construction through forested habitats would remove trees and shrubs important for nesting and foraging; if construction occurs during the nesting period, eggs and young could be lost. Although riparian forest and upland wooded draws comprise a small part of the landscape, they have disproportionately large wildlife values (Ohmart and Anderson 1986, Thomas et al. 1979). Thompson (1978) found that the highest total biomass and species diversity of breeding birds in McCone County habitats in Montana was within wooded draws. Habitat impacts to forest birds would be long term because trees would not be allowed to recolonize within the maintained ROW, and the regeneration of trees within the construction ROW would require 10 to 30 years or more. Many cavity nesting birds re-use nest cavities, and displacement from occupied habitats because of the loss of nest trees may result in reduced productivity in subsequent years.

Although no specific mitigation measures have been proposed for forest birds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications to minimize impacts to forested wetlands and uplands (described in Section 3.5 of the EIS). In addition, Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit special status forest birds. The impact of the proposed Project on forest birds is expected to be moderate in magnitude and would last for at least the life of the Project.

Keystone would implement the mitigation measures in the CMR Plan that are designed to reduce the impact to wildlife. Additional mitigation measures designed to further reduce the impact to grassland, wetland, water, and forest birds were identified by agencies and tribes; those mitigation measures the DOS considers appropriate to incorporate into the proposed Project area are listed below:

- Defer activities that affect nesting habitat until after the nesting and brood-rearing period (from April 15 to July 15); and
- If construction would occur during the period from April 15 to July 15, conduct surveys for nesting migratory birds and maintain a 100-foot buffer of undisturbed vegetation around all discovered nests until the young have fledged.

Bats

Eastern red bat and hoary bat are solitary, roost in foliage, and are migratory. Concentrations of these bats may form during fall migration. No communal bat roost sites have been recorded along the proposed Project route. However, impacts to these species in the vicinity of the proposed route would result from the short-term reduction of potential foraging habitat and habitat fragmentation until reclamation is completed and native vegetation has become reestablished. The proposed route would cross about 11.2 miles of forest habitat and result in the loss of approximately 149.3 acres of forest from the construction ROW (Table I-3.4-3) and trees would be permanently removed from the 50-foot-wide permanent ROW.

Although no mitigation measures have been developed specifically for the eastern red bat or the hoary bat, the procedures Keystone would incorporate into the Project to minimize impacts to forested wetland and upland habitats and migratory birds (described above) would also benefit bats. The impact of the proposed Project on bats is expected to be moderate in magnitude and would last for at least the life of the Project.

Shrews

Little is known about specific habitat use and distribution of special status shrews in eastern Montana. If special status shrews are present in the construction ROW during construction, it is likely that they would be affected by construction activities. Impacts to the arctic shrew, dwarf shrew, Merriam's shrew, and Preble's shrew could occur during clearing prairie and shrubland vegetation and during trenching, which would collapse dens and tunnels if they are present within the construction ROW. Adults and young within the construction ROW could also be killed by excavation and vehicle traffic. On state and federal land, the construction ROW would be seeded with plants appropriate for soil and range conditions in the area, and during operation, the permanent ROW would provide suitable habitat for shrews, including uncompacted soils for dens and burrows and plants and insects for forage.

Although no specific mitigation measures have been proposed for special status shrews, the procedures Keystone would incorporate into the Project to minimize impacts to vegetation and wildlife (discussed in Sections 3.5 and 3.6 of the EIS) would benefit these shrews if they occur along the construction ROW.

Reptiles

Impacts to special status reptiles (common sagebrush lizard and smooth greensnake) would most likely occur during construction. If either of the species is present in the construction ROW during the active construction period there could be direct mortality of individuals from construction activities and vehicle traffic. These reptiles could also be trapped in open pipeline trenches. However, as noted above, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that may fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. Access roads may serve as barriers to the movement of reptiles and serve as a source of mortality during operations for reptiles (Maxell and Hokit 1999). However, Keystone would primarily use existing access roads during construction and would use all but three new access roads only during construction. Impacts also would result from the long-term reduction of suitable habitat until reclamation of the construction ROW and access roads is complete and vegetation becomes reestablished.

Common sagebrush lizards would likely occur within sagebrush steppe habitat crossed by the proposed route and would be vulnerable to direct mortality from construction activities and access road construction and use. An estimated 32.1 miles and 428 acres of sagebrush steppe habitat would be lost or altered during construction (Table I-3.4-3). This habitat loss and alteration would produce moderate and long-term impact on sagebrush habitat since this habitat would require about 20 to 50 years to fully regenerate. Although no specific mitigation measures have been proposed for the common sagebrush lizard, mitigation measures developed for conservation of sagebrush habitat and the greater sage-grouse discussed in Section 3.8 of the EIS would benefit the common sagebrush lizard. The impact of the proposed Project on this special status lizard would be moderate and would be long term to permanent (i.e., last for the life of the Project).

The known distribution of the smooth greensnake is in northeastern Montana, and therefore this species would not likely be affected by the proposed Project.

As described above, to minimize impacts Keystone would incorporate the procedures in its CMR Plan (presented in Appendix B of the EIS) and the measures presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix). As a result, the impacts to special status species are expected to be minor and temporary during construction; during operation the impacts would be minor but would last for the life of the Project.

I-3.4.3 References Cited

Adams, R.A. 2003. Bats of the Rocky Mountain West: Natural history, ecology, and conservation. University Press of Colorado. 287 pp.

Bureau of Land Management (BLM). 2009. Montana/Dakotas Special Status Species List. Instruction Memorandum No. MT-2009-039, email transmission April 24, 2009.

Canfield, J. E., L. J. Lyon, J. M. Hillis, and M. J. Thompson. 1999. Ungulates. Pages 6.1-6.25 *in* Effects of recreation on Rocky Mountain wildlife: A Review for Montana (G. Joslin and H. Youmans, coordinators). Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Claar, J. J., N. Anderson, D. Boyd, M. Cherry, B. Conard, R. Hompesch, S. Miller, G. Olson, H. Ihsle Pac, J. Waller, T. Wittinger, and H. Youmans. 1999. Carnivores. Pages 7.1– 7.63 *in* Effects of recreation on Rocky Mountain wildlife: A review for Montana (Joslin, G. and H. Youmans, coordinators). Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society.

Connelly, J.W., M.W. Gratson and K.P. Reese. 1998. Sharp-tailed Grouse (*Tympanuchus phasianellus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/354

Davis, W. November 14, 2009. Phone conversation between W. Davis, Wildlife Biologist, Region 6, Montana Fish, Wildlife & Parks, Miles City, MT and P. Feigley, Catena Consulting LLC, concerning occurrence of grouse leks along the Keystone XL preferred route.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook. Simon and Schuster/Fireside Books, New York, NY. 785 pp.

Foresman, K.R. 2001. The wild mammals of Montana. The American Society of Mammalogists, Special Publication No. 12.

Gunderson, P. November 3, 2009. Phone conversation between P. Gunderson, Director, Region 6, Montana Fish, Wildlife & Parks, Glasgow, MT and P. Feigley, Catena Consulting LLC, concerning occurrence of grouse leks along the Keystone XL preferred route.

Hamann, B., H. Johnston, P. McClelland, S. Johnson, L. Kelly and J. Gobielle. 1999. Birds. Pg. 3.1-3.34 *in* Effects of recreation on Rocky Mountain wildlife: A Review for Montana. (G. Joslin and H. Youmans, coordinators.) Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Hickman, G. R., B. G. Dixon, and J. Corn. 1999. Small Mammals. Pg. 4.1-4.16 *in* The effects of recreation on Rocky Mountain wildlife: A Review for Montana. (G. Joslin and H. Youmans, coordinators.) Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Keystone. 2009. Supplemental Filing to ER. July 6, 2009. Document No.: 10623-006. Submitted to U.S. Department of State and Bureau of Land Management by TransCanada Keystone Pipeline, L.P.

Knick, S.T. and J.W. Connelly. 2009. Greater sage-grouse and sagebrush: An introduction to the landscape. Chapter 1, in C.D. Marti (editor) Ecology and conservation of greater sage-grouse: A landscape species and its habitats. Studies in Avian Biology, Cooper Ornithological Society. Pre-publication release available online at: http://sagemap.wr.usgs.gov/ (accessed 12/8/09)

Lenard, S., J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P.D. Skaar's Montana bird distribution. Sixth Edition. Montana Audubon, Helena, Montana.

Madden, E., R. Murphy, A. Hansen, L. Murray. 2000. Models for guiding management of prairie bird habitat in northwestern North Dakota. American Midland Naturalist 144:377 -392.

Madson, C. 2006. Gasfields & wildlife: Nearly a decade of research is showing the effects of energy development on a wide variety of Wyoming's wildlife. Wyoming Wildlife. October 2006, pages 10-19. Wyoming Game and Fish Department, Cheyenne, WY.

Maxell, B. A., and D. G. Hokit. 1999. Amphibians and Reptiles. Pg 2.1-2.29 *in* Effects of recreation on Rocky Mountain wildlife: A Review for Montana. (G. Joslin and H. Youmans, coordinators.) Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Maxell, B., J.K. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana. Northwest Fauna Number 5. Society for Northwestern Vertebrate Biology. Olympia, Washington.

Montana Board of Oil and Gas Conservation (MBOGC). 1989. Programmatic environmental impact statement on oil and gas drilling & production in Montana: Technical appendix volume. Board of Oil and Gas Conservation, Helena, MT. January 1989.

Montana Fish, Wildlife & Parks (MFWP). 2001a. Digital sage grouse habitat/current distribution and metadata. Montana Fish, Wildlife & Parks, Helena, MT. Available online at <http://fwp.mt.gov/insidefwp/gis/shapefiles/sghab.shp.zip> (Accessed May 26, 2009).

MFWP. 2001b. Sharp-tailed grouse distribution and metadata. Montana Fish, Wildlife & Parks, Helena, MT. Available online at http://fwp.mt.gov/doingBusiness/reference/gisData/metadata/sharp.htm (Accessed December 8, 2009).

MFWP. 2009a. Montana fisheries information system. Available online at: http://fwp.mt.gov/fishing/mfish/ (accessed 7/16/09).

MFWP. 2009b. Montana geographic information clearinghouse. Available online at: http://nris.mt.gov/gis/; (accessed 7/16/09).

MFWP. 2009c. Untitled. Sage-grouse and Sharp-tailed Grouse Lek Locations: Spring 2009 surveys along a portion of the Keystone XL Route B. Provided December 9, 2009, by Pat Gunderson, MFWP, Region 6.

Montana Natural Heritage Program (MNHP). 2009a. Montana field guide and tracker database. Available on line at: http://mnhp.org.

MNHP. 2009b. Montana Land Cover/Land Use Theme. Based on classifications originally developed by the University of Idaho and the Montana Natural Heritage Program for the Pacific Northwest ReGAP project. Helena, Montana.

MNHP and MFWP. 2009. Montana Animal Species of Concern. Helena, MT: Montana Natural Heritage Program and Montana Department of Fish Wildlife & Parks. 17 p. Available at: http://mnhp.org. (accessed May 4, 2009).

Montana Sage Grouse Work Group (MSGWG). 2005. Management Plan and conservation Strategies for Sage Grouse in Montana - Final. Revised 2-1-2005. Available at: http://fwp.mt.gov/fwppaperapps/wildthings/SGFinalPlan.pdf

Moskoff, William. 2005. Veery. The birds of North America, Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Revised 2005. Retrieved from Birds of North America online at: http://bna.birds.cornell.edu/bna/species/142

NatureServe. 2009. NatureServe Explorer. Available online at http://www.natureserve.org/explorer/ Accessed November 2009.

Naugle, D.E., K.E. Doherty, B.L. Walker, Matthew, J. Holloran, and H.E. Copeland. 2009. Energy development and greater sage-grouse. Chapter 21, in C.D. Marti (editor) Ecology and conservation of greater sage-grouse: A landscape species and its habitats. Studies in Avian Biology, Cooper Ornithological Society. Pre-publication release available online at: http://sagemap.wr.usgs.gov/ (accessed 12/8/09)

Ohmart, R.D. and B.W. Anderson. 1986. Riparian habitats. Pages 169-199 *in* Inventory and monitoring of wildlife habitat. A.Y. Cooperrider, R.J. Boyd, and H.R. Stuart (eds). U.S. Department of Interior, Bureau of Land Management Service Center. Denver, Co. 858 pp.

Pyke, D.A. 2009. Restoring and rehabilitating sagebrush habitats. Chapter 24 In C.D. Marti (editor) Ecology and conservation of greater sage-grouse: A landscape species and its habitats. Studies in Avian Biology, Cooper Ornithological Society. Pre-publication release available online at: http://sagemap.wr.usgs.gov/ (accessed 12/8/09)

Reichel, J. and D. Flath. 1995. Identification of Montana's amphibians and reptiles. Montana Outdoors May/June. Helena, Montana.

Robinson, J.A., J.M. Reed, J.P. Skorupa, and L.W. Oring. 1999. Black-necked Stilt (Himantopus mexicanus), The birds of North America online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available at: http://bna.birds.cornell.edu/bna/species/449.

Schuman, G. and T. Booth. 1998. Strategies for establishment of big sagebrush (*Artemisia tridentata ssp. wyomingensis*) on Wyoming mined lands. Final Report. Abandoned Coal Mine Research Program. High Plains Grassland Research Service, Cheyenne, Wyoming.

Schroeder, M.A., C.L. Aldridge, A.D. Apa, J.R. Bohne, C. E. Braun, S.D. Bunnell, J. W. Connelly, P.A. Diebert, S.C. Gargner, M.A. Hilliard, G.D. Kobriger, S.M. McAdam, C.W. McCarthy, J.J. McCarthy, D.L. Mitchell, E.V. Rickerson, and S.J. Stiver. 2004. Distribution of Sage-Grouse in North America. Condor 106:363–376.

Stedman, S.J. 2000. Horned Grebe (*Podiceps auritus*), The birds of North America online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Available online at: http://bna.birds.cornell.edu/bna/species/505

Thomas, J.W., C. Maser, and J.E. Rodiek. 1979. Wildlife habitat in managed rangelands – The Great Basin of southeastern Oregon-riparian zone. U.S.D.A. Forest Service, Pacific Northwest Forest and Range Experiment Station, GTR PNW PNW-80. 18 pp.

Thompson, L. 1978. Circle West wildlife baseline study final report. Circle West Technical Report No. 2. Montana Department of Natural Resources and Conservation. Helena, Montana.

U.S. Department of the Interior. 1996. Declining birds in grasslands ecosystems: A Department of the Interior Conservation Strategy.

van Zyll de Jong, G.G. 1985. Handbook of Canadian mammals: bats. National Museum of Natural Sciences, National Museum of Canada, Ottawa, Quebec, Canada, 2:1-212.

Vicklund, L., G. Shuman, and A. Hild. 2004. Influence of sagebrush and grass seeding rates on sagebrush density and plant size. USDA Forest Service Proceedings RMRS-P-31.

Werner, J.K., B. Maxell, P. Hendricks, and D. Flath. 2004. Amphibians and reptiles of Montana. Mountain Press Publishing Company. Missoula, Montana.

Williams, R.M. 2009. Impacts of oil and gas development on sharp-tailed grouse on the Little Missouri National Grasslands, North Dakota. A thesis summated in partial fulfillment of the requirements for the Master of Science, Wildlife and Fisheries Sciences Department, South Dakota State University, 2009.

Wyoming Game and Fish Department (WYG&F). 2004. Recommendations for development of oil and gas resources within crucial and important wildlife habitats. Wyoming Game and Fish Department, Cheyenne, WY. December 2004. 183 pp.

I-3.5 FISHERIES

Section 3.7 of the main body of the EIS provides information on the existing conditions and potential environmental impacts of Project implementation on fisheries resources, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA. It includes supplemental information on proposed crossings of intermittent and ephemeral waterbodies that have been identified as contributing to maintaining water quality and that may provide seasonal habitat that contributes to the viability of fish populations of recreational or commercial value. This section also provides additional information on Montana fish of conservation concern that could be affected by perennial stream crossings and the use of hydrostatic test water.

I-3.5.1 Existing Conditions

The proposed route would cross 42 intermittent or ephemeral streams that connect to waters supporting recreational or commercial fishery resources in Montana. These streams, which are listed in Table I-3.5-1, likely contribute to maintaining water quality and may provide seasonally used habitat that contributes to the maintenance of non-salmonid fisheries in Montana (Berry et al. 2004, MDEQ 2006a and 2006b).

TABLE I-3.5-1
Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Project Route in Montana

County	Approximate Milepost	Waterbody Name	Stream Flow Regime[1]	Proposed Crossing Technique[2]	Number of Crossings
Phillips	9.1	Dunham Coulee	Ephemeral	OC	1
Phillips	20.8 – 24.0	Corral Coulee	Ephemeral/ Intermittent	OC	3
Valley	32.5	East Fort Cache Creek	Ephemeral	OC	1
Valley	38	Hay Coulee	Intermittent	OC	1
Valley	44.9	Lime Creek	Intermittent	OC	1
Valley	51.1	Brush Fork	Intermittent	OC	1
Valley	52.3	Bear Creek	Intermittent	OC	1
Valley	53.3	Unger Coulee	Intermittent	OC	1
Valley	55.3	Buggy Creek	Intermittent	OC	1
Valley	57	Alkali Coulee	Ephemeral	OC	1
Valley	59.3	Wire Grass Coulee	Ephemeral	OC	1
Valley	59.8	Spring Creek	Intermittent	OC	1
Valley	61.7	Mooney Coulee	Ephemeral	OC	1
Valley	66.9	Cherry Creek	Intermittent	OC	1
Valley	68.4	Foss Coulee	Intermittent	OC	1
Valley	70.4	Spring Coulee	Intermittent	OC	1
Valley	70.9	East Fork Cherry Creek	Intermittent	OC	1
Valley	75.9	Lindeke Coulee	Ephemeral	OC	1

TABLE I-3.5-1 Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Project Route in Montana					
County	**Approximate Milepost**	**Waterbody Name**	**Stream Flow Regime[1]**	**Proposed Crossing Technique[2]**	**Number of Crossings**
Valley	77.9	Espiel Coulee	Intermittent	OC	1
McCone	95.3	Jorgensen Coulee	Ephemeral	OC	1
McCone	96.7	Lost Creek	Ephemeral	OC	1
McCone	101.3 – 101.4	Cheer Creek	Ephemeral	OC	2
McCone	105.3	Bear Creek	Ephemeral	OC	1
McCone	110.4 – 110.5	Shade Creek	Intermittent	OC	2
McCone	114.2	South Fork Shade Creek	Intermittent	OC	1
McCone	118.3 – 118.6	Flying V Creek	Ephemeral/ Intermittent	OC	2
McCone	122.3	Figure Eight Creek	Intermittent	OC	1
McCone	123.1	Middle Fork Prairie Elk Creek	Ephemeral	OC	1
McCone	146.2	Lone Tree Creek	Intermittent	OC	1
McCone	147.5 – 153.3	Buffalo Springs Creek	Perennial/ Intermittent	OC	3
Dawson	156.7	Cottonwood Creek	Intermittent	OC	1
Dawson	163.1	Hay Creek	Intermittent	OC	1
Dawson	166.2	Upper Seven Mile Creek	Intermittent	OC	1
Dawson	188.1	Cracker Box Creek	Ephemeral	OC	1
Prairie	208	West Fork Hay Creek	Intermittent	OC	1
Prairie	209.1	Hay Creek	Intermittent	OC	1
Fallon	244.3	Sandstone Creek	Intermittent	OC	1
Fallon	246.2	Red Butte Creek	Intermittent	OC	1
Fallon	258.4	Hidden Water Creek	Intermittent	OC	1
Fallon	272.1-272.2	Soda Creek	Intermittent	OC	2
Fallon	276.1	North Fork Coal Bank Creek	Intermittent	OC	1
Fallon	279.2	South Fork Coal Bank Creek	Intermittent	OC	1

[1] Perennial = a stream that flows continuously throughout the year; Ephemeral = a stream which flows only after rain or snow-melt and has no base flow component; Intermittent = a stream in contact with the ground water table that flows only certain times of the year, such as when the groundwater table is high or when it receives water from the surface sources.
[2] OC = open cut and consists of conventional upland construction techniques if the streambed is dry or open-cut wet methods for flowing, flume, or dam and pump crossings (see Sections 2.3.4.5 and 2.3.4.6 of the EIS for additional information on those methods).

I-3.5.1.1 Special Status Fish

Special-status fish are fish listed as threatened, endangered, or candidate species under the ESA of 1973, fish managed as "sensitive" by the BLM, and fish of special concern tracked by the Montana Natural Heritage Program. Fish of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Section 3.7 of the main body of the EIS presents information on special-status fish that are potentially present in the vicinity of the proposed Project in Montana, including one federally protected fish, eight fish listed as conservation concerns by BLM and Montana, and BLM sensitive fish, which include some Montana fish species of concern. The three additional Montana fish of concern that are not discussed in the body of the EIS are addressed in this section: the blue sucker (*Cycleptus elongatus*), shortnose gar (*Lepisosteus platostomus*), and sicklefin chub (*Macrhybopsis meeki*). Information on the presence of those species and their state ranks is presented in Table I-3.5-2.

TABLE I-3.5-2
Special-Status Fish Potentially Present in the Vicinity of the Project Route in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Fish of Conservation Concern		
Blue Sucker (*Cycleptus elongatus*)	Present in the Missouri and Yellowstone rivers within the Project area; S2S3.	Prefers swift current areas of large rivers, feeding on insects in cobble areas.
Shortnose gar (*Lepisosteus platostomus*)	Known only from Missouri River dredge cuts below Fort Peck Dam and single specimen from the lower Yellowstone River; S1.	Large rivers, quiet pools, backwaters, and oxbow lakes.
Sicklefin chub (*Macrhybopsis meeki*)	Found in the Missouri River below Great Falls; S1.	Main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel.

Sources: American Fisheries Society [AFS] 2009, BLM 2009, Brown 1971, Holton and Johnson 2003, MNHP 2009a, MNHP 2009b, MNHP and MFWP 2009.
[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)
S1 – Critically imperiled
S2 – Imperiled because of rarity or factors that make it vulnerable to extinction
S3 – Rare, uncommon, or threatened, but not immediately imperiled

Blue suckers are present in the Missouri and Yellowstone rivers in Montana. They prefer swift current areas of large rivers with low turbidity, where they feed on insects in cobble areas (AFS 2009). Blue suckers migrate upriver in spring to congregate in fast, rocky areas for spawning. They often migrate up tributary streams (e.g., the Milk River) to spawn.

Shortnose gar are distributed throughout the Mississippi-Missouri River drainage. In Montana this species is known to occur only in the Missouri River dredge cuts below Fort Peck Dam (Brown 1971), except for a single specimen from the Yellowstone River approximately 15 miles upstream of the confluence with the Missouri River (AFS 2009, MNHP and MFWP 2009). The shortnose gar typically occurs in large rivers, quiet pools, backwaters, and oxbow lakes, and exhibits a tolerance for turbid water. Spawning occurs in May or June when adhesive eggs are deposited in small clumps attached to aquatic plants or other submerged objects in shallow water (Brown 1971). Eggs hatch 8 to 9 days after spawning.

The sicklefin chub is considered one of the rarest fish in Montana and is present in large, turbid streams in the plains region of Montana (MNHP 2009a). They are limited to the main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel. Their known distribution in Montana includes the Missouri River above and below Fort Peck Lake and the lower Yellowstone River, from Intake Diversion Dam to the confluence with the Missouri River (AFS 2009). The species reaches a maximum age of 4 years and generally becomes sexually mature at the age of 2 years. Spawning occurs in main channel areas of large turbid rivers during summer months (AFS 2009).

I-3.5.2 Potential Impacts and Mitigation

All proposed crossings of ephemeral and intermittent streams in Montana would use either conventional upland construction techniques if the streambed is dry or has non-moving water at the time of crossing, or an open-cut wet crossing (flowing, dry flume, or dam and pump). In general flowing open-cut wet crossings would be used unless a specific stream has been identified as potentially supporting sensitive aquatic species. Construction of crossings at dry ephemeral or dry intermittent stream beds would have no direct impact to fisheries or aquatic resources. When flows return to the streambeds, however, some increased turbidity would likely occur because of the disturbance to the banks and streambed. The returning water would pick up loose soil and fines contributing to an increase in sediment load and downstream turbidity. Impacts to ephemeral and intermittent streams that are flowing and crossed using open-cut wet construction would be similar to impacts of open-cut wet crossings of perennial streams and include direct mortality to fishery and aquatic resources, loss and alteration of habitat structure, changes in benthic communities, loss of riparian vegetation, and increased suspended sediment and sediment deposition.

Keystone would minimize construction-related effects to ephemeral and intermittent streams by implementation of the procedures identified in its CMR Plan (presented in Appendix B to the EIS) and implementation of the MDEQ Environmental Specifications (presented in Attachment 1 to this appendix). Impacts caused by the removal of riparian cover would be minimized by cutting vegetation at ground level, leaving the root systems intact to provide streambank stability. Removal of tree stumps would be limited to the area directly over the trench line. Construction across ephemeral and intermittent streams would generally be completed within a 24-hour period and streambanks would be stabilized with sediment barriers within 24 hours of completing the crossing. Riparian vegetation would be restored with native plants and conservation grasses, and if the streambed maintains wetland vegetation, wetland mitigation measures would be implemented. Project-related impacts and recommended mitigation measures for fisheries are presented in Section 3.7 of the EIS, and potential Project-related impacts to intermittent and ephemeral streams are discussed in Section 3.3 of the EIS and in Section I-3.1 of this appendix.

I-3.5.2.1 Special Status Fish

The three Montana fish of concern addressed in this section (the blue sucker, sicklefin chub, and shortnose gar) are only associated with large rivers and streams that often have turbid or muddy water (AFS 2009, MNHP 2009a). The known distributions of these species in Montana are limited to the Missouri, Yellowstone, and Milk rivers. These rivers would be crossed by the HDD method which avoids direct disturbance to aquatic habitat and stream banks (see Section 2.3.4.5 of the EIS for additional information on the HDD method). This method of stream crossing would not directly affect these species if they are present in the rivers near the proposed crossing sites. There is a potential for the inadvertent release of drilling lubricant into the aquatic environment if there is a break-through during the drilling operation that could release these drilling fluids to the river. Drilling fluids used would be non-toxic, but would contain bentonite. Bentonite is naturally occurring fine clay that can physically inhibit respiration of fishes and aquatic invertebrates potentially resulting in suffocation. Exposure would likely be short term and limited in extent. Longer-term effects to fish populations can result from bentonite spills if larval fish are covered and suffocate due to fouled gills and/or lack of oxygen.

Disturbance to upland plant communities and environment can have direct impacts on aquatic habitats through increased sedimentation due to wind and water erosion, and a reduction in filtering capacity and infiltration of runoff due to reduced vegetative cover. While the effects of upland disturbance on aquatic habitat can be immediate, there can also be substantial response time lags for various components of aquatic systems (Baxter et al. 1999). Most disturbances to vegetation from construction activities in uplands next to the Missouri, Yellowstone, and Milk rivers would be avoided by using HDD to cross these rivers.

Invasive aquatic species can be introduced into waterways and wetlands and spread by improperly cleaned vehicles and equipment operating in water, stream channels, or wetlands (Montana Aquatic Nuisance Species Technical Committee 2002). Introduced non-native plants and animals can degrade aquatic habitats, compete with native plants and animals, and transmit fish diseases (e.g., whirling disease) that could adversely impact fish of concern.

Withdrawal of water for hydrostatic testing in Montana is planned for the Missouri River (approximately 11.4 million gallons) and the Yellowstone River (approximately 11.6 million gallons). In addition, small withdrawals of water for HDD and miscellaneous uses are planned for the Missouri, Yellowstone, and Milk rivers. MFWP has reserved instream flow water rights on some tributaries of these rivers (Table I-3.5-3). Keystone, as a junior user, would be required to ensure that the listed flow rate would be maintained in the stream while it is withdrawing water for hydrostatic testing.

TABLE I-3.5-3
Montana Fish, Wildlife & Parks Instream Water Reservations

Stream	Reach	Dates	Minimum Flows		Total Volume for Period (Acre-ft)
			Cubic ft/sec	Acre-ft/year	
Frenchman Creek	International boundary to mouth	Jan., Feb., Mar., and Dec.	2.0	2,900	480
		Apr. through Nov.	5.0	2,900	2,420
Rock Creek	International boundary to mouth	Jan., Feb., Mar., and Dec.	2.0	4,352	480
		Apr. through Nov.	8.0	4,352	3,872
Missouri River #8	Milk River to Montana state line	Year-round	5,178	3,748,500	3,748,500
Redwater River #1	Circle to East Redwater Creek	Jan., Feb., Mar., and Dec.	2.0	1,932	480
		Apr. through Nov.	3.0	1,932	1,452
Redwater River #2	East Redwater Creek to mouth	Jan., Feb., Mar., and Dec.	2.0	2,416	480
		Apr. through Nov.	4.0	2,416	1,936
Boxelder Creek	1 mile west of Belltower to Montana state line	Jan., Feb., Mar., and Dec.	4.0	4,348	960
		Apr. through Nov.	7.0	4,348	3,388
Little Beaver Creek	Russell Creek to Montana state line	Year-round	3.0	2,171	2,171

During water withdrawal, eggs and small fish may become entrained. However, water withdrawal for hydrostatic testing in Montana would likely occur during the fall, avoiding potential impacts to fish eggs and larvae. Intake hoses would be screened to prevent the entrainment of fish or debris, and hose intakes would be kept at least 1 foot off the river bottom. After use, the water would be discharged to uplands.

Contaminants can be introduced to aquatic systems through fluid leaks from equipment operation in or near water bodies or wetlands, or fuel spills during equipment refueling (impacts of accidental releases from the pipeline are addressed in Section 3.13 of the EIS). The release of toxic levels of oil, fuel, or other fluids may result in the loss of individual fish. Dilution of hazardous materials accidentally released in the aquatic environment would reduce the potential for lethal effects. Sublethal effects to fish from exposure to oil or petrochemicals include reduced survival and productivity, reduced forage availability, and displacement.

Herbicides would be used to control vegetation before and after construction. The use of herbicides near a water body could affect aquatic organisms, including fish of concern. Herbicides could enter a water body through runoff, seepage through the soils, and direct introduction to water during application (e.g., wind drift).

Implementation of the procedures in Keystone's CMR Plan and in MDEQ's Environmental Specifications associated with HDD, water use, hydrostatic testing (see Section 3.7 of the EIS), and fuel handling would minimize potential impacts to Montana fish of concern. HDD would prevent direct disturbance to larger river habitats and the sensitive fish that occupy those habitats (i.e., blue sucker, sicklefin chub, and shortnose gar). Water withdrawal for hydrostatic testing would likely occur during the fall and would not be likely to entrain fish eggs or larvae.

As a result, impacts to sensitive fish species in Montana would likely be temporary and minor.

I-3.5.3 References Cited

American Fisheries Society, Montana Chapter (AFS). 2009. Montana fish species of concern. Available online at: http://www.fisheries.org/units/AFSmontana/.

Baxter, C.V., C.A. Frissel and F.R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: Implications for management and conservation. The Flathead Lake Biological Station, The University of Montana, Polson, Montana 59860, USA. Transactions of the American Fisheries Society 128:854-867, 1999.

Berry, C., M. Wildhaber, and D. Galat. 2004. Population Structure and Habitat Use of Benthic Fishes along the Missouri and Lower Yellowstone Rivers. U.S. Army Corp of Engineers, Omaha, Nebraska.

Brown, C. 1971. Fishes of Montana. Big Sky Books. Montana State University, Bozeman, Montana.

Bureau of Land Management (BLM). 2009. Montana/Dakotas Special Status Species List. Instruction Memorandum No. MT-2009-039, email transmission April 24, 2009.

Holton, G. and H. Johnson. 2003. A field guide to Montana fishes. Advanced Litho Printing. Great Falls, Montana.

Keystone. 2009. Keystone XL Project supplemental environmental report. TransCanada Keystone Pipeline, LP. Document No.: 10623-006, July 2009.

Montana Aquatic Nuisance Species Technical Committee. 2002. Montana Aquatic Nuisance Species (ANS) Management Plan. Montana ANS Technical Committee A subgroup of The Montana ANS Steering Committee. October 15, 2002. Available online at: http://fwp.mt.gov/content/getItem.aspx?id=3258.

Montana Department of Environmental Quality (MDEQ). 2006a. 2006 Integrated 303(d)/305(b) Water Quality Report for Montana. Montana Department of Environmental Quality, Water Quality

Planning Bureau, Helena, Montana. Retrieved August 6, 2007: http://cwaic.mt.gov/wq_reps.aspx?yr=2006qryId=37017.

MDEQ. 2006b. Administrative Rules of Montana (ARM), Title 17, Chapter 30. Retrieved August 1, 2007: http://www.deq.state.mt.us/dir/legal/title17.asp.

Montana Natural Heritage Program (MNHP). 2009a. Montana field guide and tracker database. Available on line at: http://mtnhp.org.

MNHP. 2009b. Montana Land Cover/Land Use Theme. Based on classifications originally developed by the University of Idaho and the Montana Natural Heritage Program for the Pacific Northwest ReGAP project. Helena, Montana.

MNHP and MFWP. 2009. Montana Animal Species of Concern. Helena, MT: Montana Natural Heritage Program and Montana Department of Fish Wildlife & Parks. 17 p. Available at: http://mtnhp.org. (accessed May 4, 2009).

I-3.6 LAND USE, RECREATION, AND VISUAL RESOURCES

Section 3.9 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation for land use, recreation, and visual resources, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.6.1 Existing Land Use and Potential Impacts

I-3.6.1.1 Agriculture and Forest Land

The proposed route would cross approximately 94 miles of agricultural land in Montana. As shown in Table I-3.6-1, the majority of cropland crossed is fallowed (87.9 percent). The remaining agricultural land crossed is dryland (8.1 miles), flood irrigation (2.7 miles), and pivot irrigation (0.6 mile).

TABLE I-3.6-1
Agricultural Land in Montana Crossed by the Proposed Project Route[1]

Cropland Irrigation Method	Miles of Cropland Crossed	Percentage of Total Agricultural Land Crossed (%)
Dryland	8.1	8.6
Pivot Irrigated	0.6	0.6
Sprinkler Irrigated	0.0	0.0
Flood Irrigated	2.7	2.9
Fallow	82.6	87.9
Total	94.0	100.0

[1] Data from Keystone (2009) based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

As described in Section 3.9.10.1 of the EIS, where construction affects agricultural land, including irrigation systems and water supply lines, Keystone would negotiate the timing of construction and use of the existing irrigation equipment with the landowner to the extent practical. Agricultural land would be returned to conditions as near as possible to pre-construction conditions to the extent practical, including repair and replacement of irrigation equipment, as stipulated in the Keystone CMR Plan (Appendix B) and in the MDEQ Environmental Specifications (Attachment 1).

In Montana, the proposed route would cross small areas of upland forest land along portions of the pipeline route. As shown in Table I-3.6-2, the proposed route crosses a total of less than 1.2 miles of forestland, including 0.1 mile in Phillips County, 0.3 mile in Valley County, 0.3 mile in McCone County, 0.4 mile in Dawson County, and 0.1 mile in Fallon County.

TABLE I-3.6-2 Forestland Crossed by the Proposed Project Route in Montana[1]				
County	**Milepost Begin**	**Milepost End**	**Miles of Forestland Crossed**	**Forest Type**
Phillips	25.5	25.7	0.1	Upland
Valley	36.1	36.2	0.1	Upland
Valley	66.9	67.2	0.1	Upland
Valley	82.6	82.7	0.1	Upland
McCone	89.2	89.3	0.1	Upland
McCone	89.8	90.0	0.2	Upland
Dawson	158.9	159.0	0.1	Upland
Dawson	159.7	159.7	0.1	Upland
Dawson	177.3	177.3	0.1	Upland
Dawson	195.7	195.8	0.1	Upland
Fallon	229.5	229.6	0.1	Upland
Total			< 1.2	

[1] Data from Keystone (2009) based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

I-3.6.1.2 Developed Land: Residential, Commercial, and Industrial

In Montana, construction of the proposed Project would affect 44 acres of developed land; operation would affect 18 acres of developed land. The proposed route extends across commercial land (0.1 mile), industrial land (0.1 mile), residential land[9] (0.1 mile), other ROWs (3.3 miles of roadways, railroads, and utility corridors) and special use lands (less than 0.1 mile along a windbreak).

Keystone and MDEQ identified 17 structures in Montana within 25 feet of the construction ROW and 118 within 500 feet of the construction ROW (Table I-3.6-3). There are no residences within 25 feet of the construction ROW. As discussed in Section 3.9.10.4 of the EIS and in the Keystone CMR Plan (Appendix B), site-specific construction plans would be developed for commercial/industrial buildings that are within 25 feet of the construction ROW to avoid or minimize impacts to the structures and to minimize impacts to the users of those structures. Construction in those areas would be conducted in accordance with the requirements of the MDEQ Environmental Specifications (Attachment 1). Where groundwater wells are within 100 feet of a proposed facility, Keystone would construct the facilities in accordance with the requirements of the MDEQ Environmental Specifications to avoid or minimize impacts to the wells.

[9] Although the proposed route crosses residential land, there are no residences within 25 feet of the construction ROW (see Table I-3.9-3).

TABLE I-3.6-3 Structures In the Vicinity of the Construction ROW of the Project in Montana		
	Number of Structures	
Structure Type	Within 25 feet of the Construction ROW	≤ 500 feet and > 25 feet from the Construction ROW
Industrial	2	1
Groundwater well	0	4
Other	3[1]	41[2]
Outbuilding	1	48
Power Pole	11	18
Residence[3]	0	6
Total	17	118

Sources: Keystone, 2009; Montana Basemap Service Center, 2010; and a January 2010 MDEQ field survey.
[1] Includes a cattle trough, a dam, and an unidentified structure.
[2] Includes a bridge, a cattle trough, a dam, a dam with a road, a gravel pit, underground pipe, a spring box, telephone/buried cable posts, troughs, a windmill, and several unidentified structures.
[3] Single residential structures are near MPs 5.7, 23.3, 70.3, and 71.0, and two residential structures are near MP 227.5.

A total of 155 individual residences and one small cluster of about 16 residences are within approximately 1 mile of the ROW (Montana Basemap Service Center, 2010; U.S. Department of Agriculture, Farm Service Agency, 2005). The cluster of residences is just south of Baker, near MP 247.

I-3.6.1.3 Transportation Uses

Roadways

Roadways are divided into two categories: major roadways and minor roadways. Major roadways include highways with limited access, U.S. highways with unlimited access, and state and secondary highways. They serve large-scale transportation needs and are major connectors to municipal centers. Minor roadways are local roads and city streets. They serve smaller traffic volumes than major roadways and serve local transportation within the state.

Major roadways and railroads crossed by the proposed route in Montana are listed in Table I-3.6-4. The proposed route would cross two U.S. highways, seven Montana state highways, one interstate highway, and six railroad ROWs. The route would cross Montana State Highway 13 which BLM considers a scenic byway. The BNSF Railway is the only railroad crossed by the proposed route.

The classifications of roadways and railroads crossed by the proposed route are listed in Table I-3.6-5. The majority of the roadways crossed are local neighborhood, rural, and city roads. Keystone would cross all paved roads, primary gravel roads, highways, and railroads using conventional boring techniques as described in its CMR Plan (Appendix B of the EIS). Therefore, there would be little or no impact to those roadways and railroads. Open cut construction would be used to cross most smaller, unpaved roads and driveways where permitted by local authorities or private owners.

To minimize impacts to traffic during construction across roadways, Keystone would provide traffic control, including temporary detours where appropriate for crossings of smaller unpaved roads. Keystone consulted with the Montana Department of Transportation (MDT) on traffic control guidelines and program and policy analysis. MDT determined that the Manual on Uniform Traffic Control Devices is a suitable guide for traffic control.

TABLE I-3.6-4 Major Roadways and Railroads Crossed by the Project Route in Montana	
Road Name	**Milepost**
U.S. Highway 2	82.30
U.S. Highway 12	244.50
Montana State Highway 7	248.34
Montana State Highway 247	269.03
Montana State Highway 24	69.68
Montana State Highway 200	146.87
Montana State Highway 200S	147.73
Montana State Highway 13[1]	145.98
Montana State Highway 117	83.74
Interstate Highway 94	193.04
BNSF Railway	82.40
BNSF Railway	147.77
BNSF Railway	154.18
BNSF Railway	163.23
BNSF Railway	196.01
BNSF Railway	243.92

[1] Classified as a Scenic Byway by BLM.

TABLE I-3.6-5 Other Roadways and Railroads Crossed by the Project Route In Montana		
Road Class	**Number of Crossings**	**Percent of Total Crossings**
Local neighborhood road, rural road, city	98	81.7
Private road for service vehicles (logging)	7	5.8
Railroad feature (main, spur, or yard)	7	5.8
Secondary road	5	4.2
Primary road	2	1.7
Scenic byway	1	0.8
Total Crossings	120	100.0

On previous projects in Montana, MDEQ expressed concern about the ability of bridges, culverts, and cattle guards to accommodate the construction equipment and trucks hauling pipe and other heavy materials. As a result, MDEQ has recommended that prior to construction, Keystone consult with MDT to determine whether or not it would be appropriate to field check the road infrastructure (e.g., bridges, culverts, and cattle guards) to determine if the structures could accommodate the anticipated loads. For those structures determined to be unable to accommodate the loads, Keystone should develop a plan to avoid or reinforce that structure.

As a result of implementation of the procedures incorporated into the Project to minimize impacts (including the Keystone CMR Plan, presented in Appendix B to the EIS, and the MDEQ Environmental Specifications, presented as Attachment 1 to this appendix), the proposed Project would not result in significant impacts to roadways and railroads in Montana. Potential impacts to traffic along the roadways during construction and operation are addressed in Sections 3.10.1.7 and 3.10.2.7 of the EIS.

Access Roads

Construction of the Project would require a total of 50 access roads in Montana. Keystone would use existing roads for access roads to the extent practical, and all except three access roads would be temporary (i.e., used only during construction). The three permanent access roads would be used occasionally by maintenance and monitoring crews during operation of the Project.

A total of 111.5 miles of access roads would be required in Montana; 85.5 miles of those roads are privately owned (Table I-3.6-6). The area of the 50 access roads would be approximately 265 acres based on a 30-foot width. After construction, the newly constructed temporary access roads not used for access during operation of the Project would be restored to pre-construction conditions to the extent practical in accordance with the Keystone CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1).

TABLE I-3.6-6
Ownership of Access Roads Used for the Project in Montana

Ownership	Length of Access Roads (Miles)	Percent of Ownership
Federal	23.06	20.7
State	2.94	2.6
Private	85.50	76.7
Total	111.50	100.0

Keystone would limit construction traffic on existing and new access roads to the extent practical. The majority of the existing access roads proposed for the Project are used for agriculture and/or livestock purposes. Most are dirt or gravel roads and are not maintained, and some roads may require improvements prior to use for construction. Construction would take place over approximately 8 months along 4 construction spreads in Montana.[10] During operation, there would be occasional use of the access roads by maintenance and monitoring crews.

Use of access roads during construction of the Project could result in occasional inconvenience to those currently using the roadways due to the presence of construction vehicles and equipment; however, the impacts would be temporary and minor. Use of the access roads during construction and operation of the proposed Project would not result in any significant adverse land use impacts.

I-3.6.2 Existing Recreation Resources and Potential Impacts

In Montana, the proposed route does not cross any state wildlife management areas, state parks, national primitive areas, national monuments, national recreation areas, national forests, or any rivers in

[10] Spread 4 begins in Baker, Montana, extends approximately 35 miles to the Montana/South Dakota border, and continues into South Dakota for approximately 51 miles.

reaches designated as wild and scenic. One Class I and one Class II fishery would be crossed by the Project; however, both crossings would be constructed using the HDD method (see Section 2.0 of the EIS for construction methods), and therefore no impacts are anticipated.

Hunting and fishing along the proposed route may be temporarily disrupted during construction in some locations, but could resume as soon as construction is completed. Although the proposed route crosses the Lewis and Clark National Historic Trail at two locations, there are no campsites or other recreational facilities within 2 miles of the proposed crossing site.

Disruptions to recreational activities and areas would be temporary and limited to areas within the construction ROW. After construction is completed, the ROW would be available for use where permitted by law and recreational activities would not be affected. Impacts to recreational visual quality are addressed below.

I-3.6.3 Visual Resources

I-3.6.3.1 Existing Conditions

Visual resources are landscape characteristics which have an aesthetic value to residents and visitors from sensitive viewpoints such as residences, recreation areas, rivers, and highways. Characteristics include the aesthetics of natural and developed landscapes, and are considered an element of land use on federally managed lands. BLM is responsible for identifying and protecting scenic values on the public lands it manages. The Visual Resource Management (VRM) system was developed by BLM to assist in the identification and protection of scenic lands in a systematic and interdisciplinary manner.

The VRM system uses several aesthetic value classes to define the rehabilitation objective when landscapes are altered. The system classifies resources based on scenic quality, viewer sensitivity to visual change, and viewing distance. The system includes four visual inventory classes: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value. BLM’s objectives for each class are as follows:

- Class I: preserve the existing character of the landscape, including the natural ecological qualities. Some very limited management activity is permitted;
- Class II: preserve the existing character of the landscape and keep landscape changes at a minimum. Landscape changes should reflect the ambient colors, textures, and form of the surrounding features;
- Class III: keep landscape changes moderate and retain some portion of the existing character of the landscape. Management activities should not attract much attention or dominate the view. Landscape changes should reflect the basic features found in the landscape character; and
- Class IV: allow management activities that require major alterations in the existing character of the landscape. The view may be dominated by management activities. However, the location, disturbance, and blending with the surrounding landscape should be minimized.

BLM visual resource analysts for the Malta and Miles City Field Offices conducted the land inventories within their respective jurisdictions. Both offices recognize that even though BLM lands are intermingled among private lands along the proposed route, the quality of the landscape is not limited by ownership. As a result, the VRM classifications were applied to both public and private lands within the vicinity of the proposed Project in Montana. The Malta and Miles City Field Offices took slightly different approaches to the classification process with regard to highways: the Miles City Field Office opted to classify a 2-mile-wide corridor for all interstate and U.S. highways as Class II and classified a 2-mile-wide corridor for all state and other highways as Class III. The Malta Field Office was not as specific. Therefore, the analysis presented below conforms to the Miles City Field Office approach.

The BLM VRM system incorporates a scenic quality rating system. Scenic quality is evaluated using adjacent scenery, color, cultural modifications, landforms, scarcity, vegetation, water, and the character of the surrounding landscape. Table I-3.6-7 presents descriptions of each of the three scenic quality classes within the VRM system.

TABLE I-3.6-7
BLM VRM Scenic Quality Classification System

Class	Description
A	Scenery is distinctive with considerable variety in form, line, color, and texture.
B	Scenery is above average in relation to the surrounding area, has variety in form, line, color, and texture.
C	Scenery is considered common or typical throughout the region.

Table I-3.6-8 lists the VRM classifications along the proposed route in Montana. The route would not pass through areas designated as Class I. The proposed route extends through 7 areas designated as Class II based on their unique qualities (approximately 14.2 percent of the proposed route in Montana). As indicated in Table I-3.6-8, approximately 71 percent of the area in the vicinity of the proposed route in Montana is rated as Class IV. Along those portions of the route, the terrain is generally flat or gently rolling and the vegetation is mainly grassy rangeland. Between MP 102 and MP 116, the route would extend through and around some barren badland areas. The route would also cross 3 rivers with scenic quality classified as Class B: the Milk River, Missouri River, and Yellowstone River.

I-3.6.3.2 Residential Viewpoints

Table I-3.6-9 lists the communities near the pipeline route. The community nearest the proposed route is Nashua, which is about 1.5 miles (straight-line distance) from the route. A total of 70 individual residences and one small cluster of about 16 residences are located within 0.75 mile of the proposed route. The cluster of residences is just south of Baker (near MP 247). There are approximately 70 residences from which portions of the proposed Project could be observed. At 33 of the residences there is some degree of vegetative screening between viewers at the residences and the proposed Project. The vegetative screens vary from heavy, dense windbreaks to light residential landscaping. About 20 of the residences are within a BLM VRM Class II area.

TABLE I-3.6-8 VRM Classifications in the Vicinity of the Proposed Project in Montana						
Approximate Location	Starting Milepost	Ending Milepost	Length (Miles) by VRM Class			
			Class II	Class III	Class IV	Total
Frenchman Creek	0	11.99	-	-	11.99	11.99
	11.99	25.7	13.71	-	-	13.71
	25.7	35.11	-	-	9.41	9.41
Rock Creek	35.11	43.43	8.32	-	-	8.32
	43.43	68.18	-	-	24.75	24.75
Montana State Highway 24	68.18	71.11	-	2.93	-	2.93
	71.11	78.93	-	-	7.82	7.82
Old Smoky Road	78.93	80.88	-	1.95	-	1.95
U.S. Highway 2, BNSF/AMTRAK, Milk River	80.88	84.1	3.22	-	-	3.22
	84.1	87.08	-	-	2.98	2.98
Missouri River	87.08	91.42	4.34	-	-	4.34
	91.42	92.99	-	-	1.57	1.57
Parallel to Montana State Highway 24	92.92	103.35	-	10.36	-	10.36
	103.35	107.97	-	-	4.62	4.62
Nickels Road	107.97	109.97	-	2	-	2
	109.97	125.47	-	-	15.5	15.5
East Fork Prairie Elk Creek	125.47	128.98	3.51		-	3.51
	128.98	145.03	-	-	16.05	16.05
Montana State Highways 13, 200, and 200S	145.03	162.01	-	16.98	-	16.98
	162.01	192.07	-	-	30.06	30.06
Interstate Highway 94, Yellowstone River	192.07	197.02	4.95	-	-	4.95
	197.02	203.21	-	-	6.19	6.19
County Road 504	203.21	206.44	-	3.23	-	3.23
	206.44	206.78	-	-	0.34	0.34
	206.78	206.79	-	0.01	-	0.01
	206.79	243.64	-	-	36.85	36.85
U.S. Highway 12	243.64	245.76	2.12	-	-	2.12
	245.76	247.39	-	-	1.63	1.63
Montana State Highway 7	247.39	249.77	-	2.38	-	2.38
	249.77	264	-	-	14.23	14.23
County Road 7 Little Beaver Road	264	266	-	2	-	2
	266	282.5	-	-	16.5	16.5
Totals			40.17	41.84	200.49	282.5
Percent of Total			14.2	14.8	71.0	100.0

TABLE I-3.6-9 Communities Nearest the Project in Montana	
Community	**Distance (miles) from Proposed Route[1]**
Circle	2.2
Nashua	1.5
Baker	2.1
Glasgow	5.8
Glendive	17.2

[1] Approximate straight-line distance.

I-3.6.3.3 Recreation and Transportation Viewpoints

The proposed route would cross two sections of the Lewis and Clark National Historic Trail, one near the proposed pipeline crossing of the Missouri River and the second near the proposed crossing of the Yellowstone River. While the precise boundaries of the Lewis and Clark trail are unknown, many visitors come to the area for the historic experience. The route would be within 0.25 mile of the Charles M. Russell National Wildlife Refuge boundary. The proposed route would be more than 5 miles from any other identified recreation areas; the nearest such areas are the Dredge Cuts Swimming Area, which is about 5.5 miles from the proposed route, and the Downstream Campground at the base of Fort Peck Dam, which is about 6 miles from the route.

As described above, the route would cross several highways in Montana (see Table I-3.6-4), and travelers along those roadways would be able to observe portions of the Project during construction and observe some aboveground Project features during operation. Traffic volumes for those roadways are listed in Table I-3.6-10. In addition, the route would be parallel to Montana State Highway 24 for several miles southeast of the Missouri River and parallel to Montana State Highway 200S for several miles southeast of Circle.

TABLE I-3.6-10 Highway Viewpoints Crossed by the Project in Montana	
Highway	**Usage (vehicles per day)**
U.S. Highway 94	More than 3,000
U.S. Highway 2	Approximately 1,500
U.S. Highway 12	Approximately 1,100
Montana State Highway 24	200 to 800
Montana State Highway 117	200 to 800
Montana State Highway 13	200 to 800
Montana State Highway 200	200 to 800
Montana State Highway 200S	200 to 800
Montana State Highway 7	200 to 800

Other significant roadway viewpoints crossed by the proposed route are listed in Table I-3.6-11. All of these smaller roads are lightly traveled, gravel surfaced, and do not have available traffic counts.

TABLE I-3.6-11 Other Roadway Viewpoints with Potential Vistas of the Project in Montana	
Road	**Approximate Location**
Old Smoky Road	North of U.S. Highway 2
Nickels Road	South of the Missouri River
County Road 504	East of Fallon
County Road 247	South of Baker

The route would also cross the BNSF Railway/AMTRAK railroad which carries a substantial number of business and recreational travelers who would have views of the proposed Project. The railroad line parallels the Missouri River and U.S. Highway 2.

I-3.6.4 Potential Impacts and Mitigation

I-3.6.4.1 Construction

Temporary impacts to visual resources would result from both construction activities and the presence of workers, equipment, and vehicles along the construction ROW. Visual impacts would result from clearing and removal of existing vegetation, exposure of bare soils, trenching, rock formation alteration, the presence of machinery and stored pipe, the presence of new aboveground structures, and in some locations, changes to the existing contours of the land. During the final stages of construction, backfilling and grading would restore the construction ROW to its approximate previous contours, and reclamation and revegetation would ultimately return the ROW to its approximate previous condition except in currently forested areas. In addition, vegetative buffers would be planted around the pump stations to reduce the visual impacts of the facilities.

Under MEPA and MFSA, MDEQ assesses potential visual impacts of proposed linear facilities. Keystone proposes to incorporate measures into the Project that would minimize the visual effects of the Project as described in the CMR Plan (Appendix B of the EIS). Keystone would also comply with the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix), which include measures to minimize visual impacts.

The visual impacts of construction would last only through the construction period; construction would last approximately 6 to 8 months along each of the 4 construction spreads in Montana. Construction is expected to be completed within about 1 month of initiation at any single location. Changes to visual resources during construction would be both temporary (e.g., trenching along the alignment) and permanent (e.g., construction of pump stations). Impacts due to permanent changes are addressed below under the impacts of operation.

The majority of viewers of the Project during construction would be travelers along the transportation corridors in the vicinity of the Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers are generally more sensitive to changes in scenic quality, there are no major recreation areas in the vicinity of the proposed route and few recreationists would be affected. Some individuals viewing the route from the 70 residences within 0.75 mile of the ROW may be able to observe portions of the construction activities throughout the construction period.

Due to the small number of observers and the short construction period, the impact of construction of the proposed Project in Montana on visual resources would be temporary and would not be significant.

I-3.6.4.2 Operation

Shortly after the completion of construction of the Project in Montana, the ROW would be visible as a strong linear feature with some associated aboveground aspects that may adversely affect some viewers. However, previous pipeline projects indicate that after a period of from 1 to 5 years, the ROW would not be discernible in many areas, and in many other areas the adverse visual effects would be substantially reduced. Visual effects in agricultural areas would likely be eliminated with the first crop growth.

The Milk, Missouri, and Yellowstone rivers would be crossed using the HDD method to minimize impacts in the river and along adjacent areas. At the Milk River, the borehole would be located north of U.S. Highway 2 and the pipeline would pass under the highway, the railroad, and river. As a result, there would be minimal adverse visual effects throughout this Class II area. Similarly, through the use of HDD, there would be minimal adverse visual effects for the steeper slopes of the Class II area along the Missouri River. The HDD-installed crossing of the Yellowstone River would extend from the flats north of the river, proceed under both the railroad and the river, and emerge on the plateau above the river to the south. The HDD method would likely be used to construct the pipeline crossing of Highway 94, which would be in a Class II area; use of that construction method would minimize or avoid visual changes in the vicinity of the river during operation of the Project.

The remaining Class II areas (Frenchman Creek, Rock Creek, East Fork Prairie Elk Creek, and U.S. Highway 12) would be crossed using the open-cut construction method. The visual effects in these areas would be similar to those of other open-cut segments of the proposed route. After revegetation and reclamation are complete (i.e., the vegetation has become established), the terrain and surface conditions would be similar to those of the surrounding areas. Although there would be observable changes in the landscape along some portions of the ROW during operation, it is anticipated that the objectives for all Class II areas (i.e., maintaining the existing character of the landscape and not attracting the attention of the casual observer) would be achieved.

The Proposed Project would have six pump stations in Montana: four would be in BLM VRM Class IV areas (Pump Stations 9, 10, 13, and 14) and two in Class III areas (Pump Stations 11 and 12). All pump stations would be painted in colors that blend into the surrounding landscape and would have vegetative buffers installed to screen the facility from viewers. Pump Station 11 would be located at MP 97.9, which is approximately 1 mile from State Highway 24, and would not be readily observable from the roadway. The pump station is also 9 miles south of the Missouri River and would not be observable from the river.

Pump Station 12 would be located at MP 148.5, which is approximately 2 miles southeast of the community of Circle and within 500 feet of State Highway 200S. Drivers and passengers using the highway and looking toward the pump station would observe a change in the landscape compared to current conditions, and some viewers may consider that an adverse impact. The intensity of the effect would be reduced by the vegetative buffer around the pump station.

The majority of viewers of the Project during operation would be travelers along the transportation corridors in the vicinity of the Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers are generally more sensitive to changes in scenic quality, there are no major recreation areas in the vicinity of the proposed route and few recreationists would be affected. Some individuals viewing the Project from the 70 residences in the vicinity of the ROW and from residences at the small cluster of residences south of Baker may be able to observe portions of the Project on a regular basis.

Where reclamation and revegetation result in returning the ROW to visual conditions either identical to or similar to existing conditions, there would be either no impact or only minor impacts to visual resources during operation. For portions of the Project that remain visually different from existing conditions during operation, the change to visual resources would be permanent (i.e., they would exist for the duration of the Project). However, due to the small number of observers and the measures included in Project design to minimize the impacts to visual resources, the impact of operation of the Project on visual resources in Montana would not be significant.

I-3.6.5 References Cited

Keystone. 2009. Keystone Montana Major Facility Siting Act Application, Supplemental Submittals, February and April.

Environmental Report for the Proposed Keystone XL Pipeline Project. Prepared for TransCanada Keystone XL Pipeline, LLC.

Montana Basemap Service Center. 2010. Montana Spatial Data Infrastructure, Structures Framework; accessed online at: http://giscoordination.mt.gov/structures/msdi.asp.

U.S. Department of Agriculture, Farm Service Agency. 2005. National Agriculture Inventory Program aerial photographs. Aerial Photography Field Office.

I-3.7 SOCIOECONOMICS

Section 3.10 of the main body of the EIS provides information on the existing conditions and potential environmental consequences of Project implementation for socioeconomics, including information for Montana. This section of the appendix provides supplemental information on those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

The impact assessment of potential socioeconomic impacts presented in this Appendix includes information on communities in the vicinity of the Project; however, it focuses on impacts at the county level rather than the community level for two primary reasons. First, due to the rural nature of the majority of the potentially affected environment, socioeconomic data used for comparisons are limited primarily to the county level. Secondly, economic impacts may occur in communities and rural areas that are not near the proposed route.

I-3.7.1 Existing Conditions

I-3.7.1.1 Population

The proposed pipeline would cross six counties in Montana. From north to south the counties are Phillips, Valley, McCone, Dawson, Prairie, and Fallon. Population-related characteristics of the counties and the state are summarized in Table I-3.7-1. As indicated in the table, the proposed route extends through predominantly rural and sparsely populated areas, with population densities ranging from less than one to four people per square mile for the majority of the route. Each of the counties had declining populations from 1990 to 2007.

TABLE I-3.7-1
Population Characteristics Along the Proposed Route in Montana

County	Population[1]			Annual Average Change in Population	Annual Average Change in Population	Population Density (per square mile)[1]	Population Center
	1990	2000	2007	1990-2000	2000-2007	2000	
Phillips	5,163	4,601	3,934	-1.1%	-2.2%	<1	Malta
Valley	8,239	7,675	6,884	-0.7%	-1.5%	2	Glasgow
McCone	2,276	1,977	1,716	-1.4%	-2.0%	1	Circle
Dawson	9,505	9,059	8,554	-0.5%	-0.8%	4	Glendive
Prairie	1,383	1,199	1,043	-1.4%	-2.0%	<1	Terry
Fallon	3,103	2,811	2,690	-9.4%	-4.3%	2	Baker
Total	29,669	27.322	24,821	-7.9%	-9.2%		

[1] U.S. Census Bureau, 2000, 2007a, and no date.

Similar to county trends, the potentially affected communities along the proposed route have experienced an average annual reduction in population between 2000 and 2007. Potentially affected communities in this assessment are defined as those within a driving distance of approximately 3.0 miles from the proposed route. Table I-3.7-2 lists the populations of the communities within that distance.

TABLE I-3.7-2 Communities Within 3.0 Miles of the Proposed Project in Montana				
			Population	
Community	County	Proximity to Project (miles)[1]	2000[2]	2007
Nashua	Valley	1.8	325	291
Circle	McCone	2.8	644	558
Baker	Fallon	2.3	1,695	1,616
Total			2,664	2,465

[1] Approximate driving distance.
[2] U.S. Census Bureau 2000 and 2007a.

I-3.7.1.2 Housing

Table I-3.7-3 lists the existing short-term housing resources in the six counties along the proposed route. The availability of short-term accommodations varies throughout the year and depends on a number of factors, including seasonal fluctuations and timing of local events. However, previous vacancy rates can be used to compare potential vacancies with the Project's housing needs during construction.

The total number of rental housing units was about 3,250 in 2000. Throughout the area near the Project, the weighted average vacancy rate was 13.9 percent at that time. That would equate to a total of about 448 rental units at the present time, with most of the units in Dawson and Phillips counties. Table I-3.7-3 also lists the number of hotels/motels and campgrounds. The fewest number of hotel/motel rooms were in Prairie County (9) and McCone County (14).

TABLE I-3.7-3 Housing In Counties Along Proposed Route in Montana						
County	Total Housing Units (2000)	Number of Rental Housing Units (2000)	Rental Vacancy Rate (%) (2000)	Estimated Current Rental Vacancies	Number of Hotel/Motel Rooms	Number of Recreational Vehicle Sites
Phillips	2,502	632	14.1	89	135	52
Valley	4,847	826	7.9	65	503	79
McCone	1,087	240	25.8	62	14	0
Dawson	4,168	1,076	12.5	135	258	72
Prairie	718	143	15.4	22	9	18
Fallon	1,410	333	22.5	75	82	0
Total	14,732	3,250	13.9	448	1001	221

Sources: Keystone 2009a, which used the following primary data sources: Rentals = Census 2000; RV sites = Delorme Gazetteers; total hotel and motel rooms = www.travelpost.com/hotels.aspx, www.aaacolorado.com/travel/, www.tripadvisor.com/.

I-3.7.1.3 Economic Activity

Using the most recent data available, Table I-3.7.4 lists 2007 personal income and employment by industry in the six counties crossed by the proposed route. The table lists only industries with personal income equal to or greater than 5.0 percent of the respective county's total personal income, with the exception of farming. Major industries in the counties include government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation.

TABLE I-3.7-4 Employment by Major Industry in Counties Crossed by the Route in Montana[1]				
County	Industry	Number of Employees	Total Personal Income ($1000)	Percent of County Total Personal Income
Phillips	Farm	613	2,224	3.6
	Government	430	17,759	29.1
	Health Care and Social Assistance	213	5,126	8.4
	Transportation and warehousing	107	4,939	8.1
	Retail Trade	229	4,406	7.2
	Wholesale Trade	113	3,995	6.6
	Other Services	187	3,920	6.4
	Construction	145	3,598	5.9
	Finance and Insurance	82	3,124	5.1
	Other Categories	568	11,844	5.1
	Non-Farm Subtotal	2,074	58,711	96.4
	County Total	2,687	60,935	100.0
Valley	Farm	826	6,455	4.9
	Government	762	35,426	27.1
	Transportation and Warehousing	168	13,242	10.1
	Retail Trade	459	9,371	7.2
	Finance and Insurance	186	7,186	5.5
	Other Categories	2,419	58,897	45.1
	Non-Farm Subtotal	3,994	124,122	95.1
	County Total	4,820	130,577	100.0
McCone	Farm	444	4,667	17.0
	Government	189	5,809	21.2
	Wholesale Trade	75	3,175	11.6
	Construction	50	1,513	5.5
	Other Categories	539	12,248	44.7
	Non-Farm Subtotal	853	22,745	83.0
	County Total	1,297	27,412	100.0
Dawson	Farm	581	9,622	3.7
	Government	792	32,948	18.4`
	Health Care and Social Assistance	729	23,668	13.2
	Rail Transportation	68[1]	27,591	15.4
	Retail Trade	661	13,102	7.3
	Other Categories	2,245	72,086	40.3
	Non-Farm Subtotal	5,108	169,395	94.6
	County Total	5,689	179,017	100.0
Prairie	Farm	221	3,517	22.4
	Government	175	6,998	44.6

TABLE I-3.7-4 Employment by Major Industry in Counties Crossed by the Route in Montana[1]				
County	Industry	Number of Employees	Total Personal Income ($1000)	Percent of County Total Personal Income
	Other Categories	277	5,170	33.0
	Non-Farm Subtotal	452	12,168	77.6
	County Total	673	12,168	100.0
Fallon	Farm	398	7,045	8.1
	Mining	250-499[2]	18,039	20.7
	Government	283	11,288	13.0
	Construction	108[2]	7,909	9.1
	Transportation and Warehousing	140	7,598	8.7
	Health Care and Social Assistance	158	4,711	5.4
	Other Categories	196	30,359	34.9
	Non-Farm Subtotal	1,842	79,904	91.9
	County Total	2,240	86,949	100.0

Source: U.S. Bureau of Economic Analysis 2009
[1] Data presented only for industries with personal income equal to or greater than 5.0 percent of the respective county's total personal income.
[2] Data not available in U.S. Bureau of Economic Analysis 2009; data from U.S. Census Bureau 2009

In 2007 there was a relatively wide range of total personal income among the six counties. In Dawson County and Valley County, the total personal incomes for that year were about $179 million and $131 million, respectively, and in McCone County and Prairie County they were about $27 million and $12 million, respectively.

Personal income generated from farming ranged from about 3.6 percent of the total personal income in Phillips County, to 22.4 percent of the total in Prairie County. Table I-3.7.5 lists the number of farms for each of the six counties for 2007 and 2002. The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Valley County had 420 farms in 2007, up from the 336 in 2002. The county with the fewest farms is Prairie County, with 105. A comparison between the 2007 agricultural census data and the 2002 data shows that the number of farms in each county increased.

TABLE I-3.7-5 Farm Income in Counties Crossed by the Project Route								
	2007			2002			Percent Change from 2002	
County	Number of Farms	Gross Income ($ 000)	Percent of State Total	Number of Farms	Gross Income ($ 000)	Percent of State Total	Number of Farms	Gross Income
Phillips	241	6,034	3.0	190	2,259	2.2	27	167
Valley	420	9,719	4.8	336	3,024	2.9	25	221
McCone	315	4,950	2.5	263	1,751	1.7	20	183
Dawson	295	2,641	1.3	263	1,810	1.7	12	46
Prairie	105	1,664	0.8	91	906	0.9	15	84
Fallon	165	1,538	0.8	140	658	0.6	18	134
Montana	11,344	201,752	100	9,968	103,574	100	14	95

Source: U.S. Department of Agriculture 2002 and 2007.

Per capita income and median household income for each county crossed by the proposed route are listed in Table I-3.7-6 along with data for the state and the U.S. In most counties, the 2007 per capita income and the 2007 median household income were less than those of the state, and in every county the 2007 per capita income and median household income were less than the national levels.

The county with the lowest 2007 median household income was Prairie, at $32,857, which was $10,143 less than the state's median household income. The county with the highest 2007 median household income was Dawson, at $43,678, which was $678 greater than the state's median household income.

TABLE I-3.7-6 Per Capita Income for Counties Crossed by the Route in Montana						
	Per Capita Income[1] ($)			Median Household Income[2] ($)		
County	2007	1999	Difference Between County and State in 2007	2007	2004	Difference Between County and State in 2007
Phillips	26,876	17,288	-6,349	33,798	31,742	-9,202
Valley	31,556	23,247	-1,669	37,019	34,514	-5,981
McCone	24,857	20,499	-8,368	38,535	29,746	-4,465
Dawson	29,268	20,307	-3,957	43,678	35,740	678
Prairie	28,874	21,524	-4,351	32,857	31,221	-10,143
Fallon	35,405	20,281	2,180	42,408	37,822	-592
Montana	33,225	21,585	-5,390	43,000	35,574	-7,740
United States	38,615	27,939	NA	50,740	44,334	NA[3]

[1] Data from U.S. Bureau of Economic Analysis, 1999 and 2007.
[2] Data from U.S. Census Bureau, 1999, 2004, and 2007b.
[3] NA = not available.

As noted above, the major industries in the six counties are government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation. In the general area (eastern Montana), there were approximately 20,180 semi-skilled labor jobs and 32,280 skilled labor jobs in 2008 (Ockert 2008). The median wage was $21,366 for semi-skilled labor and $36,587 for skilled labor.

Unemployment data for the six counties, the state, and the U.S. are listed in Table I-3.7-7. The October 2009 unemployment rate in each county was lower than the U.S. level for the same time period, and generally less than that of the state.

TABLE I-3.7-7
Unemployment Rates for Counties Along the Route in Montana

Location	Rate (%)			Difference Between County and State in October 2009 (%)
	October 2009[1]	2008	2002	
Phillips	4.9	4.5	4.5	-1.0
Valley	4.7	3.8	4.1	-1.2
McCone	3.1	2.6	2.7	-2.8
Dawson	3.9	3.3	3.4	-2.0
Prairie	3.0	3.8	5.1	-2.9
Fallon	2.8	2.3	3.3	-3.1
Montana	5.9	4.5	4.5	-
United States	10.2	5.8	5.8	-

Source: U.S. Bureau of Labor Statistics 2009.
[1] Preliminary.

I-3.7.1.4 Tax Revenue

Table I-3.7-8 lists the 2007 property taxes levied by taxing entities in each county along the proposed route, the assessed value of property, and the implied effective tax rate. Effective property tax rates in the area of influence range from a low of 1.61 percent for the rural taxes assessed on property value in Fallon County to a high of 3.09 for the rural taxes assessed on property value in Dawson County. The average rate of the assessed rural taxes for the counties was 2.39 percent.

TABLE I-3.7-8
Assessed 2007 Tax Revenues and Assessed Property Valuation in Counties Crossed by the Project Route

County	Property Valuation ($)	Tax by Assessing Entity ($) State	County	Local Schools	Countywide Schools	Misc Fire Districts	Average City	SIDs[1] and Fees	Total All Taxes	Effective Tax Rate (%)
Phillips	321,173,215	1,454,022	1,072,155	2,348,783	388,631	101,757	280,298	1,428,280	7,073,926	2.20
Valley	485,988,933	2,288,509	2,616,238	4,256,067	1,109,805	393,838	824,998	1,917,211	13,406,666	2.76
McCone	191,888,122	617,586	1,330,050	956,802	243,504	16,778	136,958	28,409	3,330,087	1.74
Dawson	389,463,999	1,508,449	2,899,065	4,339,497	757,015	151,662	1,009,983	1,384,520	12,050,191	3.09
Prairie	94,403,567	332,198	760,371	427,445	118,587	14,598	76,641	468,104	2,197,944	2.33
Fallon	334,310,467	2,056,667	2,661,678	0	0	123,032	320,706	232,547	5,394,630	1.61
Total	1,817,228,303	8,257,431	11,339,557	12,328,594	2,617,542	801,665	2,649,584	5,459,071	43,453,444	2.39 (avg)

Source: Montana Department of Revenue 2009a.
[1] SIDs = Special Improvement Districts.

I-3.7.1.5 Public Services

Table I-3.7-9 lists key public services and facilities that serve the area within approximately 50 miles of the proposed route in each of the six counties. Each county has at least one medical facility.

There are multiple law enforcement service providers in the counties along the proposed route, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies, such as university police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, two law enforcement agencies serve each county that would be crossed by the proposed Project. Valley County is served by four law enforcement agencies.

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities.

Although it is unlikely that construction workers would bring school-aged children to the area during the construction period, schools are included in Table I-3.7-9.

TABLE I-3.7-9
Public Services and Facilities within 50 Miles of the Project in Montana

County	Police/Sheriff Departments[1]	Fire Departments[1]	Nearest Medical Facilities[2]	Schools[3]
Phillips	1	2	Phillips County Hospital (Malta)	1 district, with 5 elementary schools, 7 middle schools, and 4 high schools
Valley	4	3	Frances Mahon Deaconess Hospital (Glasgow)	8 districts, with 15 elementary schools, 18 middle schools, and 8 high schools
McCone	2	1	McCone County Health Center (Circle)	1 district, with 2 elementary schools, 2 middle schools, and 1 high school
Dawson	2	4	Glendive Medical Center (Glendive)	1 district, with 4 elementary schools, 4 middle schools, and 2 high schools
Prairie	2	1	Prairie Community Health Center (Terry)	2 districts, with 3 elementary schools, 3 middle schools, and 1 high school
Fallon	2	2	Fallon Medical Complex (Baker)	1 district, with 2 elementary schools, 3 middle schools, and 2 high schools

[1] Capital Impact 2008.
[2] HomeTownLocator 2008.
[3] Great Schools 2008.

Table I-3.7-10 provides the 2002 operations budgets for significant public services supplied by the municipalities potentially affected. In 2002, Glendive had the largest police, fire, highway, and solid waste management operations budgets. During that same year, Nashua had the smallest police, fire, and solid waste management operations budget and Terry had the smallest highway operations budget.

TABLE I-3.7-10 Operations Budgets for Public Services in the Communities Near the Project in Montana[1]					
	Operations Budget ($)[2]				
City/Town	Police Protection	Fire Protection	Regular Highways	Solid Waste Management	Housing and Community Development[1]
Malta	151,000	24,000	87,000	275,000	294,000
Glasgow[3]	587,000	51,000	538,000	228,000	14,000
Nashua	8,000	3,000	27,000	8,000	NA
Circle	80,000	4,000	28,000	74,000	64,000
Glendive[3]	704,000	280,000	406,000	764,000	28,000
Terry	40,000	6,000	22,000	91,000	240,000
Baker	168,000	28,000	120,000	159,000	NA

[1] Data are for 2002 except where noted.
[2] Source: City-Data 2008.
[3] 2006 Operations Budget.

I-3.7.2 Potential Impacts and Mitigation Measures

I-3.7.2.1 Overall Societal Benefits and Costs of the Project

The main benefit to society of the proposed Project would be the transport of crude oil from the WCSB to the U.S. to meet the growing demand by refineries and their markets in Petroleum Administration for Defense District (PADD) III. An additional benefit to society would be the transport of crude oil to some refineries in PADD II. Crude oil would be delivered primarily to existing delivery points near Nederland and Houston, Texas (PADD III), with some deliveries to the Cushing facility in Oklahoma (PADD II). Crude oil would be transported from these delivery points to various refineries. As described in Section 1.2 of the EIS, PADD III refineries are projected to have an increasing need for foreign oil, and would benefit from imports from relatively stable and secure nations such as Canada. This need is in part documented by the fact that at the time of issuance of the EIS, Keystone had binding contracts for approximately 380,000 bpd of WCSB crude oil, which is more than half of the initial 700,000 bpd capacity of the pipeline. The Project would benefit residents of the United States, particularly those that obtain fuel from PADD III and PADD II refineries. In other words, the main benefits from this Project would be regional and national rather than local to Montana.

As with any type of economic activity, building the Project would produce a social opportunity cost to the economy when compared to alternative uses of those same economic resources. The opportunity cost would be the next best use that could be made of the jobs, energy and materials devoted to the Project in the U.S. or world economy. Conceptually, the resources used to construct the proposed Project could be used to invest in energy efficiency, improve gas mileage efficiency to reduce crude oil consumption, build other projects such as buildings or bridges, or saved for later. This opportunity cost would mainly be in the form of irretrievable materials, energy, worker hours, and capital used for the Project. However, because the financial costs of the Project would be provided by Keystone, it is not likely that the funds required for the proposed Project would be spent on any of the alternatives listed above.

The social opportunity cost of constructing and operating the Project could also include alternative methods to meet the primary need that the proposed Project is intended to meet; i.e., providing crude oil to PADD III refineries. Alternative ways to meet the need for additional oil transfer capacity might include expanding existing pipelines (this alternative is addressed in Section 4.0 of the EIS), using less oil overall, improvements in oil use efficiency, more domestic production close to PADD III, and developing alternatives to the use of oil as a fuel source. Any social benefits derived from implementation of these alternatives instead of the proposed Project (including energy efficiency) would be an opportunity cost of the Project. However, as described in Sections 1.2 and 4.0 of the EIS, the proposed Project is likely the only feasible alternative to meet the projected oil import needs of PADD III, and thus the opportunity cost in this case is likely less than the social benefits of the Project. In other words, energy efficiency and other alternatives would not be enough to meet the projected crude oil need in PADD III that the Project is designed to serve.

There may be indirect national or regional (PADD III and II) benefits and costs from the proposed Project, including the effect on oil price (likely to be insignificant) and any secondary effects on the oil market and crude oil transportation grid as a result of the new pipeline. Also, it is likely that obtaining additional oil from a stable and secure source would reduce the need to obtain oil from unfriendly or less stable sources and may reduce the overall costs of obtaining oil from unfriendly sources.

There may be local impacts if additional electrical distribution lines are built in Montana to provide electrical power to the pump stations. These would likely be relatively small distribution lines with minimal economic impact from their construction.

Project construction may result in some social stresses on those who either oppose the Project or who do not like change (e.g., the temporary presence of a large number of construction workers). However, most social stresses that occur would most likely fade or end when construction is completed. In addition, as described in this appendix and in the EIS, costs from environmental damage and a lessening of recreational quality would be minimal.

The benefits and costs to Keystone would be private benefits and costs. While this EIS is not concerned with private benefits and costs, it is useful to note what these benefits and costs might generally be. Private benefits to Keystone would primarily consist of gross revenues earned from transporting crude oil for shippers. These revenues would accrue to Keystone and may be shared with its stockholders. Gross revenues would translate into profits for Keystone if the Project earns enough to offset costs over time. Profits could take the form of higher salaries, bonuses, and promotions for its employees; profits may also increase the ability of Keystone to expand or invest in other projects, and/or be used to provide a higher return for shareholders. It may take several years for the Project to be profitable as revenues increase, costs are recovered, and interest costs on financing decrease. Profits could last for the life of the Project.

The main private costs of the proposed Project would be borne by Keystone and include construction; operation and maintenance; local, state and federal taxes; implementing environmental mitigation measures; financing (debt payments); permitting; landowner payments; contingencies; and any fines that may be imposed. If such costs were too great, if Project revenues were not sufficiently high, or if the Project is not constructed, net losses could accrue to Keystone and to shareholders, either in the short term (e.g., the Project isn't constructed and Keystone has to absorb the costs incurred to date) or in the long term (e.g., the Project is constructed and operated, but operates at a net loss for many years).

The secondary benefits and costs to those who live in proximity to the proposed Project (e.g., personal income from working on the Project, tax revenues to a local taxing district, and inconvenience during construction) are discussed below.

I-3.7.2.2 Construction

Construction Workforce and Work Camps

Construction of the Project pipeline is planned to occur in 4 construction spreads in Montana (Table I-3.7-11). Each spread would require 6 to 8 months to complete. The Project would require construction of 6 pump stations in Montana, with each pump station anticipated to be constructed in 18 to 24 months. Work on the Project in Montana is proposed to commence in 2011 and to be completed by the end of 2012.

TABLE I-3.7-11
Pipeline Construction Spreads for the Project in Montana

Spread Number	Approximate Location	Approximate Length (miles)	County	Community Base for Construction
Spread 1	MP 0 to 81	81	Phillips and Valley	Hinsdale and Glasgow
Spread 2	MP 81 to 163	82	McCone and Dawson	Glasgow and Circle
Spread 3	MP 163 to 247	84	Dawson, Prairie, and Fallon	Glendive and Baker
Spread 4[1]	MP 247 to 282	35	Fallon	NA[2]

[1] Spread 4 begins in Baker, Montana, extends approximately 35 miles to the Montana/South Dakota border, and continues into South Dakota for approximately 51 miles.
[2] The worker base for construction of Spread 4 would be in South Dakota.

Keystone anticipates a maximum construction workforce of 500 to 600 personnel for each spread and 20 to 30 for each pump station (see Table I-3.7-12). A maximum of two spreads would be constructed simultaneously during a work season; one work season is planned for 2011 and the second is planned for 2012. Pump stations would not be constructed concurrently and the workers may be assigned to more than one pump station; however, the assessments below consider the maximum work force that would involve a separate workforce for each pump station.

Keystone would attempt to hire local construction workers to the extent practical. If a sufficient number of qualified workers is available, Keystone estimates that approximately 10 to 15 percent of the workforce may be hired from the local pool of construction workers for each pipeline spread (about 50 to 100 workers per spread) and each pump station (about 2 to 4 workers per spread). However, there may not be a sufficient number of workers available in some areas of Montana to achieve this goal.

TABLE I-3.7-12
Estimated Number of Construction Workforce for the Project in Montana

Facility	Number of Workers per Facility: Low	Number of Workers per Facility: High	Number of Facilities[1]	Total Construction Workforce[1]: Low	Total Construction Workforce[1]: High
Spread	500	600	4	2,000	2,400
Pump Station	20	30	6	120	180
Total	520	630	4	2,120	2,580

[1] Only two of the three spreads in Montana would be in operation concurrently. Construction workers on Spread 4 would be housed in South Dakota. The peak pipeline workforce to be housed in the Montana work camps would be up to 1,200 during either of the two work seasons. The total workforce listed in this table is the cumulative total over two work seasons.

Keystone recognizes that the rural areas in Montana along the proposed route do not have sufficient temporary housing to accommodate the planned construction workforce. As a result, Keystone would install temporary work camps to provide accommodations for workers during construction of the pipeline (as further described in Section 2.2 of the EIS). There would be two camps in Montana, one near Nashua and the other near Baker, to accommodate workers from Spreads 1, 2, and 3. Workers from Spread 4 would be housed in South Dakota. As noted above, no more than two spreads would be in operation during each of the two work seasons. Pump station workers would not be housed in the work camps.

Each construction camp site would be established on approximately 80 acres of land, of which 30 acres would be used as a contractor yard and 50 acres for housing and administration. The camps would be designed to provide accommodation for approximately 600 people each and would include prefabricated, modular dormitory-style units with heating and air conditioning systems. The camps would provide sleeping areas with shared and private wash rooms, recreation facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, security units, and an infirmary unit.

Potable water would be provided by drilling a well where feasible. If adequate supply cannot be obtained from a well, water would be obtained from municipal sources or trucked to each camp. A wastewater treatment facility would be included in each camp. Electricity for the camps would either be generated on site through diesel-fired generators or provided by local utilities from interconnections to distribution systems.

Population

During construction there would be a temporary increase in population in each county along the proposed route due to the presence of construction workers. Population impacts in the region of influence would depend on the composition of the construction workforce in terms of local versus non-local workers and the existing population of the area. Keystone would use local construction workers where possible, with an estimated 10 to 15 percent of the total construction workforce possibly hired from local communities. There is a possibility that local workers would leave their existing jobs to take on higher-paying Project-related construction jobs, but that effect would likely be insignificant in the long term. Few non-local workers are expected to be accompanied by their children or other family members because of the mobile nature of the workforce along the pipeline route during construction.

As described above, pipeline workers in Montana would be housed in work camps established by Keystone; this would reduce the effect of the temporary increase in population on residents of the rural areas. As noted above, a maximum of two spreads would be constructed simultaneously, and therefore, the 1,200-person total capacity of the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season (one work season is planned for 2011 and the second is planned for 2012).

With use of the work camps for the majority of the construction workforce in Montana, the temporary population increase would result in a minor and temporary impact on the social structure of the area in the Project vicinity. However, work camps would be in the vicinity of Baker and Nashua, and after work hours a portion of the pipeline workers would likely leave the camps on occasion. Similarly, pump station construction workers using local housing would be a part of the local population during non-working hours for the duration of the construction period each work season. This could result in occasional temporary minor to moderate impacts in Baker and Nashua and in the vicinity of the pump stations, primarily in the form of social stresses and an increased demand on local public services. Those impacts would end after construction was completed.

Housing

Assuming that 10 to 15 percent of the workforce would be local construction workers, there would be a need for approximately 440 to 570 housing units for workers on each construction spread, assuming that each worker would require his or her own unit. However, it is not likely that a sufficient number of temporary housing units would be available, even if some workers lived in their own campers or motor homes. Therefore, as described above, to accommodate most of the construction workers in Montana, Keystone would establish two construction work camps in the area. Because a maximum of two spreads would be constructed simultaneously, the 1,200-person total capacity of the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season.

Workers associated with the pump stations would not be housed in the work camps. Use of temporary housing in the vicinity of the pump stations may result in a temporary, minor impact to other potential users of temporary housing during each work season (e.g., tourists and anglers). However, the owners of the temporary housing would experience a positive impact if the housing would otherwise remain vacant during construction.

Although there would be some temporary housing units rented by workers, use of the camps by the majority of workers would avoid using all of the available temporary housing and allow normal use of those housing units. As a result, there may be a minor, temporary impact on temporary housing in the vicinity of the proposed route due to construction of the Project.

Public Services

The influx of construction workers in local communities also has the potential to generate additional demands on local public services. The magnitude of public service impacts would vary by community, depending on the size of the non-local workforce and their accompanying families, the size of the community, and duration of stay. However, few non-local workers are expected to be accompanied by family members because of the short construction period and transient nature of the work. With a relatively large construction workforce temporarily in the area, the primary increases in public service needs would be responses to emergencies and disturbances during construction. However, at least the majority of the construction workforce would be housed in the work camps where there would be medical care facilities and security staff to handle emergencies and disturbances. The camps would also include water supplies and sanitary waste treatment facilities. As a result, construction impacts to existing public services in the vicinity of the Project, including the towns of Baker and Nashua, would be minor and temporary.

Local Economies

The Project would generate direct and indirect economic benefits for local and regional economies along the pipeline route. During construction, these benefits would be derived from wages earned by local construction workers that are above the wages that might otherwise have been earned at other jobs by those workers, from construction-related expenditures made at local businesses, construction worker spending in the local economy that would not have occurred without the Project, and taxes on both wages and expenditures that would go to local and state governments. Overall, construction of the proposed Project in Montana would result in a positive economic impact to the businesses and taxing jurisdictions in counties along the proposed route and in some of the communities near the route.

Construction through active cropland would result in the loss of income from at least a portion of the crop for at least one growing season. It may also affect income and land value in the long term along the ROW, as well as the ability of the landowner to sell the property. However, Keystone stated it would compensate farmers for lost crops, reclaim the land in the construction ROW to match pre-construction conditions to allow farming to continue, and provide payments for easements along the proposed route. As a result, the impact of the Project on farm income would be temporary. The significance of the impact to each landowner would depend on the terms of payment agreed upon between the landowner and Keystone.

During operation, the pump stations would consume at least as much electrical power as other customers currently use in the area. That could result in long-term stability of the usage rates of electricity and increased profits to local electric co-ops; it may also result in issues for local co-ops regarding procurement of additional energy supplies.

I-3.7.2.3 Operation

Population, Housing, and Public Services

Operation of the Project would require approximately four to eight permanent employees in Montana. Even assuming that none of those workers would be local residents, that number of new residents would not have an adverse effect on population, housing, or public services in the counties along the proposed route in Montana or in the nearby communities.

Local Economies

During operation, activities associated with maintenance, monitoring, and repair of the Project would generate a demand for goods and services, including electrical power, that would result in long-term economic benefits to the region. The beneficial impact would likely be minor in comparison to the overall economies of the counties and the communities near the Project.

Tax Revenue and Fiscal Resources

Once constructed, the Project would generate long-term property tax revenues for the counties traversed by the pipeline that would last for the life of the Project. The increase in tax revenue was estimated by staff at the Montana Department of Revenue (MDR 2009a and b). Table I-3.7-13 lists the estimated property taxes by taxing district within each county. Based on those estimates, the Project would generate approximately $63 million in annual property tax revenues in Montana, or about 46 percent more in property taxes than was generated in 2007 in those same counties. About $47 million of that amount would be paid to McCone, Valley, and Dawson counties.

In estimating the property taxes, the MDR applied the existing tax rate (12.0 percent) for Class 9 properties (Utilities Mileage, Pipelines Mileage) to the estimated capital cost of the pipeline in Montana. The property taxes generated by the Project would have a long-term positive economic impact on the counties. The magnitude of the impact would vary from county to county and would range from minor to major.

Some tax revenue would also go to the state general fund and to the federal government. If the Project receives lower tax rates than estimated in Table I-3.7-13, the revenues would also be lower than the estimates in presented in the table. There would be relatively minor costs to state agencies for monitoring the Project during construction and operation. These costs would likely be offset by fees collected from Keystone.

TABLE I-3.7-13
Estimated Taxes by Special Districts in Counties Along the Project Route

County	Portion of Total Length of Project Pipeline in County (%)	Market Value (Capital Cost of Project)	Class 9 Tax Rate (%)	Taxable Value	Average Rural Mills	Estimated Total Taxes	95-Mill Statewide School Equalization Tax	6-Mill Statewide University System Tax	Total Local Taxes
Phillips	1.88	$130,941,355	12	$15,712,963	378.93	$5,954,069	$1,492,731	$94,278	$4,367,060
Valley	4.60	$320,388,422	12	$38,446,611	487.53	$18,743,712	$3,652,428	$230,680	$14,860,604
McCone	4.89	$340,586,823	12	$40,870,419	542.36	$22,166,302	$3,882,690	$245,223	$18,038,389
Dawson	2.96	$206,162,985	12	$24,739,558	671.99	$16,624,844	$2,350,258	$148,437	$14,126,149
Prairie	1.55	$107,956,968	12	$12,954,836	554.08	$7,178,068	$1,230,709	$77,729	$5,869,630
Fallon	4.68	$325,960,395	12	$39,115,247	246.62	$9,646,602	$3,715,948	$234,691	$5,695,963
Total	20.56	$1,431,996,948		$171,839,634		$80,313,597	$16,324,764	$1,031,038	$62,957,795

Source: Montana Department of Revenue 2009b.

I-3.7.3 References Cited

Capital Impact. 2008. Law Enforcement Agencies and Fire Departments in Montana. Website: http://www.capitolimpact.com/gw/statepage.asp?state=mt&stfips=30&stname=Montana. (Accessed September 2008.)

City-Data. 2008. Website: http://www.city-data.com/. (Accessed November 2008.)

Delorme. 2004. Montana Atlas & Gazetteer. P.O. Box 298, Yarmouth, Maine 04096.

Great Schools. 2008. Website: http://www.greatschools.net/. (Accessed September 2008.)

HomeTownLocator. 2008. Montana Counties. Website: http://montana.hometownlocator.com/counties/. (Accessed September 2008.)

Hotel and motel rooms were found using www.travelpost.com/hotels.aspx, www.aaacolorado.com/travel/, www.tripadvisor.com/

Keystone. 2009a. Environmental Report for the Proposed Keystone XL Pipeline Project. Prepared for TransCanada Keystone XL Pipeline, LLC.

Keystone. 2009b. Response to Data Request #1. Submitted to U.S. Department of State by TransCanada Keystone XL Pipeline, L.P. Application for Presidential Permit. January 29.

Keystone. 2009c. Response to Data Request #2. Submitted to U.S. Department of State by TransCanada Keystone XL Pipeline, L.P. Application for Presidential Permit. April 4.

Montana Department of Revenue. 2009a. Biennial Report, July 1, 2006 to June 30, 2008, Revisions January 13. Website: http://mt.gov/revenue/ publicationsreports/ biennialreports/2005-2006biennialreport.pdf. (Accessed July 21, 2009.)

Montana Department of Revenue. 2009b. Personal communication with Vern Fogle, Economist. E-mail correspondence, November 24.

Ockert, S. 2008. Department of Commerce, Census and Economic Information Center, Montana. Email Communication with S. Graber, ENSR. September 17, 2008.

Travelpost.com. 2008. Hotel Directory. Website: http://www.travelpost.com/hotels.aspx. Accessed September 2008.

U.S. Bureau of Economic Analysis. 1999. Regional Economic Accounts, Local Area Personal Income, Table CA1-3: Per capita personal income. Available at: http://bea.gov/regional/reis/. Accessed November 2009.

U.S. Bureau of Economic Analysis. 2006. Local Area Personal Income. Website: http://www.bea.gov/bea/regional/reis/default.cfm#step3. Accessed September 2008.

U.S. Bureau of Economic Analysis. 2007. Regional Economic Accounts, Local Area Personal Income, Table CA1-3: Per capita personal income. Available at: http://bea.gov/regional/reis/. Accessed November 2009.

U.S. Bureau of Economic Analysis. 2009. CA05N, Personal Income by major Source and earnings by NAICS industry, and CA25N, Total full-time and part-time employment by NAICS industry. Accessed on December 9, 2009.

U.S. Bureau of Labor Statistics. 2009. Local Area Unemployment Statistics. Website: http://data.bls.gov/gov/lau/#tables. Accessed December 2009.

U.S. Census Bureau. 1999. Small Area Income & Poverty Estimates, State and County Interactive Table, http://www.census.gov/did/www/saipe/data/statecounty/index.html. Accessed November 2009.

U.S. Census Bureau. 2000. Various demographic data, including population, housing, and race-ethnicity. Available online at: <http://censtats.census.gov/usa/usa.shtml>. Accessed in 2009.

U.S. Census Bureau. 1999. Small Area Income & Poverty Estimates, State and County Interactive Table, http://www.census.gov/did/www/saipe/data/statecounty/index.html. Accessed November 2009.

U.S. Census Bureau. 2004. Small Area Income & Poverty Estimates, State and County Interactive Table, http://www.census.gov/did/www/saipe/data/statecounty/index.html. Accessed November 2009.

U.S. Census Bureau. 2007a. Various demographic data, including population, housing, and race-ethnicity. Available online at: <http://censtats.census.gov/usa/usa.shtml>. Accessed in 2009.

U.S. Census Bureau. 2007b. Small Area Income & Poverty Estimates, State and County Interactive Table, http://www.census.gov/did/www/saipe/data/statecounty/index.html. Accessed November 2009.

U.S. Census Bureau. No Date. 1990s Population data. Available at; http://www.census.gov/popest/archives/1990s/. Accessed December 2009.

U.S. Department of Agriculture. 2002. National Agriculture Statistics Service.

U.S. Department of Agriculture. 2007. National Agriculture Statistics Service.

I-3.8 AIR QUALITY AND NOISE

I-3.8.1 Air Quality

I-3.8.1.1 Environmental Setting

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the vicinity of the Project in Montana are described below.

Montana Climate

Montana is in the humid continental climate zone, an area noted for its variable weather patterns and large temperature ranges. Summer high temperatures average over 89 ˚F, while winter low temperatures average 12 to 20 ˚F. Many different types of air masses occur over the state, principally polar and tropical air masses. Where polar air masses collide with tropical air masses, there is an uplift of the less dense and moister tropical air that results in precipitation. Representative climate data for Circle, which is about 2.2 miles from the proposed route, are presented in Table 3.12.1-1 of the EIS.

Ambient Air Quality

Ambient air quality is regulated by federal, state, and local agencies. State air quality standards cannot be less stringent than the national ambient air quality standards (NAAQS). The Montana ambient air quality standards (MAAQS) and the NAAQS are listed in Table I-3.8-1.

The U.S. Environmental Protection Agency (EPA) uses four categories to classify the air quality of all areas of the United States: attainment, unclassifiable, maintenance, or nonattainment. The Project would not pass through any nonattainment areas in Montana.

EPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the country, and to assist in designation of nonattainment areas. To characterize the background air quality in Montana, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations for 2008 is presented in Table 3.12.1-3 of the EIS.

TABLE I-3.8-1 National and Montana Ambient Air Quality Standards				
Pollutant	**Time Period**	**Federal (NAAQS)**	**Montana (MAAQS)**	**Standard Type**
Carbon Monoxide	Hourly Average	35 ppm[a]	23 ppm[b]	Primary
	8-Hour Average	9 ppm[a]	9 ppm[b]	Primary
Fluoride in Forage	Monthly Average	- -	50 µg/g[c]	- -
	Grazing Season	- -	35 µg/g[c]	- -
Hydrogen Sulfide	Hourly Average	- -	0.05 ppm[b]	- -
Lead	90-Day Average	- -	1.5 $\mu g/m^3$ [c]	- -
	Quarterly Average	1.5 $\mu g/m^3$	- -	Primary & Secondary
	Rolling 3-Month Average	0.15 $\mu g/m^3$ [c]	--	Primary & Secondary
Nitrogen Dioxide	Hourly Average	0.100 ppm[d]	0.30 ppm[b]	Primary
	Annual Average	0.053 ppm[e]	0.05 ppm[f]	Primary & Secondary
Ozone	Hourly Average	0.12 ppm[g]	0.10 ppm[b]	Primary & Secondary
	8-Hour Average	0.075 ppm[h]	- -	Primary & Secondary
Particulate matter less than 10 microns in diameter	24-Hour Average	150 $\mu g/m^3$ [i]	150 $\mu g/m^3$ [j]	Primary & Secondary
	Annual Average	- -	50 $\mu g/m^3$ [k]	Primary & Secondary
Particulate matter less than 2.5 microns in diameter	24-Hour Average	35 $\mu g/m^3$ [l]	- -	Primary & Secondary
	Annual Average	15 $\mu g/m^3$ [m]	- -	Primary & Secondary
Settleable Particulate	30-Day Average	- -	10 g/m^2 [c]	- -
Sulfur Dioxide	Hourly Average	- -	0.50 ppm[i]	- -
	3-Hour Average	0.50 ppm[a]	- -	Secondary
	24-Hour Average	0.14 ppm[a]	0.10 ppm[b]	Primary
	Annual Average	0.030 ppm[e]	0.02 ppm[f]	Primary
Visibility	Annual Average	- -	3 x 10 -5/m[f]	- -

Sources: U.S. Environmental Protection Agency 2009 and Montana Department of Environmental Quality 2009.
Notes:

Mg = Microgram(s).
m^3 = Cubic meter(s).
ppm = Part(s) per million.

[a] Federal violation when exceeded more than once per calendar year.
[b] State violation when exceeded more than once over any 12 consecutive months.
[c] Not to be exceeded (ever) for the averaging time period as described in state or federal regulation.
[d] Federal violation when the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area that exceeds 0.100 ppm (effective January 22, 2010).
[e] Federal violation when the annual arithmetic mean concentration for a calendar year exceeds the standard.
[f] State violation when the arithmetic average over any four consecutive quarters exceeds the standard.
[g] Applies only to nonattainment areas designated before the 8-hour standard was approved in July, 1997; Montana has none.
[h] Federal violation when 3-year average of the annual 4th-highest daily maximum 8-hour concentration exceeds standard.
[i] State violation when exceeded more than eighteen times in any 12 consecutive months.
[j] State and federal violation when more than one expected exceedance per calendar year, averaged over 3-years.
[k] State violation when the 3-year average of the arithmetic means over a calendar year at each monitoring site exceed the standard.
[l] Federal violation when 3-year average of the 98th percentile values at each monitoring site exceed the standard.
[m] Federal violation when 3-year average of the annual mean at each monitoring site exceeds the standard.

I-3.8.1.2 Regulatory Requirements

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The requirements applicable to the proposed Project in Montana are described in detail in Section 3.12.1.2 of the EIS.

I-3.8.1.3 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis:

- Temporary impacts resulting from emissions associated with construction activities; and
- Long-term or permanent (i.e., lasting the life of the Project) impacts resulting from emissions generated from operation of a stationary source.

Construction

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with construction of the Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks. Because pipeline construction moves through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies and in accordance with the procedures in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix). In addition, Keystone would establish work camps in Montana to house construction workers and to provide key services to the workers. The camps may require preconstruction permitting unless exemptions exist and are met for temporary nonroad engines. By complying with applicable regulations and implementing the procedures in the CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1), emissions from construction-related activities would not significantly affect local or regional air quality; construction of the Project would have a minor, short-term adverse impact on the air quality of the area.

Operation

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with operation of the Project would include minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations, and minimal emissions from mobile sources using fossil fuel. Keystone would comply with applicable regulations that address emissions during operation. As a result, emissions from operation of the Project would not significantly affect local or regional air quality. The impact on air quality would be minor and would last for the life of the Project.

I-3.8.2 Noise

I-3.8.2.1 Environmental Setting

The Project would be constructed in primarily rural agricultural areas of Montana. It is estimated that the existing sound level in the vicinity of the proposed route is in the range of 40 dBA (rural residential) to 45 dBA (agricultural cropland). Sound in the area is generated by roadway traffic, farm machinery on a seasonal basis, pets, and various household noises. EPA (1978) reported that areas along major highways and interstates may have higher ambient sound levels, ranging from approximately 68 to 80 dBA.

In Montana, there are no residences within 25 feet of the ROW and only six residences within 500 feet of the ROW (Keystone 2009). Based on Keystone (2009) and data in Montana Basemap Service Center (2010), there are no residences within 0.5 mile of the pump stations, and there are four residences and one commercial structure more than 0.5 mile and less than 1 mile from the pump stations. Prior to construction, Keystone would verify the proximity of structures to the pump stations and determine if they are occupied by residences or businesses.

I-3.8.2.2 Regulatory Requirements

The noise requirements applicable to the proposed Project in Montana are described in Section 3.12.2.2 of the EIS.

I-3.8.2.3 Potential Impacts and Mitigation

Noise impacts for the Project would generally fall into two categories:

- Temporary impacts resulting from construction activities (e.g., operation of construction equipment); and
- Long-term or permanent (i.e., lasting the life of the Project) impacts resulting from operation of Project facilities.

Construction

As noted in Section 3.12.2.3 of the EIS, construction of the Project would be similar to other pipeline system projects in terms of schedule, equipment used, and types of activities. Construction would increase sound levels in the vicinity of Project activities, and the sound levels would vary during the construction period, depending on the construction phase. Construction sound levels are rarely steady, but instead fluctuate depending on the number and type of equipment in use at any given time. Construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance. Residential, agricultural, and commercial areas within 500 feet of the construction ROW would experience short-term inconvenience from the construction equipment noise. Keystone would implement the applicable procedures in its CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1) to minimize the effects of construction noise on individuals, sensitive areas, and livestock. As a result, construction of the proposed Project would have a minor and temporary impact on sound levels in the vicinity of the construction ROW.

Operation

As described in Section 3.12.2.3 of the EIS, operation of the electrically driven pump stations would result in an increase in sound levels. However, this increase would be limited to the area in close proximity to the pump stations. It is expected that sound levels would attenuate nearly to existing ambient levels (40 to 45 dBA) within about 2,300 feet of each pump station, and there are no structures within 0.5 mile (2,640 feet) of the pump stations. Although noise impacts from the electrically powered pump stations are projected to be minor, Keystone would perform a noise assessment survey during operation in locations where residents express concerns about pump station noise. Those surveys would indicate the sound levels at that residence and would be used to determine what noise abatement measures would be needed to reduce the sound levels at that residence. Mitigation measures could include construction of berms around the pump station or planting vegetation screens.

As a result, operation of the Project would not result in a significant increase in sound levels. The impact on sound levels would be minor and would last for the life of the Project.

I-3.8.3 References Cited

Keystone. 2009. Email response to data discrepancies in Supplemental Filing to ER. July 31, 2009.

Montana Basemap Service Center. 2010. Montana Spatial Data Infrastructure, Structures Framework; accessed online at: http://giscoordination.mt.gov/structures/msdi.asp.

Montana Department of Environmental Quality. 2009. Federal & State Air Quality Standards. Available online at: http://www.deq.state.mt.us/AirQuality/Planning/AIR_STANDARDS%20NEW.pdf. Accessed December 2009.

U.S. Environmental Protection Agency (EPA). 1978. Protective Noise Levels. (USEPA 550/9-79-100). November.

U.S. Environmental Protection Agency. 2009. Airdata. Available online at: http://www.epa.gov/air/data/reports.html. Accessed December.

I-4.0 UNAVOIDABLE ADVERSE IMPACTS

The Project would incorporate various types of measures to avoid or reduce environmental impact, including the following:

- Measures committed to by Keystone in its CMR Plan (Appendix B);
- Measures required by regulation at the federal, state, or local level;
- Measures included within the MDEQ Environmental Specifications (Attachment 1); and
- Additional discretionary mitigation measures required by Montana and other cooperating agencies.

Nonetheless, implementation of the Project would result in some adverse impacts that cannot be fully avoided, as summarized in this section. More detailed discussions of the potential impacts that cannot be avoided are presented in Sections 3.1 through 3.12 of the EIS and in Section I-3.0 of this Appendix. Those discussions include the effects on specific species where appropriate. Most of the unavoidable adverse impacts would result from construction of the Project and would be minor and either temporary or short term. None of the unavoidable adverse impacts would be significant.

I-4.1 GEOLOGY

- Potential for a temporary increase in landslide risk during excavation activities in steep areas and at water crossings due to vegetation clearing and alteration of surface drainage patterns.
- Damage or destruction of paleontological resources due to grading and trench excavation.
- Potential that paleontological resources would not be accessible beneath the ROW during operation for the duration of the Project.
- Lost access to potential sand, gravel, clay, and stone resources within the ROW for the duration of the Project.

I-4.2 SOILS AND SEDIMENTS

- Potential temporary to short-term increase in soil erosion where vegetation is cleared.
- Existing structure of some farmland soils may be altered by construction activities.
- Localized soil compaction in construction areas may lead to slower or less vegetation reestablishment following construction.
- Construction activities conducted during precipitation events or wet weather conditions may cause soil rutting and displacement and surface water pooling or water diversion which would increase localized soil erosion.
- Spills or leakage of fuels, lubricants, and/or coolants from construction equipment or vehicles could adversely affect soils.
- Construction in areas where drain tile systems are present would necessitate temporary disruption of these systems.
- Differential settling of soils in the ROW may occur after construction of the pipeline is complete.

- Pipeline operating temperatures may cause a minor and localized increase in soil temperature and a decrease in soil moisture content.

I-4.3 WATER RESOURCES

- Disturbance of soils and vegetation in or near waterbody crossings during construction may result in temporary adverse impacts on water quality and turbidity.
- Water bodies may be adversely affected where erosion occurs and hazardous substances (such as pesticides or herbicides) are present in eroded material.
- Potential minor loss of floodplain area because of placement of Project infrastructure within a floodplain.
- Temporary changes in surface water drainage patterns during construction.
- Minor long-term changes in surface water drainage patterns during operation where aboveground facilities are present and where minor topographic changes have been made.

I-4.4 WETLANDS

- Wetland hydrology may be altered such that wetland functions are reduced, or at some locations, eliminated.
- Alterations of wetland vegetation community composition and structure would occur and primarily be temporary, but in some instances permanent, due to clearing during construction and maintenance activities within the permanent ROW during operation.
- Removal of forested and scrub-shrub wetland habitats during construction would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands along the permanent ROW.
- During construction across depressional wetlands, disturbance to supporting clay layers or small scale disturbances to topography and drainage may alter the retention capacity.
- Pipeline operating temperatures may result in slight increases in water temperatures where the pipeline crosses through small wetlands; small ponded wetlands crossed by the alignment may remain unfrozen a few days longer than surrounding wetlands and may thaw a few days sooner than surrounding wetlands. These temperature changes could have either positive or adverse effects on wildlife, depending on the species.

I-4.5 TERRESTRIAL VEGETATION

- Clearing and grading sagebrush shrublands and forest communities would result in long-term to permanent changes in species composition and community structure (height and density) within the construction ROW.
- Maintenance of the permanent ROW would result in permanent impacts to forest and sagebrush communities, except for sagebrush up to 2 feet tall within the ROW.
- Installation of aboveground facilities would result in a permanent loss of vegetation at the facility sites where revegetation is not possible (e.g., concrete pads at pump stations and mainline valves).
- Some sensitive plants and their habitats may be lost during construction.

- Removal of vegetation from the ROW would increase the potential for noxious weeds and other invasive plants to colonize and may result in a small decrease of vegetation community diversity.

I-4.6 WILDLIFE

- Construction would degrade or fragment wildlife habitats in and near the construction ROW; the duration of the impact would range from temporary to long term and would include effects on known habitat for mule deer, white-tailed deer and pronghorn winter ranges; greater sage-grouse and sharp-tailed grouse lek buffer zones; two prairie dog towns; and 49 raptor nests.
- Increased noise and human activity during construction may displace some wildlife in the vicinity of construction; this may interfere with foraging, breeding, and movements, depending on the construction schedule.
- Clearing, grading, and trenching would result in direct mortality of animals with limited mobility.
- Direct mortalities may occur as a result of collisions of animals with construction vehicles and equipment, maintenance and monitoring vehicles, and when birds collide with the electrical transmission lines associated with the pump stations.
- Indirect mortality and/or reduced reproduction may result from increased predation on grassland and shrubland nesting birds and small mammals by raptors using transmission line poles for perches.
- For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats would be long term or permanent because the permanent ROW would be maintained free of trees and large shrubs.
- Aerial surveillance and other traffic from routine construction and maintenance may cause a short-term alteration of behavior of individual animals.

I-4.7 FISHERIES RESOURCES

- Temporary and localized obstructions to fish movement would occur during construction of some stream crossings.
- Trenching activities could result in displacement or mortalities to fish, macroinvertebrates, and amphibians.
- If scouring occurs due to changes in bed conditions, it could affect species associated with stream bottom spawning, rearing, or feeding, or could temporarily affect fish movements during low flow periods.
- Open trench dry cuts would loosen sediments making them more prone to suspension during initial post-construction streamflows and could result in a minor and temporary to short-term decrease in primary production.
- Elevated turbidity in and near dredging, wet trenching, and wet backfilling sites would result in temporary downstream deposition of fine sediments; that sedimentation could result in a temporary to short-term decrease in primary production.
- If contaminants are present in stream beds being crossed using the wet trenching method, contaminants may be released and could affect aquatic organisms. The likelihood of encountering contamination is low and dilution in the waterbody would likely result in a minor impact that would be temporary to short term.

- Impacts from an accidental release of bentonite would be limited to a short-term reduction in feeding success or the temporary suspension of migratory behavior or habitat use by foraging fish.
- Large volumes of water withdrawn for hydrostatic testing would reduce the amount of water available for use by fish and could temporarily result in decreased mobility, increased susceptibility to predation, increased stress-related energy expenditures of fish, habitat abandonment, and deterioration or temporary loss of habitat.

I-4.8 THREATENED AND ENDANGERED SPECIES

- Construction would result in the disturbance or removal of native prairie, wetland, and woodland habitats in the construction ROW that may include suitable habitat for sensitive species.
- Surface disturbances during construction could result in the loss or alteration of potential breeding and/or foraging habitats for sensitive species and short-term fragmentation of those habitats until native vegetation has become reestablished.
- Direct mortality of less mobile sensitive species could occur due to collisions with construction vehicles and construction equipment, and the potential abandonment of a nest site or territory, including the loss of eggs or young.
- More mobile sensitive species may experience a temporary to short-term displacement from areas within and near the construction ROW during construction as a result of increased noise, activity, and human presence.

I-4.9 LAND USE, VISUAL RESOURCES, AND RECREATION

- Existing land uses within the active construction zone along the construction ROW would be stopped for the duration of construction.
- Some developed land uses in close proximity to the construction ROW may experience indirect effects due to dust, noise, and activity in the construction zone.
- Most land uses along the construction ROW would be returned to pre-construction uses after construction is completed; however, aboveground facilities would permanently convert existing uses to an industrial use.
- Land in the construction ROW that is currently enrolled in the Conservation Reserve Program (CRP) in Montana would be temporarily affected. Keystone would compensate landowners for any loss of CRP payments due to Project-related activities.
- From the start of construction on cropland until the next crop is planted, there would be an impact on agricultural use of the construction ROW. However, Keystone would compensate farmers for lost crops due to construction.
- Placement of pump stations and mainline valves in cropland would result in the loss of that land for agricultural purposes for the life of the Project. However, Keystone would compensate farmers for lost crops.
- Construction would alter the existing visual quality in the vicinity of the proposed route due to the presence of construction equipment and activity, the loss of vegetation, and the presence of aboveground facilities under construction.

- Although no recreation facilities would be affected in Montana, construction activities along the construction ROW and noise from construction may temporarily affect recreation experiences in the vicinity of the active construction area.
- During operation, the aboveground industrial facilities would alter the visual quality of the rural areas along the proposed route.

I-4.10 SOCIOECONOMICS

- Some land would be affected in the long term along the ROW. Land values and uses along the ROW could be affected.
- Construction and operation of the proposed Project would not have unavoidable adverse impacts on population, housing, economic activity, tax revenues, fiscal resources, or public services.

I-4.11 CULTURAL RESOURCES

- Mitigation measures are being developed for any significant unavoidable adverse impacts to cultural resources that are identified during the EIS process due to construction and operation of the Project, and a Memorandum of Agreement (MOA) that codifies those mitigations will be prepared. It may not be possible to identify all unavoidable adverse impacts to cultural resources associated with the construction of the Project prior to initiation of grading and excavation. To address those potential impacts, DOS and the consulting parties under Section 106 of NHPA are negotiating a Programmatic Agreement that would provide a method for development of mitigation measures for unanticipated potential impacts to cultural resources identified during the construction and operation of the proposed Project.

I-4.12 AIR QUALITY AND NOISE

I-4.12.1 Air Quality

- Temporary and localized air quality impacts would occur during construction due to emissions of fugitive dust and emissions from fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.
- Impacts associated with operation would include minimal fugitive emissions from pipeline connections and pumping equipment at the pump stations, and minimal emissions from fossil fuel mobile sources used during maintenance and monitoring activities.

I-4.12.2 Noise

- During construction, sound levels would increase in the vicinity of the construction ROW resulting in temporary impacts at agricultural, residential, and commercial areas within 500 feet of the construction ROW.
- During operation, sound levels would increase up to 2,300 feet from each pump station; however, there are no structures within 0.5 mile (2,640 feet) of the pump stations.

I-5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

MEPA requires that the EIS describe any irreversible and irretrievable commitments of resources that would be involved in the proposed action if it is implemented. An irreversible resource commitment is defined as the loss of future options and the effect that use of the resource would have on future generations. It applies primarily to non-renewable resources, such as minerals, and to those resources that are renewable only over long time spans, such as soil productivity. An irretrievable commitment of resources results from the loss of production or harvest, or the use of renewable resources. Opportunities for other uses of those resources during the period of the proposed action are not possible. The decision to use the resource can be reversed (e.g., after the life of a project), but the forgone use opportunities are irretrievable.

For the proposed Project, most resource commitments are neither irreversible nor irretrievable. As described in Sections 3.1 through 3.12 of the EIS, most impacts are short term and temporary. There would not be any irretrievable or irreversible commitments of threatened and endangered species, transportation, recreation, or public services associated with construction and normal operation of the proposed Project within Montana. The following sections provide summaries of the irreversible and irretrievable commitments of resources that would result from implementation of the Project.

I-5.1 ENERGY, MATERIALS, AND LABOR

The use of materials for construction of the proposed Project, such as steel, concrete, aluminum, plastics, and glass, would be both an irretrievable and irreversible commitment of resources if the materials are not recycled at the end of the Project. Fossil fuel used for energy during construction and operation of the Project would be an irreversible commitment of that resource. Electrical energy consumed by the pump stations that is not renewable would also be irreversible, but the use of renewable energy would be an irretrievable commitment of energy. Labor required for construction and operation of the proposed Project would also be an irretrievable commitment of resources.

Construction materials, energy, and labor are not in short supply, and their use for the proposed Project would not have an adverse impact on their future availability for other uses.

I-5.2 OTHER RESOURCES

Table I-5.2-1 lists the irreversible and irretrievable commitments of resources that would occur due to implementation of the proposed Project.

TABLE I-5.2-1 Summary of Irreversible and Irretrievable Commitments of Resources Due to Implementation of the Project in Montana			
Resource	**Irreversible Commitment**	**Irretrievable Commitment**	**Explanation**
Geology	Yes	Yes	Use of gravel, sand, and rock during construction would be irreversible. Loss of access to mineral resources within the permanent ROW would be an irretrievable commitment of resources.
Soils and Sediments	No	Yes	Soils would be eroded from disturbed areas, but would not be irreversibly lost. Soil compaction may occur in some areas and could be an irretrievable commitment until the soil is loosened mechanically or naturally.
Water Quality and Quantity	No	Yes	Water obtained for hydrostatic testing would be tested and discharged to stable upland areas. A small portion of streamflow would be lost irretrievably due to water withdrawal during hydrostatic testing.
Wetlands	Yes	Yes	Construction across wetlands would result in a temporary irretrievable loss of wetland function and in some areas may result in a permanent irreversible loss of wetland function.
Terrestrial Vegetation	No	Yes	Vegetation would be irretrievably removed from the sites of aboveground facilities. Forest, sagebrush, and other woody vegetation would be irretrievably removed from the construction ROW and except for sagebrush up to 2 feet in height, would not be allowed to reestablish within 15 feet of either side of the pipeline centerline or under electrical transmission lines.
Terrestrial Wildlife	Yes	Yes	Mortality of relatively non-mobile individual animals would be an irreversible commitment. Removal or alteration of wildlife habitat would be an irretrievable commitment.
Fisheries	No	Yes	There would be no irreversible commitments of fisheries resources. A small portion of streamflow and the associated fisheries habitat would be irretrievably lost due to water withdrawal during hydrostatic testing.
Land Use, Recreation, and Visual Resources	No	Yes	Agricultural crops and timber may be lost irretrievably along the construction ROW during the active construction period, and forestland would not be allowed within 15 feet of the pipeline centerline during operation. Land used for aboveground facilities, access roads, and the permanent ROW would be an irretrievable commitment. Alterations of visual quality due to the presence of the permanent ROW and Project-related facilities would be an irretrievable commitment.
Socioeconomics	Yes	Yes	Funds expended on the Project would be an irreversible commitment. Labor and resources expended on construction of the Project would be an irretrievable commitment. Energy used during construction and operation would be an irretrievable commitment. Increases in the property-tax basis of land dedicated to the Project would be an irreversible commitment.
Cultural Resources	No	No	Implementation of the cultural resources Programmatic Agreement would result in mitigation of cultural resources impacts, and therefore there would not be an irreversible or irretrievable commitment of those resources.
Air Resources	No	Yes	There would be minor, short-term irretrievable commitments of air resources during construction and possibly minor irretrievable commitments of air resources during operations.

I-6.0 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This addresses tradeoffs in the relationship between short-term uses of the environment and maintenance and enhancement of long-term productivity of resources; it does not repeat the analyses provided in the main body of the EIS and in Section I-3.0 of this appendix. Short-term uses of resources associated with the Project in Montana are defined as uses during the life of the Project. Long-term productivity involves sustaining the interrelationships of each resource in a condition sufficient to support ecological, social, and economic health during and after the life of the Project.

Implementation of the proposed Project would result in primarily temporary impacts (lasting only for the duration of construction) or short-term impacts (lasting up to 3 years after construction). These include impacts to wetlands, some vegetation (some vegetation would require more than 3 years to recover), terrestrial wildlife, most land use (exceptions would be the pump stations which would remain through the life of the Project), air quality, and noise levels. Keystone would minimize the impacts through incorporation of the procedures described in its CMR Plan (Appendix B), in Section 2.0 of the EIS, and throughout Sections 3.1 through 3.12 of the EIS, and the procedures required in MDEQ's Environmental Specifications (Attachment 1).

Construction and operation of the proposed Project would be accomplished in accordance with the applicable regulatory standards for water quality, biological resources, cultural resources, and air quality. After termination of the Project, all affected resources are expected to be able to return to conditions that are identical or similar to those that existed prior to implementation of the Project. Therefore, long-term productivity of the resources affected by the Project would be maintained.

Economic activity in the vicinity of the Project in Montana would be aided in the short term by the economic benefit of wages earned by local construction workers, by local construction purchases made by Keystone, and by local purchases made by construction workers. Longer-term benefits to economic activity include any purchases made by Keystone during Project operation, four to eight permanent jobs, and property taxes generated for the duration of the Project.

I-7.0 REGULATORY RESTRICTIONS

In 1995, the Montana Legislature amended MEPA to require Montana state agencies to evaluate in their environmental documents any regulatory restrictions proposed to be imposed on the use of private property (Section 75-1-201(1)(b)(iv)(D), MCA). The cost of mitigation measures designed to make a project meet minimum environmental standards with implementation methods specifically required by federal or state laws and regulations does not need to be evaluated under the implementing guidelines for the requirement. The procedures presented in Keystone's CMR Plan (Appendix B) are Keystone's proposal and, therefore, not subject to the economic evaluation requirement. The remainder of this section addresses the estimated cost of discretionary mitigation measures recommended by the cooperating agencies in the EIS or that MDEQ has legal discretion to require.

I-7.1 MITIGATION MEASURES

Table I-7.1-1 lists the mitigation measures recommended for the proposed Project in Montana, along with an indication of what the impacts would be with and without the mitigation measures, and a cost estimate for each mitigation measure.

TABLE I-7.1-1
Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Project

Recommended Mitigation Measure	Intent of Mitigation Measure	Anticipated Result of Implementation of Mitigation Measures	Comments and Cost Estimate
Avoid crossing water ponds and/or reservoirs.	Avoid impacts to water ponds and/or reservoirs.	The proposed route does not cross any reservoirs and crosses only one stock water pond. The impact to the stock pond could be avoided by rerouting the pipeline to avoid the pond. Other impacts associated with routing the pipeline around the pond have not been identified since Keystone has not been given permission by the landowner to enter the property.	The estimated cost of rerouting the pipeline around the stock water pond is approximately $30,000.
Avoid wet crossings (such as the flowing open-cut method) of any stream, lake, reservoir, or pond	Avoid impacts to streams, lakes, reservoirs, or ponds.	The proposed route does not cross any lakes or reservoirs in Montana and only one stock water pond. The waterbody crossing procedures in the Keystone Construction Mitigation and Reclamation (CMR) Plan are designed to address specific resource issues. With implementation of those procedures, impacts to streams crossed would be minor and temporary to short term. With implementation of the recommended mitigation measure (such as the dam and pump, dry flume, or horizontal directional drilling methods), impacts would be reduced to minor and temporary.	To cross all flowing streams with one of the dry crossing methods described in Keystone's CMR Plan would add $19.7 million to the Project costs. However, some streams are too wide to use the dry crossing method and would require the HDD method; those sites have been identified and are included in Project cost estimates. If additional sites are identified that require HDD to avoid wet crossings, the Project costs would increase; these costs would be dependent on the subsoil conditions encountered and the length of the crossing and cannot be estimated with certainty.

TABLE I-7.1-1
Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Project

Recommended Mitigation Measure	Intent of Mitigation Measure	Anticipated Result of Implementation of Mitigation Measures	Comments and Cost Estimate
Construction equipment and construction-related vehicles crossing a water body should use a crossing location that is within the dewatered reach created by the selected dry crossing construction method.	Avoid impacts to waterbodies due to use of equipment bridges.	With incorporation of the waterbody crossing procedures in the Keystone CMR Plan, Keystone would use methods to cross streams that are designed to minimize impacts. The impact to streams due to the use of equipment bridges is expected to be minor and temporary to short term. Implementation of the mitigation measure would reduce the impacts of some equipment crossings, but would increase the duration of the presence of stream flow control devices (e.g., dams and flumes). The impact to stream habitats may increase at some locations where the stream flow control devices remain in place and may be reduced at some stream locations.	The costs to cross streams are included in the costs described above. Implementation of this mitigation method would require that the bridge crossing be established over the dewatered area in the beginning of construction and be maintained through the entire construction season to allow crews to move through the area

This page intentionally left blank.