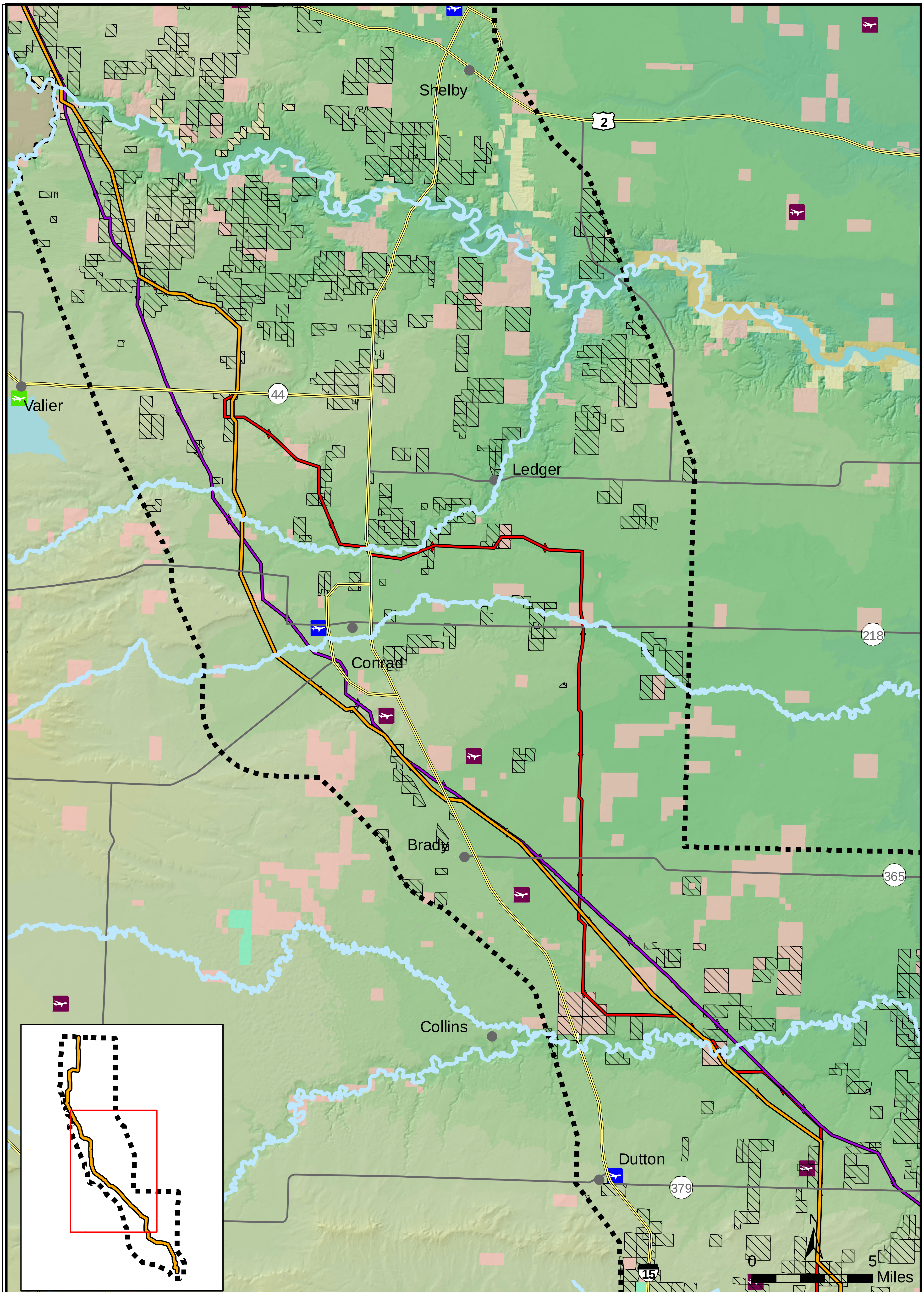
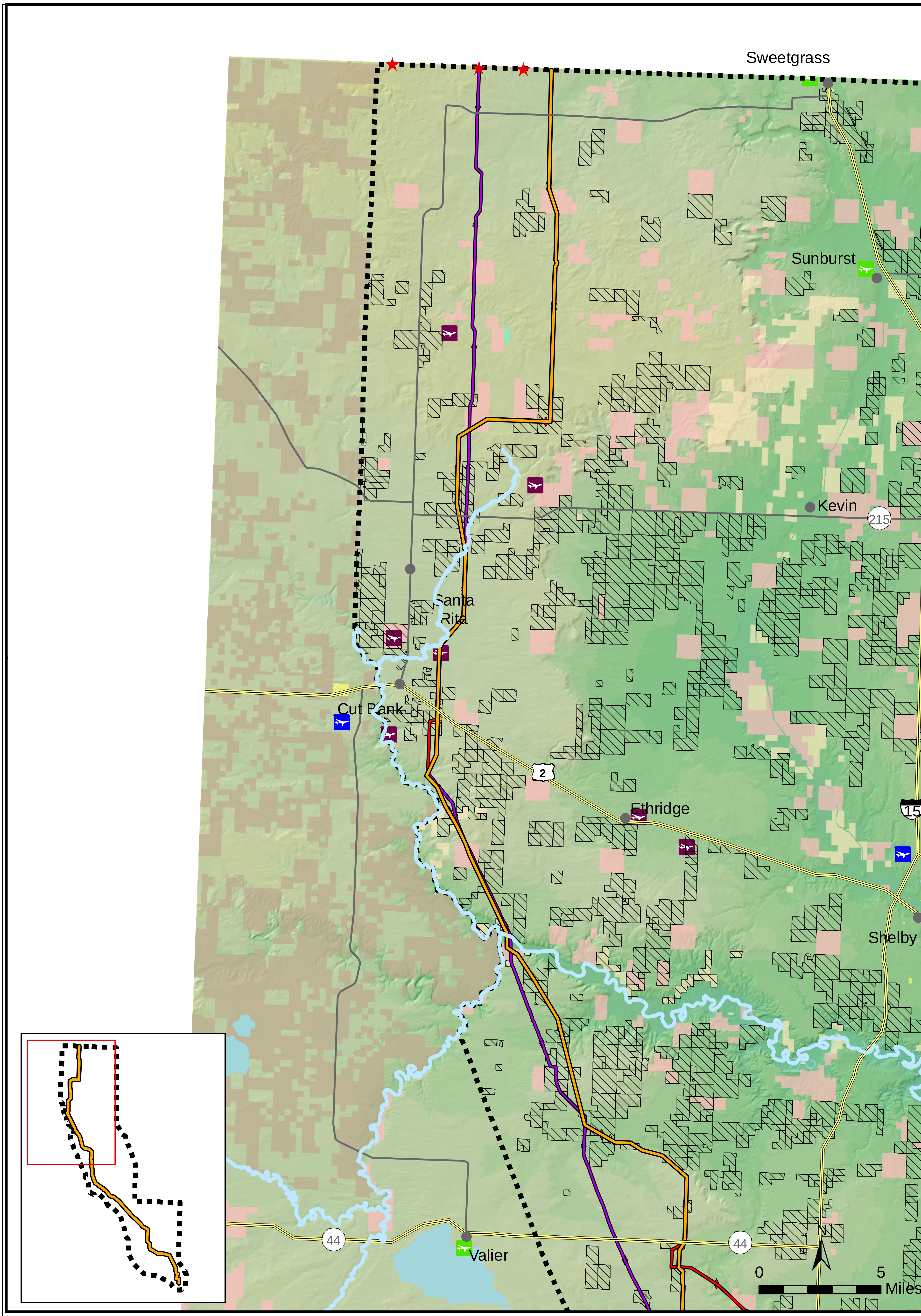


FIGURE 3.1-2
PROPOSED MATL POWERLINE
LAND USE ANALYSIS AREA
MIDDLE

LEGEND

Ownership
- Tribal
- State Government
- US Department of Agriculture
- US Department of Defense
- USDA Forest Service
- USDI Bureau of Land Management
- USDI Bureau of Reclamation
- USDI Fish and Wildlife Service
- US Government - Other
- Water (NHD)
- Conservation Reserve Program
- Paved Public Airport
- Unpaved Public Airport
- Private Airstrip
- Heliport
- ALT2 - ALIGNMENT
- MILE MARKERS
- ALT3 - ALIGNMENT
- MILE MARKERS
- ALT4 - ALIGNMENT
- MILE MARKERS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY_AREA
- MAJOR_HIGHWAYS
- SECONDARY_ROADS
- RIVERS AND STREAMS

GIS map by Patricia Williams -TTMTI 3-1-2-LandUseAnalysisArea-Middle.mxd



LEGEND

Ownership
- Tribal
- State Government
- US Department of Agriculture
- US Department of Defense
- USDA Forest Service
- USDI Bureau of Land Management
- USDI Bureau of Reclamation
- USDI Fish and Wildlife Service
- US Government - Other
- Water (NHD)
- Conservation Reserve Program
- ALT2 - ALIGNMENT
- MILE MARKERS
- ALT3 - ALIGNMENT
- MILE MARKERS
- ALT4 - ALIGNMENT
- MILE MARKERS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY_AREA
- MAJOR_HIGHWAYS
- SECONDARY_ROADS
- RIVERS AND STREAMS
- Paved Public Airport
- Private Airstrip
- Unpaved Public Airport
- Heliport

FIGURE 3.1-3
PROPOSED MATL POWERLINE
LAND USE ANALYSIS AREA
NORTH

GIS map by Patricia Williams -TTMTI 3-1-3-LandUseAnalysisArea-North.mxd

Residential

Residential land use in the analysis area includes cities, towns, colonies, residential clusters (for example, unincorporated subdivisions), and dwellings (for example, farm or ranch houses). In addition, several Hutterite colonies are located in the analysis area. Cities and towns in the analysis area are:

- Great Falls and Black Eagle, in Cascade County,
- Power and Dutton, in Teton County,
- Conrad and Brady, in Pondera County,
- Shelby, Sunburst, and Sweetgrass, in Toole County, and
- Cut Bank, in Glacier County.

With the exception of Cascade County, no land use zoning rules currently apply in the analysis area and no planned subdivisions are currently proposed for future construction in analysis area portions of Glacier, Toole, or Pondera counties (Yeagley 2006). In the Cascade County portion of the analysis area, there are no planned subdivisions (MATL 2006b). In Teton and Chouteau counties, there is no zoning and there are no planned residential developments in the analysis area (MATL 2006b).

Commercial and Industrial

Commercial and light industrial activities (linear/point facilities) in the analysis area include communication facilities (cellular telephone and microwave), oil and gas production, surface mining (gravel pits), airstrips (public and private), railroads, pipelines and transmission lines, roadways, and military installations (MATL 2006b, Connel 2007). Primary concentrations of communication sites occur in the vicinity of Great Falls, Shelby, and Cut Bank, although individual facilities are distributed throughout the area. Existing commercial and industrial businesses within the study area were identified based on parcel information in the CAMA database.

Oil and gas production facilities occur primarily in the northern half of the analysis area and consist of wells, pump and compressor stations, collector and transmission pipelines, meter stations, industrial or processing plants, and product storage tanks, both above and below ground (MATL 2006b). Most oil and gas facilities are associated with production and processing of natural gas or propane, though approximately one-third are associated with crude oil (MATL 2006b).

There are several public and private airports or airstrips in the analysis area. Public airports include those associated with the towns of Sunburst, Shelby, Conrad, and Dutton (MATL 2006b).

Agricultural

Of the 1,444,790 acres in the analysis area, approximately 1,277,000 acres (88 percent of the analysis area) are considered agricultural lands, including irrigated and non-irrigated cropland and rangeland. **Table 3.1-2** summarizes the proportion of different agricultural land uses in the analysis area. Agricultural lands are almost entirely on privately owned land; however, some dry land crops and grazing occur on public lands in the analysis area.

Irrigated croplands include those using flood, pivot, wheel and hand line irrigation systems. Crops grown on irrigated fields in the region are typically hay and alfalfa. Non-irrigated crops are predominately drought resistant cereal grains (MATL 2006b).

TABLE 3.1-2
AGRICULTURAL LANDS IN THE ANALYSIS AREA

Farmland Use	Percent of Farmland[a] in Analysis Area
Irrigated Cropland	4.2
Dry Land Crops	68.7
Grazing	26.9
Wild Hay or Alfalfa	0.1

Notes:

[a] Percentage is based on the percent of parcels where all or a portion of the parcel is in the analysis area. Some parcels may indicate irrigated acres, but those acres may occur outside the analysis area. The "farmland use" category is associated with the parcel, but the location of the type is not mapped within the parcel.

Source: USDA NAIP 2005

Management of agricultural lands can involve the use of DGPS-guided farming equipment and vehicles and other equipment used for irrigation, aerial and ground based spraying, plowing, seeding, fertilizing, and harvesting. Some ground based spraying equipment has "booms" extending 45-75 feet on either side. These activities occur on 73 percent of the farmland in the analysis area.

Publicly Managed Land

The overall Project area contains about 10 percent public lands (**Table 3.1-1**). Of these public lands, most are managed by the DNRC, FWP, BLM, and FWS (**Figures 3.1-1, 3.1-2**, and **3.1-3**).

The State of Montana has jurisdiction over 97,318 acres within the analysis area, the majority of which is under jurisdiction of DNRC as school trust parcels. These Montana state trust lands are administered and managed for the benefit of the public schools and the other endowed institutions under the direction of the Montana State Board of Land Commissioners. The Real Estate Management Bureau of DNRC's Trust Land

Management Division is responsible for processing applications for rights of way and easements across surface lands and navigable waterways administered by the state.

FWP manages several wildlife management areas, fishing access sites, and other wildlife and recreation areas.

The primary Federal agencies with lands within the analysis area are the BLM and FWS. BLM managed land is located in scattered parcels throughout the northern half of the analysis area (**Figures 3.1-1, 3.1-2**, and **3.1-3**). Right-of-way permits for crossing U.S. BLM managed land are managed by the BLM Lands and Realty office and approved following the appropriate Resource Management Plan compatibility assessment and NEPA review process.

The FWS has management authority of the Benton Lake National Wildlife Refuge, located approximately 10 miles north of Great Falls. FWS also manages three waterfowl production areas (WPA) in the analysis area, one located approximately 6 miles west of Benton Lake, one located approximately 12 miles northwest of Benton Lake, and one located approximately 15 miles northeast of Cut Bank (**Figures 3.1-1, 3.1-2,** and **3.1-3**).

The analysis area also contains several properties owned by the U.S. Department of Defense (**Figures 3.1-1, 3.1-2,** and **3.1-3**). The use of such properties is managed by Malmstrom Air Force Base (CAMA 2006).

Final siting of the transmission line on public lands would require MATL to obtain permits from state or Federal agencies for rights of way or easements, and would likely require compatibility assessments with these agencies to ensure that localized alignment decisions are made in accordance with the relevant management plans.

Conservation Easements

Within the analysis area are private lands managed under conditions detailed in conservation easements held by both FWS and the USDA Farm Service Agency. FWS holds 37.545 acres of wetland easements on some private land in the northern portion of the analysis area. Approval to locate facilities within areas managed under wetland easement by FWS is determined by a compatibility review process that takes into account proposed facility location and access relative to wetland avoidance on the parcel under easement.

FWP currently holds the Lewis and Clark Heritage Greenway Conservation Easement on about 2,400 acres owned by PPL Montana adjacent to the southern boundary of the analysis area. The purpose of the easement is to protect and enhance the open space, natural, and visual resources, when consistent with hydropower production and power transmission activities. The switch yard in which all alternatives would terminate is located on the northern edge of the easement.

The Farm Service Agency holds CRP easements on several thousand acres in the analysis area (**Figures 3.1-1, 3.1-2,** and **3.1-3**). CRP contracts between the Farm Service Agency and private landowners typically preclude agricultural activities on land managed under the program. Facility siting on CRP contracted land requires a compatibility review by the Farm Service Agency to determine a facility's potential impact to the CRP status of the affected property. Haying and grazing of CRP acreage are authorized under limited conditions (USDA Farm Service Agency 2006):

- Managed haying and grazing are authorized no more frequently than 1 out of every 3 years after the CRP cover is fully established. CRP participants requesting managed haying and grazing are assessed a 25 percent payment reduction except when conducted in an "emergency" area.
- Emergency haying and grazing of CRP acreage may be authorized to provide relief to livestock producers in areas affected by a severe drought or similar natural disaster.

Existing Roadway Network

Highways and roads in the analysis area are listed in **Table 3.1-6** and include:

- Federal and state highways
- Paved secondary state highways and county roads
- Improved county roads
- Unimproved roadways

Interstate 15 runs west from Great Falls to Vaughn and then north to the farming communities of Power, Dutton, Brady, and Conrad, and then to Shelby and the border crossing at Sweet Grass. At Cut Bank the proposed power line would cross U.S. Highway 2, the primary east-west highway along the Hi-Line. North of Great Falls, the proposed power line would cross U.S. Highway 87. The analysis area includes 124 miles of Interstate 15.

There are numerous secondary roads in the analysis area including paved Federal and state highways and improved (paved) county roads. These roadways run east-west (for example, MT 219 from Conrad to Pendroy) and north-south (for example MT 214 from Cut Bank north to Santa Rita and beyond). There are 86 miles of Federal and state highways in the analysis area.

Improved county roads are primarily gravel roadways that serve rural residents. These roadways, in conjunction with improved secondary roads, provide the transportation infrastructure for ranchers and farmers in the Project area. These roads are vital to rural residents for uses such as hauling grain and cattle and moving large tractors and farming implements. Unimproved roadways are those two-track roads that provide the farmer or rancher with access to and within their owned or leased land. There are approximately 2,346 miles of improved and unimproved county, city, and local roads in the study area.

With the exception of Interstate 15, U.S. Highways 2 and 87, and some sections of the secondary road system, the basic road infrastructure in the study area has changed little in the last 40 to 50 years. Federal and state highways have load restrictions specific to length, width, height, and weight of the transported load. Any exceedance of these criteria requires a single trip permit from MDT.

Most of the county roads have 24-foot-wide graveled driving surfaces (McDonald 2006). Some road shoulders and county bridges may not be suitable for heavy loads (McDonald 2006).

Railroad Facilities
The Burlington Northern and Santa Fe Railway northern tier mainline generally parallels U.S. Highway 2 through the project area from Shelby to Cut Bank. A north-south line runs from Great Falls through Power and on to the border at Sweet Grass (MATL 2006b). Two branch lines, one to Choteau and another to Valier serve the agricultural producers in those areas. There are 171 miles of railroad in the analysis area.

Pipeline Facilities
Many existing pipelines serve the oil and gas producers traversing the project area. These include large natural gas pipelines up to 20 inches in diameter (Cut Bank to Warm Springs pipeline) and many small pipelines serve the oil fields around Conrad, Cut Bank, and Shelby. Many small (4- to 6-inch-diameter) lines from the oil fields near Cut Bank converge at "tank hill" where crude oil is collected for subsequent delivery to refinery facilities such as Montana Refining in Great Falls. Most of these lines run north-south on the western edge of the project study area with one pipeline running east-west (MATL 2006b).

Aircraft Facilities
Small unmanned airports are located near the towns of Conrad, Shelby, and Cut Bank. Private airstrips are located throughout the study area serving owners and aerial applicators that serve the agricultural producers.

Other Utilities
When MATL identified its proposed Project alignment in the MFSA application, all pipelines and transmission lines were located so that MATL could avoid placing structures on them. Telephone companies do not have detailed comprehensive databases or maps of buried telephone lines that can be accessed for this application process. MATL would finalize structure and location with owners of these facilities.

Future Land Use

During scoping, several landowners provided information of planned uses within the analysis area. These include:

- Wind farms
- Additional ranges and a first responder training center at the Great Falls Shooting Sports Complex
- Future conversion to cropland of some lands enrolled in the CRP.

No specific time lines were provided for these activities.

3.1.3 Environmental Impacts

3.1.3.1 Alternative 1 — No Action

Under the No Action alternative, the transmission line would not be constructed. There would be no additional impacts on land uses, including farming, DGPS, irrigation, crop dusting, production costs, livestock control, or other activities, from transmission lines. Land uses in the area would remain similar to what they are now. Some wind farms that subscribed to the MATL facilities during the transmission open season may not be built.

No impacts would occur to transportation and utilities if the No Action alternative were selected. Current levels of infrastructure use would be maintained.

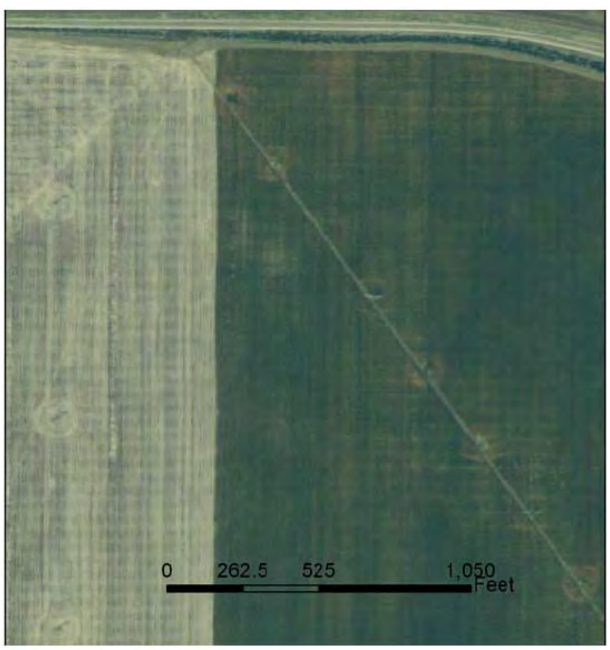
3.1.3.2 Alternatives 2, 3, and 4 — Action Alternatives

Interference with Farming

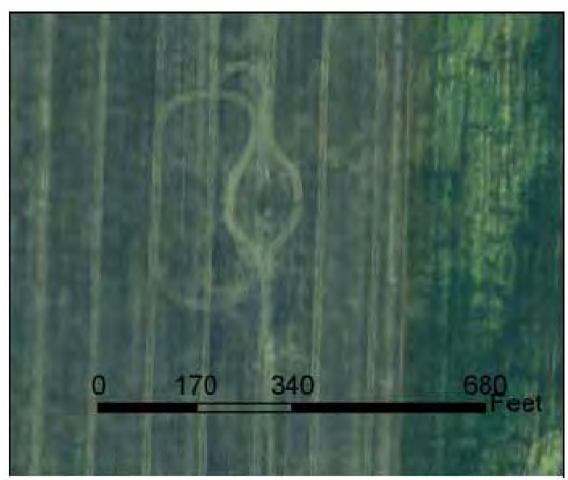
Considerable concern has been expressed by farmers whose land would be crossed by the transmission line. They have identified concerns related to a loss of production, more effort and expense required to farm around transmission line structures, interference with a few mechanical irrigation systems, acreage that cannot be farmed due to the structures, guy wires, and access roads, and the introduction of weeds. **Appendix H** contains land uses by milepost for each alternative.

Mechanical irrigation, automated farming methods, farming equipment with large spans (up to 144 feet) for fertilizer, pesticide, and herbicide application, cultivation, harvesting, and crop dusting would all be affected by support structures. These effects could be substantial for an individual operator. Farming equipment continues to become larger and more automated while crops become more "high tech" requiring more precise application and timing of pesticides and fertilization. Farmers run the risk of costly damage to their equipment if it strikes a structure. Depending on the location, farming method, and type of structure, areas would be taken out of production around the base of support structures, and the support structures would be in the way of all equipment (see aerial/orthophotographs below). MATL would compensate farmers for increased production costs and is in the process of revising a method for calculating production costs. **Section 3.13** contains information on the additional cost of farming and estimated compensation.

Structures located near the edge of a field may prevent equipment from reaching the edge of the field (see photographs below).



H-Frame on edge of field then diagonal crossing

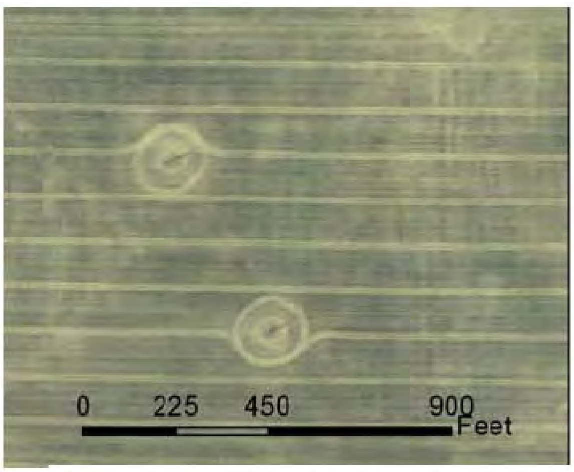


Farming around H-frame

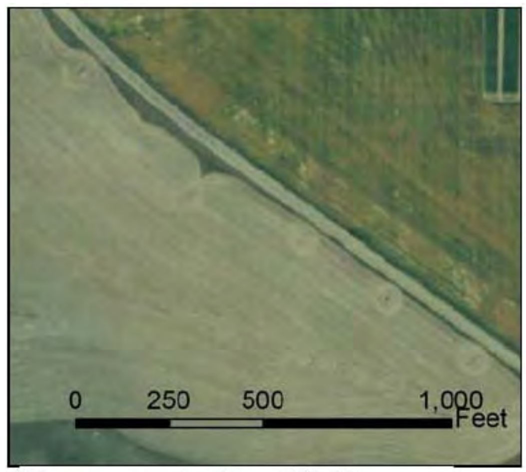
When crossing a cultivated field is necessary, effects may be minimized by placement of H-frame structures in a north-south or east-west orientation, where the poles are parallel to the rows, avoidance of diagonal field crossings, use of monopole structures in the place of H-frames, and placing structures on the edges of fields.

The worst case scenario for loss of production area is siting H-frame structures diagonally or perpendicularly to rows and structures set close enough to the edge of a field so that farm equipment cannot fit between the structure and the edge of the field (see photograph).

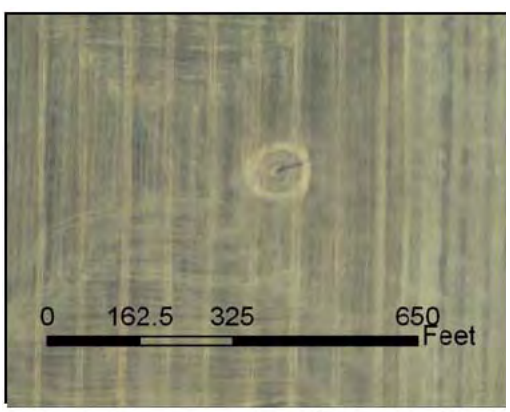
Production costs would increase as farmers have to divert their equipment around structures; make additional passes; take additional time to maneuver equipment; skip areas; or reseed, retreat, or refertilize areas. The efficiency of some large, DGPS-guided equipment would be adversely affected.



Farming around H-frame



Structures at edge of field



Farming around Monopole

Monopole along road adjacent to fields

In conducting the analysis summarized in **Table 3.1-3**, the proposed and alternative alignments were overlaid onto the 2005 orthophotographs (USDA NAIP 2005) and photographic interpretation was used to document the land use on the alignments. **Appendix H** provides a milepost by milepost interpretation of land uses along each alignment, organized into eight land use types: (1) irrigated cropland, (2) non-irrigated cropland, (3) rangeland/pastureland, (4) road and railroad, rights-of-way, (5) residential, (6) forest, (7) riparian, and (8) water. **Table 3.1-3** shows the miles of crossings parallel, perpendicular, and diagonal to irrigated, non-irrigated, and range fields along the alternative alignments.

Based on the miles of transmission line that would cross irrigated and non-irrigated cropland at a diagonal, Alternative 2, with 54.9 miles of diagonal crossings would interfere with farming less than the Alternative 3 which has 67.7 miles of diagonal crossing. In total, irrigated cropland would be crossed in any direction by 1.1 percent of Alternative 2 (1.4 miles) and 2.8 percent of Alternative 3 (3.3 miles). Twenty-five percent of Alternative 2 (32.8 miles) crosses rangeland, compared to almost 19 percent of Alternative 3 (22.5 miles).

Alternative 4 was developed by DEQ, in part, to reduce the impacts on farming from the proposed transmission line. Alternative 4 has fewer miles of the alignment crossing non-irrigated cropland at a diagonal (27.9 miles versus 54.8 miles in Alternative 2 and 64.7 miles in Alternative 3). Alternative 4 crosses 0.1 mile of irrigated cropland at a diagonal, Alternative 2 also crosses 0.1 mile of irrigated cropland at a diagonal, and Alternative 3 crosses 3.0 miles.

Following the development of the alternatives, several agency-proposed local realignment segments were identified to reduce the number of miles of farmland crossed diagonally, to reduce the total number of miles of farmland crossed, and to reduce the acres removed from farm production by structures. These segments and the quantitative effects on these factors are displayed in **Appendix A** of the March 2007 document. Others identified on the March 2007 document are described in Section 3.16.

TABLE 3.1-3
TYPES OF LAND USE CROSSED BY ALTERNATIVES 2, 3, AND 4 (MILES)

	Alternative 2				Alternative 3				Alternative 4			
	Parallel[a]	Perpendicular[b]	Diagonal[c]	Total	Parallel[a]	Perpendicular[b]	Diagonal[c]	Total	Parallel[a]	Perpendicular[b]	Diagonal[c]	Total
Irrigated cropland	1.3	0.0	0.1	1.4	0.3	0.0	3.7	3.4	1.2	0.4	0.1	1.7
Non-irrigated cropland	33.7	3.4	54.8	91.9	26.7	0.5	64.7	91.9	47.7	11.2	27.9	86.8
Rangeland	7.0	1.7	24.0	32.7	7.7	0.2	14.6	22.5	8.9	5.2	33.7	47.8
Road/ Right-of-way/ Railroad	0.5	1.0	0.9	2.4	0.3	0.2	1.3	1.8	0.4	0.3	0.6	1.3
Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Forest	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1
Riparian	0.6	0.0	0.8	1.4	0.2	0.0	1.6	1.7	0.8	0.1	1.0	1.9
Water	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Total Miles	43.2	6.2	80.6	129.9	35.4	0.9	85.4	121.6	59.0	17.2	63.4	139.6

Notes:

[a] parallel to north and south (±5° due north or south).

[b] perpendicular to north and south (±5° due east or west).

[c] diagonal to due north, south, east, or west.

Sources: Orthophotographs 2005 (USDA NAIP 2005); NRIS 2000; MATL 2006b; field verification; photographic interpretation (**Appendix H**).

Subtotals and totals may differ in tenths of a mile from actual sums due to Microsoft Excel rounding procedures for different functions.

Land Removed from Production

Table 3.1-4 compares how many miles of transmission line cross CRP land or cropland under each alternative. For the purposes of this analysis, the area removed from cropland production or CRP was assumed to be 5 feet from the structure in any direction. Actual losses could be greater, for example, if a structure is located so close to the edge of a field that equipment could not maneuver between the structure and the edge of the field. Likewise, if structures are located at the edge of a field and parallel to the cropping pattern, actual losses could be minimal. For double-pole H-frame support, the base area (1.5 feet by 23.5 feet) with 5 feet added to all sides would remove 0.0088 acre (385.25 square feet) from production per structure.

Alternative 4 would require the use of monopole structures in all areas where the transmission line would cross CRP land or cropland. Monopole structures require less of a footprint for each structure. Monopoles would remove .0049 acre from production because of their 6.5-foot-wide concrete foundations (plus 5 feet on either side).

TABLE 3.1-4
ACRES OF PRODUCTION IN CRP OR CROPLAND AFFECTED BY H-FRAME OR MONOPOLE STRUCTURES IN ALTERNATIVES 2, 3, AND 4[a]

	Alternative 2	Alternative 3	Alternative 4
Miles of Monopole Crossing CRP or Cropland	53	0	88.9
Number of Monopole Structures[b]	350	0	587
Acres CRP or Cropland Removed from Production by Monopole	1.72	0	2.88
Miles of H-Frame Crossing CRP or Cropland	40.3	95.2	0
Number of H-frame Structures on CRP or Cropland[c]	266	628	0
Acres CRP or Cropland Removed from Production by H-frame[b]	2.34	5.53	0
Total Acres of Cropland and CRP Removed from Production[c]	**4.06**	**5.53**	**2.88**

Notes:

[a] MATL has provided a range of estimated disturbance for various structures and construction details as plans for the transmission line have progressed (MATL 2006b). Analysis was based on conservative estimates of area disturbed by the transmission line construction and structures.

[b] Monopoles would be set on average 800 feet apart (6.6 structures per mile).

[c] H-frames would be set on average 800 feet apart (6.6 structures per mile).

Sources: Orthophotographs 2005 (USDA NAIP 2005), NRIS 2000, MATL 2006b; field verification; photographic interpretation (**Appendix H**)

During construction and line maintenance, short-term disruption of farming activities along the alignment could occur. Locating structures and access roads in previously disturbed areas, or in areas where agricultural practices have already been modified, would minimize long-term impacts along the alignments. Environmental protection measures listed in **Table 2.3-4** would be implemented to reduce potential impacts on land use due to erosion, soil compaction, and noxious weeds.

Interference with Crop Dusters

Experienced crop duster pilots are capable of avoiding conductors and structures by flying over, under, or around them, although additional passes may be required and coverage near power lines may be spotty. Nationwide in 2005, there were 90 agricultural aircraft accidents investigated by the National Transportation Safety Board (2006). Of those, 14 included a power line, guy wire, or static wire as a contributing factor (two were fatal). Five of the accidents involved helicopters and the remainder involved airplanes. One was a helicopter that started to crash and hit a power line on the way down. None were in the Project area or in Montana.

Alternatives 2 and 3 are similar in the number of miles of transmission line that cross CRP and cropland (93.3 and 95.2 miles, respectively). Alternative 4 would cross the least amount of CRP and cropland (88.9 miles). Potential impacts would be mitigated as crop dusters would be informed of the transmission line, and maps would be provided prior to and upon completion of the MATL line.

Interference with DGPS-Guided Farming Equipment

Under Alternatives 2, 3, and 4, potential interference could occur to certain types of DGPS systems installed in farm equipment (EPRI 2000). MATL proposes the following measures to address problems with DGPS interference:

- MATL would support upgrades to improve the DGPS system's resistance to interference. Specifically, physically shielding the DGPS antennae from electromagnetic interference, where practicable, would alleviate interference. Another potential solution would be to upgrade the unit to be compatible with the Wide Area Augmentation System (WAAS). WAAS provides a more extensive coverage area and is less susceptible to signal interference. WAAS augments DGPS with additional signals for increasing the reliability, integrity, accuracy, and availability of DGPS (MATL 2006b).

WAAS has an accuracy specification that results in a horizontal accuracy of better than 5 meters. This accuracy would be helpful for DGPS-guided equipment.

Livestock Control and Gates

Issues related to controlling livestock and gate closure were raised during scoping. In response, all action alternatives include environmental protection measures to ensure gates are installed, closed, and maintained as needed to control livestock and public access in coordination with affected landowners. Although not 100 percent effective, these measures would reduce problems caused by unauthorized access or gates being left open.

Conservation Easements and Special Management Areas

Linear miles of lands under Federal and State special management and those lands currently under Federal or State conservation easements (wetland easements, CRP, and FWP easements) that would be crossed by the 3 alternatives are summarized in **Table 3.1-5**. Alternatives 2 and 3 would cross state-owned lands on the edge of the Great Falls Shooting Sports Complex, while Alternative 4 would avoid the complex completely.

TABLE 3.1-5
MILES OF FEDERAL/STATE LAND AND SPECIAL MANAGEMENT AREAS AND CONSERVATION EASEMENTS CROSSED

	Alternative 2	Alternative 3	Alternative 4
Montana FWP-owned Land (Great Falls Shooting Sports Complex) [a]	0.73	0.51	0.0
Montana FWP Easement (north side of Great Falls Switch Yard) [a]	0.12	0.10	0.10
Montana State Trust Land (DNRC) [a]	10.62	5.91	11.03
Conservation Reserve Program (CRP) [a]	23.61	3.76 (Wetlands) 14.33 (CRP)	1.7 (Wetlands) 30.77 (CRP)
BLM-owned Land [b]	0.29	0.14	0.29

Sources: [a] Montana State Library, Montana Natural Heritage Program, January 17, 2007.
[b] Montana Cadastral/CAMA data, November 2007.

Residential Developments

Alternatives 2 and 4 each have one residence within 100 feet of the edge of the alignment and Alternative 3 has four. The safety zone for the transmission line is 105 feet wide. Impacts on residences are primarily noise and visual quality and are discussed in those sections.

Planned Land Use

Alternatives 2, 3 and 4 cross through Glacier, Pondera, Teton, Toole, and Cascade counties. All of these counties have adopted a comprehensive land use plan. Cascade County is the only county in the Project analysis area with zoning regulations.

According to the November 15, 2006, version of the Cadastral GIS coverage for Cascade County, there do not appear to be any subdivisions planned or existing in the path of Alternative 2 or 3 alignments. Alternative 4 would cross the planned Kyles Addition subdivision just north of Great Falls from mileposts 2.12 to 2.26. No residences have been constructed in this subdivision but the land is subdivided and platted.

Right-of-way Restrictions

Farming and other activities are permitted on transmission line rights-of-way provided that they do not interfere with line operation and maintenance or create safety problems for workers or others. Landowners may be restricted from constructing buildings or conducting other activities that would interfere with line operation.

Pipelines

Pipelines are discussed in Section 3.3 and Section 3.4.

Transportation

Highways and Roads
The Federal, state, and county roads that would be crossed by each alternative are listed in **Table 3.1-6**, along with the milepost reference. MATL would follow environmental protection measures, described in Chapter 2 and **Appendix F**, to minimize impacts when crossing local access roads and highways. Some minor additional use of roads and highways would occur during construction of the transmission line. Effects would be short term.

Traffic Levels
Agriculture dominates all other land uses in the Project area. The principal activity that would increase traffic on all improved roads is traffic associated with power line construction. Several issues would need to be addressed during the construction period.

TABLE 3.1-6 HIGHWAYS CROSSED BY ALTERNATIVE			
Highway Name	**Alternative 2**	**Alternative 3**	**Alternative 4**
Interstate 15	52.9[a]	50.1	72.6
US 2	99.9	94.8	109.6
US 87	5.0	4.6	2.7
Route 225	11.3	10.7	3.7
Route 379	29.8	24.5	30.3
Route 365	48.5	45.0	50.7
Route 218	NC	NC	60.3
Route 219	60.6	57.3	NC
Route 534	66.0	59.9, 60.0, 62.2	NC
Route 44	73.7	70.9	83.3
Route 215	108.2	103.0	118.0
Route 214	128.0	119.8	137.8

Notes:
a = Milepost distance rounded to nearest 1/10 mile
NC = Alternative would not be crossed by highway

A critical element would be timing power line construction and maintenance activities to avoid conflicts with farm machinery. According to Sherwin K. Smith, Executive Director of the Teton County Farm Service Agency, the farm schedule is as follows:

- Fall seeding of winter wheat, September to Mid-October
- Spring seeding of spring wheat, Mid-March to May
- Harvest, July to September or later depending on early snows.

When the existing Great Falls to Cut Bank 115-kV line was constructed in the mid-1960s, a large combine had a 20- to 24-foot header, a big drill was 32 feet, and few, if any, 4-wheel drive tractors were available. Present day equipment has grown substantially (Broesder 2006). Some of the widths are listed below:

- Combine tread width–large unit 13.1 feet is standard, up to 15.1 feet with axle extenders.
- Four wheel drive tractor dual wheels up to 18 feet wide; triples up to 22 to 24 feet wide.
- Air drills (both Case IH and New Holland) - 57-foot drill when folded for transport is 20 feet 6 inches wide by 17 feet high.

With equipment this large, conflicts with farm machinery on local roads are unavoidable especially during seeding and harvest. Timing and open, frequent communication between the landowners and the contractor(s) would help to reduce impacts. The use of pilot vehicles during equipment mobilization and delivery of large, long loads on secondary roads would minimize conflict with ongoing farming activities especially during seeding and harvest.

Airports and Private Airstrips

Alternatives 2, 3, and 4 each pass close to two airports, Conrad and Horner Field. The Conrad Airport is a public airport with two runways (one paved and one turf) and serves an average of 74 aircraft per week. Alternative 3 is 0.75 mile southwest of the Conrad airport, Alternative 2 is 2 miles southwest, and Alternative 4 is 3.7 miles to the northeast. Horner Field is a private, gravel airstrip (Airnav.com 2006). Alternatives 2 and 3 are 1.55 miles east of Horner Field, and Alternative 4 is 1.8 miles to the southwest. Usage information for these facilities is not available. Alternatives 2 and 4 pass about ¼ mile north of a private airstrip near milepost 115 and 125, respectively.

Adherence to FAA regulations and coordination of construction activities would minimize conflict with the MATL project. Construction of the power line, whether parallel to the existing 115-kV NorthWestern line or not, would add to the existing transmission and distribution lines in the project area. Local pilots, those with private airstrips, and aerial spray pilots would be adversely impacted.

Roads and Railroad Crossing and Paralleling

Comments were raised regarding the number of crossings the proposed transmission line would make of roads and railroads.

Support structures adjacent to roads may pose a hazard to motorists, in some cases, if the vehicle leaves the roadway. Because of this, transmission line structures are normally located outside of the road right-of-way. Additionally, roads are commonly used by aircraft for navigation because they are located on a map and transmission lines parallel to a road could create a hazard for a few aircraft that fly less than 80 to 100 feet above the ground.

Transmission line construction and maintenance could increase conflicts with train traffic in the project area, especially at uncontrolled crossings. The power line would have to cross a railroad right-of-way or would run parallel to it at some point along its alignment (MATL 2006b).

The primary impacts to infrastructure would result from power line construction. Follow-up power line maintenance using standard equipment would be an infrequent occurrence and not add greatly to the existing traffic loads on the roadway network.

Direct impacts include increased traffic on major highways and secondary roads, minor delays along these alignments to allow equipment and material to be delivered to specific locations along the alignment, and a traffic stoppage during the conductor stringing phase.

3.1.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.2 Geology and Soils

Issues of concern associated with geologic resources are: the potential for seismic activity, mass movement, subsidence, and mineral resources. Issues associated with soil resources are soil stability, potential for erosion, compaction, salinity, construction requirements for roads and access, and revegetation.

3.2.1 Analysis Methods

The agencies used GIS to display maps depicting the geologic and soil properties that could be affected by the Proposed Project or alternatives. Geologic information was collected from U.S. Geological Survey (USGS) topographic maps, USGS seismic risk data, geologic maps and data primarily from the Montana Bureau of Mines and Geology (MBMG), and from baseline geology data provided in the MATL application (MATL 2006b). Data for important soil properties, including soil type, soil depth, soil stability, potential for erosion, compaction, salinity, limitations for roads and access, and revegetation, were acquired from the NRCS database (NRCS 2006a), the MATL application (MATL 2006b), and aerial photo interpretation. Geologic and soil resources (slope stability and erosion potential) that could be affected differently by different alternatives were evaluated and compared for each alternative alignment.

Analysis Area

The analysis area for geologic and soil resources is the same as the Project study area. The study area is generally located on relatively flat-lying plains on the eastern slope of the Northern Rocky Mountains (Northern Great Plains physiographic province).

3.2.2 Affected Environment

Geology and soils in the analysis area are described below in terms of characteristics relevant to the issues of concern stated under Section 3.2 above.

Geology

The bedrock geologic units present in the analysis area are primarily Cretaceous shales and sandstones deposited during repeated advances and regressions of the inland sea present from 65 to 135 million years before the present (MATL 2006b). The surface expressions of geologic formations crossed by each alignment extend across the entire analysis area and are nearly flat-lying. At the southern end of the analysis area, the dominant structural feature is the northeast trending Great Falls Tectonic Zone, which thins the Cretaceous shales and sandstones (MBMG 2002a).

The north end of the analysis area is on the west flank of the Kevin-Sunburst dome, which produces a slight westerly dip in the Cretaceous sedimentary rock of approximately 100 feet per mile (MBMG 2002b).

The sedimentary formations that underlie the analysis area include the Kootenai Formation, Blackleaf Formation, Marias River Formation, Telegraph Creek Formation, Virgelle Formation, Eagle Formation, and the Two Medicine Formation. The Marias River, Telegraph Creek, and Two Medicine formations underlie most of the analysis area. The Marias River Formation is the uppermost member and is comprised primarily of dark-gray shale with some limestone and sandstone beds; the Telegraph Creek Formation is a yellowish-gray, fine-grained sandstone with interbedded gray shale; and the Two Medicine Formation is comprised of a non-marine mudstone with thin beds of fine-grained sandstone (MBMG 2002c).

Overlying these sedimentary bedrock formations throughout most of the analysis area are deposits of glacial till, glacial lake sediments, and alluvial materials. The glacial till is composed of grayish-brown unsorted clay-size to boulder-size sediments and rock fragments (MBMG 2002c and 2002d). The thickness of the till typically ranges from 1 to 15 feet, with occasional thicknesses greater than 200 feet (MBMG 2002b and 2002c). Alluvial deposits are present in the analysis area along river and stream channels and are typically poorly sorted to well sorted sand and gravel materials that are locally derived or reworked glacial till (MBMG 2002a).

Potential for Seismic Activity

The potential for seismic activity within the analysis area is low. There are no mapped active faults in the analysis area (USGS 2006b). The nearest faults are the South Fork Flathead Fault and two small unnamed faults near the Sweet Grass Hills (MATL 2006b). The USGS has created models to estimate the peak acceleration for any area within the country. Peak acceleration is used to assess the potential impact of earthquakes on structures. The peak acceleration for the analysis area (with a 10 percent probability of exceedance within the next 50 years) is 4.5 to 6.5 percent of the force of gravity, relatively low compared to elsewhere in the U.S. (USGS 2006b).

Mass Movement

Mass movement is the relatively rapid movement of geologic materials (commonly known as a slump or slide). The potential for mass movement of soil or rock primarily depends on topography and the dip of the bedding planes of the bedrock. The general topography and bedding plane dip slopes of the analysis area are flat with small potential for mass movement. The potential for mass movement is also based on the overall shear strength of the geologic materials. Glacial till is unconsolidated and thus prone to mass movement if located on a slope of 15 percent or greater. Shale is also prone to mass movement on slopes. Areas within the analysis area having the greatest potential for mass movement are found where glacial till materials are positioned on terraces and the incised banks of the Teton River, Marias River, Dry Fork Marias, and Buckley Coulee. **Figure 3.2-1** shows areas in the study area with surficial expressions of shale and glacial till on slopes greater than 20 percent. Field review and examination of aerial photographs of the Teton River crossings indicate there are numerous slumps on the steep slopes.

Subsidence

Subsidence can occur when voids are created in subsurface materials (sinkholes in limestone or subsurface mining) causing collapse of overlying material, or when the withdrawal of groundwater or petroleum causes geologic material to settle. The potential for the creation of voids and subsequent sinkholes within the geologic materials in the analysis area is low to nil due to the absence of limestone. No active or abandoned subsurface mines are located within the alignments of the action alternatives. Subsidence related to the withdrawal of groundwater or petroleum is also unlikely within the analysis area since petroleum is extracted at low to moderate rates and from consolidated bedrock formations. Groundwater pumping in the analysis area does not occur at rates and volumes large enough to cause subsidence.

Mineral Resources

Mineral resources include oil, gas, coal, sand and gravel, and precious metals. Petroleum deposits are found within the Cretaceous rock formations that are mapped from south of Cut Bank to the Canadian border. There are numerous producing and abandoned oil wells present across this portion of the analysis area. South of the Marias River to Great Falls, there are fewer oil wells and fewer known oil and gas deposits. The Cretaceous rock formations also contain deposits of coal. There are no known precious metal deposits in the study area. A few gravel pits are scattered throughout the study area, but none of the alternatives crosses an active gravel pit.

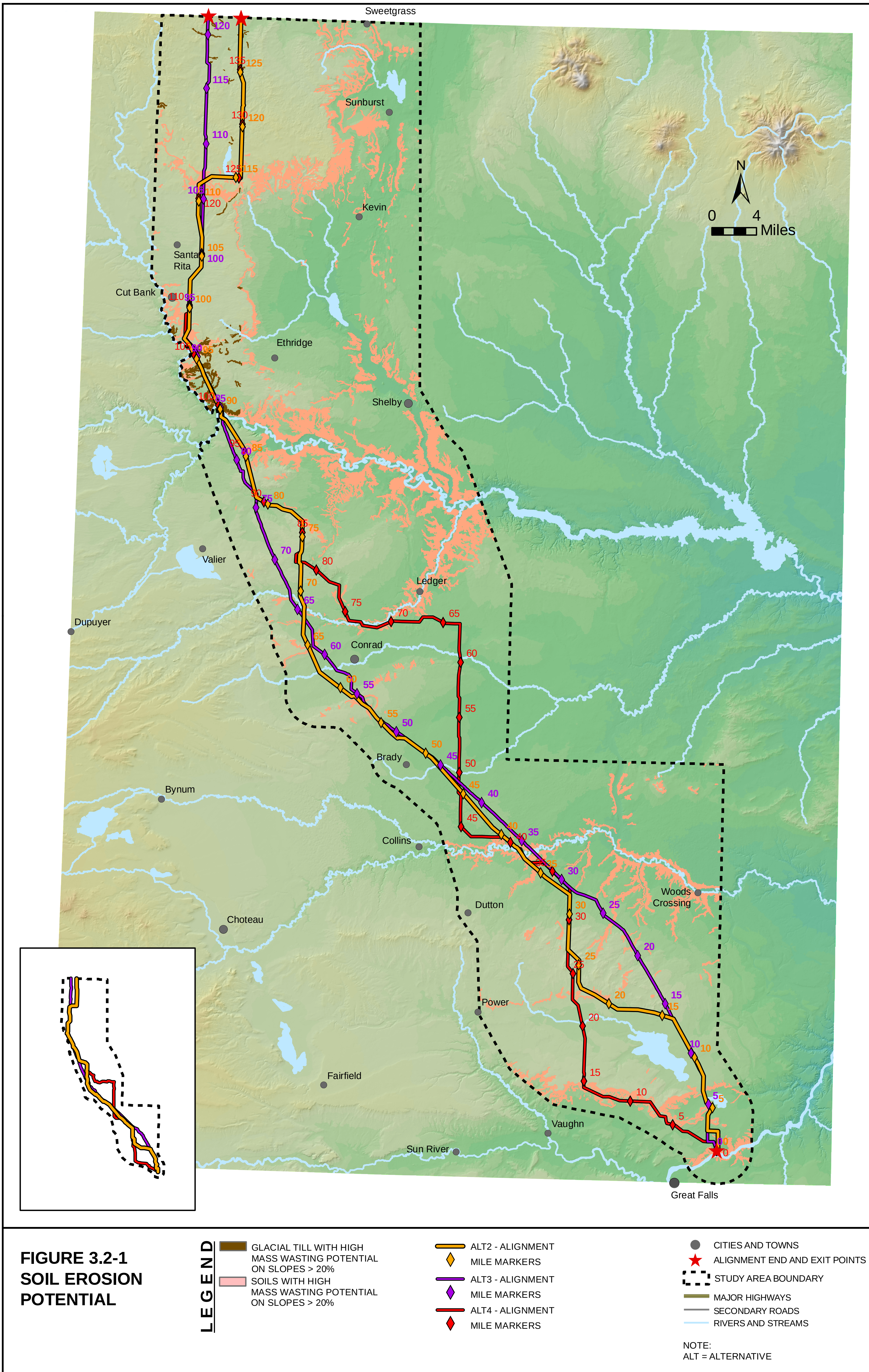


FIGURE 3.2-1
SOIL EROSION POTENTIAL

GIS map by Ed Madej -TTEMI-HE Fig3_2-1_MATL_erosian_potential_110707.mxd

Soils

The kinds of soils that have developed in the analysis area are determined by five major factors: (1) climate; (2) living organisms; (3) parent material; (4) topography; and (5) time. Three of the five factors have had a major influence on soil development in the analysis area; they are climate, parent material, and topography. The colder, semi-arid climate has caused soil profiles to be shallow compared to soils from warmer and wetter locales. As discussed in the Geology section, soils that develop on shale and sandstone bedrock have considerably different parent materials than soils that develop from glacial till and glacial outwash sediments. In addition, topography has local influences due to the erosional downcutting and steeper slopes associated with the major Marias and Teton stream drainages and their associated tributaries.

Soils that form on relatively flat deposits of glacial till are mostly well-drained and fine-textured soils. These soils are suitable for agriculture and rangeland and are rated fair to good for growing grasses, low to moderate for frost action, and high for corrosion of steel (NRCS 2006a). Most of the soils within the MATL analysis area that have developed from the glacial till deposits are classified in the Mollisol soil order (NRCS 2006a). Other soil types, with lesser areal coverage than Mollisol soils, are classified in the Entisol, Inceptisol, and Vertisol soil orders. Only very small areal amounts of Alfisols and Aridisols soils are found within the analysis area.

Soils in the Mollisol soil order characteristically have a dark-colored, relatively thick, and organically rich surface horizon that developed under thousands of years of grassland vegetation (Soil Science Society of America [SSSA] 1997). Within the analysis area, the Mollisol soils typically have a fine- to fine-loamy-grained texture, are well drained, and have formed on stream terraces, alluvial fans, and glacial till plains with slopes less than 10 percent.

Soils in the Entisol soil order are younger and weakly developed soils, compared to Mollisols, with little, if any, profile development (SSSA 1997). Entisol soils are found on very recent geomorphic surfaces (Brady 1990). Within the analysis area, Entisol soils typically are well-drained soils with a fine-loamy to loamy-grained texture. Entisol soils are mapped on flood plains, glacial till plains, and hills with slopes up to 60 percent within the MATL analysis area.

Soils in the Inceptisol soil order are also weakly developed soils with few diagnostic features but are considered to be more developed than the Entisol soils. These soils typically have a subsurface mineral horizon with some weatherable minerals that have been slightly altered or leached (SSSA 1997). Within the analysis area, the Inceptisol soils typically have a fine- to fine-loamy-grained soil texture. These soils are well drained and can produce good agricultural crops under proper management (Brady

1990). In the MATL analysis area, Inceptisol soils have formed on alluvial fans, glacial till plains, and hills with slopes less than 45 percent (NRCS 2006a).

Soils in the Vertisol soil order are mineral soils with greater than 30 percent clay. Within the analysis area, the Vertisol soils have formed from finer-grained glacial sediments that were deposited by glacial outwash. These soils can be well drained under proper management, but will form deep wide cracks when dry (SSSA 1997). Vertisol soils in the analysis area typically have a very fine- to fine-grained texture and are found on alluvial fans, glacial till plains, and lake plains with slopes less than 10 percent.

Soil Stability and Erodibility

The stability and potential for erosion of these soils are primarily dependent on the particle size, slope, and potential for mass movement. Fine-grained soils are more susceptible to wind and water erosion than coarser soils, and soils on steep slopes are more prone to erosion than soils located on relatively flat terrain. Steep slopes are also required for the mass movement of soils.

The majority of the MATL analysis area contains relatively flat terrain. Exceptions are the steep slopes associated with the bluffs north of Great Falls and stream banks along the Teton River, Dry Fork of the Marias River, and Marias River. Mass movement of soils is occurring within the analysis area along the Teton River. Areas of highly erodible or unstable soils (soils with shale and glacial till materials on slopes greater than 20 percent) within alternative alignments are shown in **Figure 3.2-1**.

Compaction

The degree to which soils may become compacted from farming or construction operations is primarily dependent on the surface soil grain size, the mineral composition of the soil, and the moisture content. Soils with high silt and clay content are more susceptible to becoming compacted than sandy soils under the same moisture conditions. Moist soils are more prone to compaction for all soil texture and mineral types. Dry soils are less susceptible to compaction than wet soils, but dry soils produce more dust that is eroded by wind. Many of the soils within the MATL analysis area have fine-grained surface soil textures and will be prone to compaction by construction equipment, if adequate soil moisture is present. This may be especially true with cement trucks delivering concrete for monopole foundations.

Salinity

Salinity is a measure of the salt content of the soil. Highly saline soils inhibit the growth of vegetation due to the increased osmotic potential exerted by the salts in the soil solution. Revegetation of disturbed areas with highly saline soils may be problematic. Most of the soils within the analysis area have low to moderate salinity and small areas of saline soils could be avoided. Revegetation success should not be influenced by saline soils in the analysis area with the exception of saline seep areas.

Roads and Access

Roads are best constructed on soils with coarse-grained surface soil textures, compared to soils with surface soils with fine-grained textures. Many soils in the MATL analysis area have fine-grained surface soil textures and may not be suitable for building temporary or permanent roads.

Revegetation

The soils within the MATL analysis area are mostly rated fair to good for growing grasses. The reestablishment of range or cropland vegetation on the disturbed lands should be successful if standard fertilization and seeding methods are implemented.

3.2.3 Environmental Impacts

Potential impacts to geologic and soil resources from the four alternatives are described in this section. The difference among action alternatives depends on the competency of the bedrock, soil type, slope, and disturbance activities that would take place at a given location. Resource characteristics that could be affected differently by each action alternative are slope stability (due to mass movement) and soil stability (due to erosion). Increasing the risk of mass movement could not only result in slope instability, but also compromise the integrity of transmission line support poles. Increasing soil erosion could result in the loss of topsoil, reduced effectiveness of revegetation efforts during reclamation, and increased sedimentation to surface water. Increased soil compaction would also reduce the effectiveness of reclamation efforts in the selected alignment.

Other geologic and soil characteristics (seismicity, subsidence, mineral resources, salinity, road substrate material, and compaction) are similar throughout the analysis area. Impacts to (and from) these resources would be the same for all alternatives and are described below.

3.2.3.1 Alternative 1 — No Action

The No Action alternative would not affect geology or soil resources beyond current impacts from farming, road building, and construction activities.

3.2.3.2 Alternative 2 – Proposed Project

Areas within the Alternative 2 alignment that are prone to impacts, including slope stability (due to landslide in areas underlain by glacial till and shale on a slope), soil stability (due to erosion on slopes), and soil compaction, are shown on **Figure 3.2-1**. Overall, with successful implementation of the MATL proposed environmental protection measures and the required DEQ environmental specifications, impacts to soils and geology under Alternative 2 would be minor and primarily of short duration.

MATL proposes to use laminated wood or steel poles, which are usually treated with chemicals to extend the life of the wood. Some of the chemicals typically used include pentachlorophenol, creosote, arsenic, and chromium. Some of these chemicals may affect the soil immediately adjacent to the pole. Pentachlorophenol is approved for use by EPA, but is considered a probable human carcinogen. Pentachlorophenol, when released to soil or water, would be slowly broken down by sunlight, other chemicals, and microorganisms to other chemicals within a couple of days to months.

Potential for Landslide

Landslides are the downslope movement of earth or surface materials due to gravity, and include rock falls, rotational or translational slides, and earth or debris flows. Slides are the most common and most destructive type of landslide and of most concern for the MATL project. Slides are likely to occur on incised banks and steep slopes primarily where the alignment would cross streams and rivers. Landslides could result in the shifting or collapse of transmission line poles and would likely contribute to the sediment load of nearby surface water. Landslides occur naturally and can be exacerbated by ground disturbance and heavy equipment associated with the construction of the transmission line. The risk for landslide is greatest in the hills near Black Horse Lake (milepost 5), and at the north side of the Teton River (milepost 35 to 40). Areas within the Project study area with high potential for landslide are shown on **Figure 3.2-1**. MATL would implement erosion and sediment control practices as provided in its application (**Table 2.3-4**) (MATL 2006b) and required by the State of Montana. DEQ Environmental Specifications in **Appendix F** include precision mapping of unstable soils along these segments of the Alternative 2 alignment and providing an alignment wider than 500 feet to allow flexibility in pole placement near the Teton River, so future landslides do not adversely affect the proposed line.

Soil Stability and Erodibility

Areas prone to soil instability, mass movement, and associated soil erosion are shown on **Figure 3.2-1**. Areas with glacial till on slopes greater than 20 percent and fine-textured soils on slopes greater than 20 percent have the highest potential for mass movement and soil erosion. Approximately 16.4 miles of Alternative 2 are located on unstable soils on slopes greater than 15 percent. Soil stability and erodibility are primarily dependent on soil texture, slope, and degree of disturbance. Soils along much of Alternative 2 are fine-grained and are prone to erosion when the vegetative cover is disturbed, which would be primarily during construction activities. The greatest potential for soil erosion for Alternative 2 would be from the construction of access roads along the valley walls of the Teton and Marias rivers. Implementing soil and erosion control measures would help minimize the formation of gullies.

Compaction

Soils may become compacted under all action alternatives, especially during the construction phase. MATL has committed to stripping topsoil, by sidecast methods, for new access roads and replacing the sidecast soils following construction. MATL has also developed specific mitigation measures for soils, including providing an erosion control plan and implementing best management practices (water bars, drainage contours, straw bales, filter cloth, or similar) for areas with susceptible soils to minimize impacts to soils.

3.2.3.3 Alternative 3 – MATL B

Alternative 3 is 8.3 miles shorter than the Alternative 2 (121.6 miles vs. 129.9 miles) due to more diagonal segments along the entire alignment. The potentials for mass movement and unstable soils are similar to those under Alternative 2, but the lengths of the alignment with the potential for mass movement and the occurrence of unstable soils are less under Alternative 3.

Potential for Landslide

Mass movement impacts and mitigations would be similar to Alternative 2. The risk for mass movement is greatest near the historic channel of the Teton River (milepost 32 to 34) and at the Marias River crossing (milepost 84 to 85). Areas within the Project study area with high potential for landslide are shown on **Figure 3.2-1**. MATL would implement erosion and sediment control practices as provided in its application (**Table 2.3-4**) (MATL 2006b) and required by the State of Montana draft Environmental Specifications (**Appendix F**) and a required stormwater pollution prevention plan under Montana's Water Quality Act.

Soil Stability and Erodibility

Areas prone to soil instability, mass movement, and associated soil erosion problems are shown on **Figure 3.2-1**. About 12 miles of Alternative 3 are located on unstable soils on slopes greater than 15 percent. Soil stability and erodibility are primarily dependent on soil texture, slope, and degree of disturbance. Soils along much of Alternative 3 are fine-grained and are prone to erosion when the vegetative cover is disturbed, which would be primarily during construction activities. The greatest potential for soil erosion for Alternative 3 would be from the construction of access roads along the banks of the Teton and Marias rivers. Implementing soil and erosion control measures would help minimize the formation of gullies.

3.2.3.4 Alternative 4 – Agency Alternative

Alternative 4 is 139.9 miles in length, which is about 10 miles longer than the proposed Project (129.9 miles). This alternative is composed of 60.9 miles of the Alternative 2 alignment and 78.7 miles of agency-developed alignments that branch off the Alternative 2 alignment. The 78.7 miles of agency alignments were developed to address identified local scoping issues and concerns. The potentials for mass movement and unstable soils are similar to those under Alternatives 2 and 3, but the lengths of the alignment with the potential for mass movement and the occurrence of unstable soils are greater under Alternative 4 primarily due to the alignment of the alternative along the Dry Fork of the Marias River.

Potential for Landslide

Mass movement impacts and mitigations would be similar to Alternative 2. The risk for landslide is greatest within the historic channel of the Teton River (milepost 36 to 42), along the Dry Fork of the Marias River (milepost 70 to 82), and at the Marias River crossing (milepost 98.5 to 100.5). Areas within the Project study area with high potential for landslide are shown on **Figure 3.2-1**. MATL would implement erosion and sediment control practices as provided in its application (**Table 2.3-4**) (MATL 2006b) and required by the State of Montana (**Appendix F**) and a required stormwater pollution prevention plan under Montana's Water Quality Act.

Soil Stability and Erodibility

Areas prone to soil instability, mass movement, and associated soil erosion problems are shown on **Figure 3.2-1**. About 24 miles of Alternative 4 are located on unstable soils on slopes greater than 15 percent. Soil stability and erodibility are primarily dependent on soil texture, slope, and degree of disturbance. Soils along much of Alternative 4 are fine-grained and are prone to erosion when the vegetative cover is disturbed, which would be primarily during construction activities. The greatest potential for soil erosion for Alternative 4 would be from the construction of access roads along the banks of the Teton, Dry Fork of the Marias, and Marias rivers. Implementing soil and erosion control measures would help minimize the formation of gullies.

3.2.3.5 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.3 Engineering and Hazardous Materials

3.3.1 Analysis Methods

Engineering concerns pertain to transmission line support structures and the impacts of these structures associated with crossing contaminated sites, pipelines, other transmission lines, major highways, streams, and rivers.

Analysis Area

The analysis area for engineering and hazardous materials includes the proposed power line alignments, staging locations, and a 1-mile buffer zone on each side of the proposed alignments.

Information Sources

Information for the analysis of engineering resources was obtained from the MATL MFSA application (MATL 2006b). Information sources for hazardous materials in the affected environment included the online U.S. Environmental Protection Agency (EPA) Region 8 Superfund Site Locator (EPA 2006c), the online Montana NRIS (2006b), and field observation of oil and gas extraction operations within the analysis area.

Methods used to analyze the potential impacts of alternatives 2, 3, and 4 included evaluation of proposed alignments with respect to mapped hazardous materials in the analysis area and evaluation of proposed activities with respect to potential use and generation of hazardous materials.

3.3.2 Affected Environment

Proposed Transmission Line Design

The transmission line would be designed, constructed, operated, and maintained in accordance with the NESC, U.S. Department of Labor OSHA Standards, and other guidance as appropriate for safety and protection of human life and the environment.

Federal Superfund Sites

A review of the online EPA Region 8 Superfund Site Locator found that there are no Federal Superfund (Comprehensive Environmental Response, Compensation, and Liability Act, or CERCLA) sites in the Project area. The closest Federal Superfund sites to the project area are the Barker Hughesville historic mining district and the Carpenter-Snow Creek mining district, both of which are on the Federal National Priorities List.

Barker Hughesville mining district is 36.2 miles southeast of Great Falls. Carpenter-Snow Creek mining district is 46 miles southeast of Great Falls.

State Superfund Sites

There are four state Superfund sites in the Project area. Three of the sites are not affected by any transmission line alignments. The Conrad Refining Company site, 1 mile south of Conrad, is an inactive, 9-acre oil refinery operated from 1929 to 1941 where operators disposed of sludge in on-site pits. The Midwest Refining Company site, in Conrad near Front Street and Second Street South, is an inactive, 0.9-acre former oil refinery in operation around 1929. Little historic or other information is available about the facility. The Union Oil-Cut Bank Refinery site (also known as the Flying J Refinery), 3 miles southeast of Cut Bank, is an inactive crude oil refinery and natural gas processing plant operated from 1937 to 1983. One site, The Carter Oil Company Cut Bank Refinery, 1 mile east of Cut Bank is within 1,000 feet of the Alternative 2 alignment.

Oil and Gas Operations and Pipelines

Numerous oil and gas fields are located in the northern portion of the analysis area. All action alternatives would traverse areas with operating oil and gas extraction wells, well waste pits, oil and gas storage systems, and pipelines. A variety of pipelines, including gathering system main lines and transmission or trunk lines between 8 and 20 inches in diameter, are within or traverse the Project study area. These pipelines are used to transport either crude oil or natural gas. Four major pipelines are in a broad corridor between the Canadian border and Cut Bank; six major pipelines are between Cut Bank and Great Falls.

Crude oil pipelines in the analysis area were located based on information provided by several sources including Front Range Pipeline Company, USGS topographic maps, agency field notes from the fall of 2006, review of 2005 aerial photographs, NRIS mapping, and the Montana Board of Oil and Gas Conservation. Crude oil pipelines in the NRIS database (Corridor Oversight Review Committee, Montana State Library 1999), or provided by the above referenced sources include:

- Two Continental crude oil pipelines located east of Great Falls running northwest approximately parallel to the Proposed Project and alternatives. The pipelines are 12 inches and 18 inches in diameter. These pipelines run from east of Great Falls through Portage, Cascade County, to Cut Bank and beyond. These pipelines are crossed in the vicinity of Cut Bank by alternatives 2, 3, and 4.

- Two Front Range Pipeline Company 10-inch mainlines, one 6-inch mainline, and one 16-inch mainline start at the U.S.-Canada border and end at the Santa Rita pump station.

- One Front Range Pipeline Company 16-inch mainline starts at Santa Rita station and ends in Laurel, Montana.
- One Front Range Pipeline Company 8-inch mainline starts at the Santa Rita station and ends at the Cut Bank station.

Additional smaller natural gas pipelines are likely located within the analysis area and may be crossed by alignments associated with alternatives 2, 3, and 4.

3.3.3 Environmental Impacts

3.3.3.1 Alternative 1 — No Action

The MATL transmission line would not be built. There would be no engineering or hazardous materials concerns if the No Action alternative is selected.

3.3.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Proposed Construction

The 500-foot-wide Alternative 2 alignment would come within 100 feet of an existing pipeline for a total length of 7.0 miles. The Alternative 3 alignment would come within 100 feet of an existing pipeline for a total of 23.7 miles, and the Alternative 4 alignment would come within 100 feet of an existing pipeline for a total of 5.7 miles. A study, requested by DEQ and prepared by SNC LAVALIN for MATL (SNC LAVALIN 2006b) helped quantify the relationship between the maximum induced voltage on a theoretical pipeline caused by the operation of the MATL 230-kV transmission line for different lengths of parallel and separation distances. Assuming the transmission line was constructed near the center of the 500-foot wide alignment, the separation distance between the pipeline and the transmission line would be a minimum of 250 feet. The SNC LAVALIN study estimated that the steady state induced voltages on the pipeline should be below the safety threshold of 15 volts (voltage that a human with an average body weight can withstand) (Canadian Standard Association 2007; .NACE Standard 2000) under most conditions. However, the study recommends that MATL contact the pipeline companies when the length of parallel and separation distance could induce voltages that exceed the 15 volt safety threshold. Common grounding mitigation measures were recommended in the study to reduce risks of induced voltages from human contact with an affected pipeline (SNC LAVALIN 2006b). Mitigation measures included grounding mats, gradient wire controls, and gradient control mats and grids. The risk for potential pipeline damage (accelerated corrosion) would also increase with an increase in length of alignment proximal to a pipeline. With the implementation of safe work and sound construction practices, no short-term adverse impacts would be associated with transmission line construction tasks.

__Proposed Operations and Maintenance__

No long-term adverse impacts would be associated with operation and maintenance of the transmission line. Wood H-frame structures generally require more maintenance than steel structures and have a shorter useful life. Wood H-frame structures should meet the operational life of the proposed transmission line. Pentachlorophenol would be used as a wood preservative for the wood pole structures and is an EPA registered restricted use pesticide for this use. When poles are no longer sound or useful, structure components that have been treated would have to be disposed of as a hazardous waste (estimated 11,000 cubic yards of treated wooden poles).

Impacts to buried utilities, such as pipelines, and the minimum separation distances and length of parallel were evaluated and modeled for MATL by SNC LAVALIN (SNC LAVALIN 2006b). Many factors and assumptions were used to model the steady state line operation and single line to ground fault conditions. In addition to the variables for the transmission line, the amount to induced voltages on a pipeline would also depend on the pipeline coatings, other physical properties of the pipeline, and soil conditions. Some reference lengths of separation distances and lengths of parallel that would result in induced voltages of 15 volts are provided in **Table 3.3-1**.

TABLE 3.3-1
MAXIMUM STEADY STATE INDUCED VOLTAGES FOR SELECTED SEPARATION DISTANCES AND LENGTHS OF PARALLEL

Horizontal Separation between Transmission Line and Pipeline (feet)	Length of Parallel (miles)	Maximum Induced Voltage (Volts)
<66 feet (min. modeled)	About ½ mile	12
100	About 1 mile	15
150	About 2 miles	15
240	About 4 miles	15
330	About 6 miles	15
1640	About 9 miles	15

The length of the parallel and separation distances would vary for each alternative. **Table 3.3-2** provides the lengths of parallels by alternatives for horizontal separations that may have induced voltages above the 15 volt threshold. After a selected alternative alignment has been certified by DEQ and DOE, the locations of any potentially high induced voltages could be provided to all impacted pipeline companies. MATL would consult with pipeline owners about the best methods to implement the appropriate mitigation measures to reduce discharges and interference with cathodic protection systems (MATL 2006, SNC LAVALIN 2006). Agencies would require MATL to consult with owners of pipelines crossed and paralleled (within 2,000 feet) and implement any measures requested by the pipeline owner or operator to prevent interference with the cathodic protection system. Common grounding mitigation measures, such grounding mats, gradient wire controls, and gradient control mats and grids, would likely be required. In addition, the transmission line would comply with all Federal and State regulations concerning co-locating a transmission line near a buried gas pipeline (Dawalibi 2004). Additional discussion on the mitigating measures that could be used and the safety of co-locating a transmission line with a pipeline is provided in Section 3.4.3.

TABLE 3.3-2
AREAS WHERE TRANSMISSION LINE AND PIPELINE SEPARATION AND LENGTH OF PARALLEL MAY CREATE VOLTAGES ABOVE 15 VOLTS

Alternative	Total Length of Parallel (<100 feet separation)[1]	No. of Parallels (<100 feet separation) that are minimum of 1 mile long[1]	No. of Parallels (<150 feet separation) that are minimum of 2 miles long[1]	No. of Parallels (<240 feet separation) that are minimum of 4 miles long[1]
Alt. 2	7.0 miles	2	0	0
Alt. 3	9.8 miles	4	0	0
Alt. 4	5.7 miles	0	0	0

1 A horizontal separation and length of parallel that may create induced voltages above 15 volts.

Federal and State Superfund Sites

No Federal or state Superfund sites would be affected by any of the proposed alignments.

3.3.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.4 Electric and Magnetic Fields

This section describes background information regarding impacts from electric and magnetic fields (EMF) and corona effects, and evaluates the action alternatives for impacts on human health and safety.

Both current and voltage are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge, measured in amperes (A), creates a magnetic field. The magnetic field is expressed in units of milligauss (mG). The voltage, the force or pressure that causes the current to flow, measured in units of volts (V) or thousand volts (kV), creates an electric field. Both fields occur together whenever electricity flows, hence the general practice of considering both as EMF exposure. Any device connected to an electrical outlet, even if the device is not turned on and current is not flowing, would have an associated electric field that is proportional to the voltage of the source to which it is connected. Magnetic fields occur only when current is flowing. Common materials such as wood and metal usually do not shield against magnetic fields.

This section also addresses safety considerations in the immediate vicinity of transmission lines. Additionally, the potential for corona effects on the human environment from transmission lines is discussed. Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors, the wires that carry electricity. Corona effects are of concern for potential audible noise, interference with radio, television, and other electrical devices, such as differential Global Positioning System (DGPS) equipment, production of visible light, and photo chemical reactions.

3.4.1 Analysis Methods

The EMF effects of the transmission lines were calculated for a range of distances from the transmission line. In general, the farther removed a person is from the transmission line, the lower the EMF strength. Different scenarios were tested in the calculations. Because the magnetic field varies with the current carried on the transmission line, magnetic field strength was calculated for the normal anticipated voltage of 230 kV (under normal operating conditions) per circuit. In the optimized phasing orientation, the phases of the single circuit are offset to minimize the EMF strength. As described in Section 3.4.2, the focus of EMF health studies and the focus of the following impacts analysis are on magnetic fields, although electric fields are included for completeness.

Since MATL's policy is to minimize EMF exposure levels to the extent practicable, MATL would use the vertical optimized phasing orientation for the single-circuit line. Results from the non-optimized phasing orientation are included for comparison purposes only. The calculations evaluate EMF strength at a range of distances from the centerline of the transmission line, both within and outside the approximate 105 feet safety zone, and for the portion of each span where the conductors are closest to the ground. The magnetic field is expressed in units of mG; the electric field is expressed in units of kV/m.

The potentials for corona effects and effects on safety are also evaluated. The nearest potential stationary receptors to the transmission line were determined for the proposed alternative reference centerline alignment and included residences, schools, and commercial establishments.

Analysis Area

Based on the use of the single circuit, H-frame structure transmission line, the analysis area for human health effects from electric and magnetic fields would include the right-of-way plus 30 feet to either side of the edge of the right-of-way as a safety zone. This totals 105 feet along each alignment. According to the MFSA application, the safety zone can be adjusted if necessary to meet the electric field requirements set forth by the State of Montana of 1 kV/m at the edge of the right-of-way (safety zone) in residential and subdivision areas.

Information Sources

General EMF data were researched from the American Conference of Governmental Industrial Hygienists, the Institute of Electrical Engineers, the California Department of Health Services, the National Institutes of Health, World Health Organization, journal articles, and the National Institute of Environmental Health Sciences (NIEHS).

3.4.2 Affected Environment

The affected environment is described in terms of both magnetic and electric health concerns.

Magnetic Field Health Concerns

In recent years, the focus of the EMF health studies for power lines has been on the magnetic fields created by the power lines. These studies investigated the potential that exposure to magnetic fields would increase the risk of cancer, leukemia, miscarriages, and other diseases. A recent report by the BioInitiative Working Group (2007) documents key studies and reviews for low-intensity effects of electromagnetic fields. This report attempts to document deficiencies in current exposure standards which are primarily safety limits, and the need for biologically-based exposure standards. The

BioInitiative report concludes that a reasonable approach would be 1mG planning limit for habitable space adjacent to new or upgraded power lines and a 2mG limit for all other new construction. Other groups have adopted far less stringent standards.

A 60-Hertz (Hz; cycles per second) magnetic field is created in the space around transmission line conductors by the electric current flowing in the conductors. This is the frequency of ordinary household current, usually referred to as 60 cycle. The strength of the magnetic field produced by an electric transmission line depends on the amount of current flowing through the conductor (the higher the electrical load, the higher the current), the configuration of the conductors (spacing and orientation), the height of the conductors, the distance from the line, and the proximity of other electrical lines. As the electric load (and the resulting current) on a transmission line varies continually on a daily and seasonal basis, the magnetic fields likewise vary throughout the day and year. Magnetic fields are highest closer to the line and diminish with distance. Physical structures, such as buildings, are transparent to magnetic fields in that they do not provide any shielding, thus fueling the interest in potential health effects.

Existing magnetic field levels in the project vicinity are primarily produced by common household appliances. Magnetic field strengths of some common household appliances are listed in **Table 3.4-1**. This table shows that the magnetic fields at a distance of 3 feet range from less than 0.1 mG to 18 mG.

TABLE 3.4-1
EMF LEVEL OF SOME COMMON HOUSEHOLD APPLIANCES

Appliance	Magnetic Field at 3 feet (mG)
Clothes dryers	0.0 to 1
Clothes washers	0.2 to 0.48
Electric shavers	Less than 0.1 to 3.3
Fluorescent desk lamp	0.2 to 2.1
Hair dryers	Less than 0.1 to 2.8
Irons	0.1 to 0.2
Portable heaters	0.1 to 2.5
Television	Less than 0.1 to 1.5
Toasters	Less than 0.1 to 0.11
Vacuum cleaners	1.2 to 18.0

Notes:
EMF = electric and magnetic field
mG = milligauss
Source: Waveguide 2003

Existing transmission and distribution lines also contribute to EMF levels. **Figure 3.4-1** shows the existing transmission lines in the project vicinity. As an example of maximum existing EMF, MATL has modeled EMF levels from the existing 115-kV transmission lines that run through the proposed Project area. At a distance of 49 feet from the existing 115-kV transmission line (which coincides with the proposed location of MATL's new transmission line), the magnetic field is 6.5 mG and the existing electric field is 1.75 kV/m. At a distance of 200 feet from the existing 115-kV transmission line the magnetic field is 0.4 mG and the electric field is 1.06 kV/m under normal operating conditions.

No Federal or state regulations are in effect specifying environmental limits on the strengths of magnetic fields from power lines. However, the state of Montana has adopted an electric field exposures of 1 kV/m edge of right-of-way standard in residential and subdivided areas unless waived by the landowner and a 7 kV/m standard for road crossings.

Electric Field Health Concerns

Safety considerations in the immediate vicinity of electric power lines include the potential for electric shock, the clearance of the power lines above ground, measures to prevent unauthorized climbing of the poles, and the proximity of the transmission lines to other utilities such as oil wells and pipelines.

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses.

Sparking and Shocks

In a high electric field, it is theoretically possible for a spark discharge from the induced voltage on a large vehicle to ignite gasoline vapor during refueling. However, the probability for the precise conditions to occur for ignition is extremely remote. According to the Conrad-Shelby EIS (DOE 1986), the ignition of fuel under a transmission line would require that an individual be standing on damp earth or vegetation and that the vehicle to be refueled will be exposed to the maximum intensity of the electric field. Also, the vehicle must not be grounded.

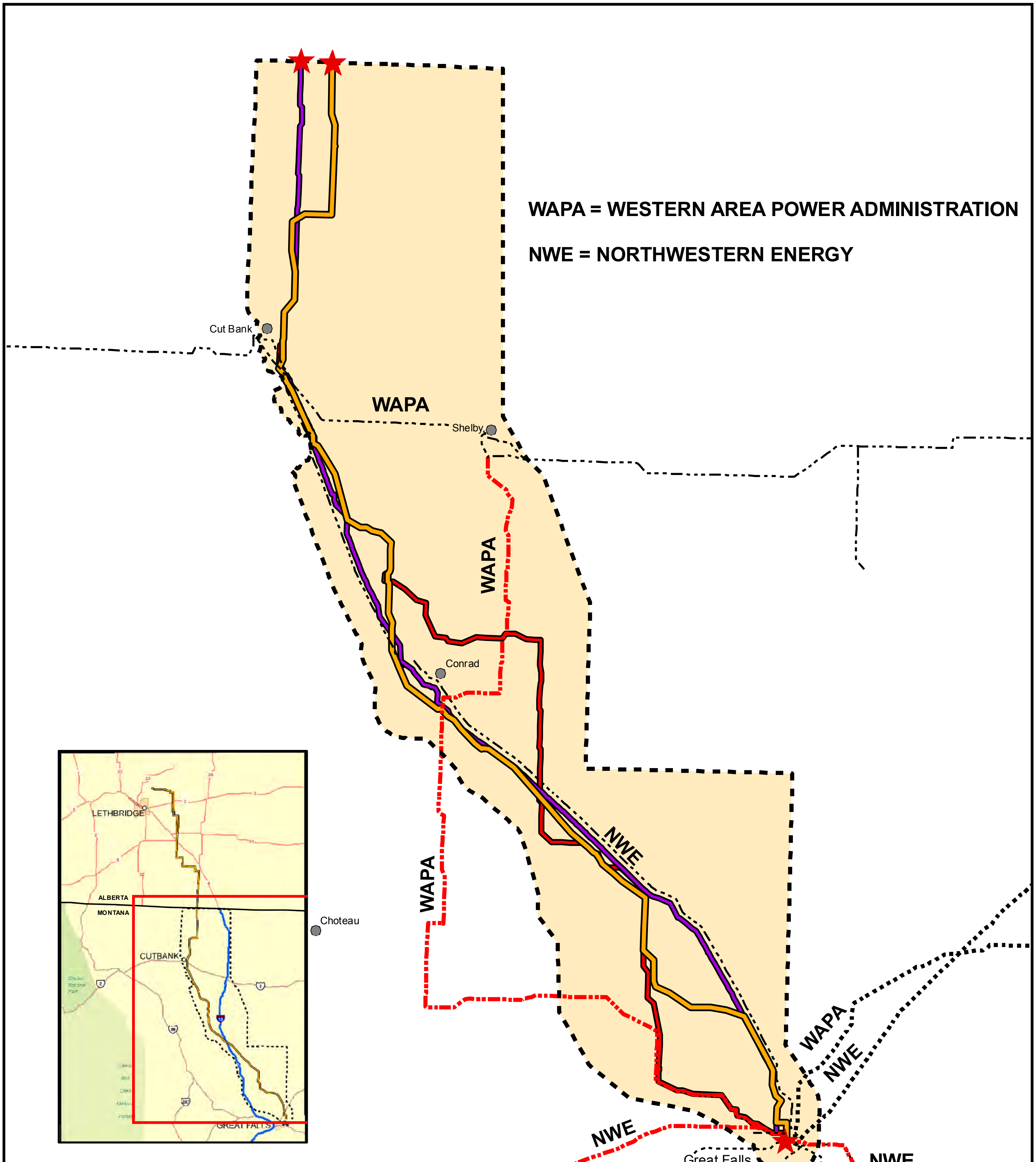


FIGURE 3.4-1
EXISTING TRANSMISSION LINES LARGER THAN 69kV IN PROJECT VICINITY

LEGEND

- 230kV POWERLINE
- 161kV POWERLINE
- 115kV POWERLINE
- 100kV POWERLINE
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA
- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_4-1_MATL_Transmission_Lines_letter_012207.mxd

Finally, the air-fuel mixture must approach optimal flash-point conditions. Therefore, the number of precise conditions to be met to achieve fuel ignition reduces the likelihood of the occurrence. In the event fueling is to be done under a power line, grounding is recommended.

Short Circuit Currents

When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced. Some representative short-circuit currents in undisturbed electric fields of 1 kV/m and 3.5 kV/m are provided in **Table 3.4-2**.

TABLE 3.4-2
SHORT CIRCUIT CURRENTS FOR VARIOUS OBJECTS IN MILLIAMPERES (MA)

	Electric Field	
Object	**1 kV/m**	**3.5 kV/m**
Person (5′8″ tall)	0.016	0.06
Cow	0.024	0.08
Sedan	0.11	0.40
Camper truck (28′long)	0.28	1.00
Large trailer-truck (65′x8.5′x13.5′)	0.93	3.30
Large haystacker and 4wd tractor	0.89	3.10
3- strand fence (200′ long)	0.30	1.10

Source: Conrad –Shelby Transmission Line EIS (DOE 1986)

Based on the length requirements set forth by the U.S. Department of Transportation, the longest permitted truck in Montana is 65 feet. This is also the longest anticipated vehicle under the proposed transmission line with a short-circuit current of 0.93 milliampere (mA)/kV/m. Large farm equipment, such as hay wagons, sprayers, and combines, would also have large short-circuit currents but would not exceed the NESC criterion of 5 mA. For example, a 130 foot sprayer would have an estimated worst case induced current at midspan of .79 mA. Under a worst case scenario, the short circuit current to the largest anticipated vehicle (a semi truck and trailer) is 3.3 mA, which is less than the NESC criterion of 5 mA. The transmission line will be designed to accommodate the maximum height of a vehicle or piece of equipment passing under the line. If a person provides the only conducting path from the object to the ground, then the currents listed in **Table 3.4-2** flow through the person, when the person touches the object and the object is below the line. Based on the action alternative descriptions, all equipment being operated around the transmission line should be properly grounded. In summary, electric field health concerns are:

- *Steady-State Current Shock* – Steady-state currents are those that flow continuously after a person contacts an object, such as a vehicle, and provides a path to ground for the induced current. The effects of these shocks range from involuntary movement in a person to direct physiological harm. Steady-state current shocks occur in instances of direct or indirect human contact with an energized transmission line. An example of direct steady-state current shock would be similar to the incident that occurred when a young farm worker touched a grain auger to a transmission line while in contact with the auger. Based on the investigations by NIOSH following the incident, the current entered the worker through his hands and exited through his left foot. The worker therefore became the exit point for the steady state current.

- *Spark-Discharge Shocks* – Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage is sufficiently high, a spark-discharge shock would occur as contact is made with the ground. Spark-discharge shocks that create a nuisance occur in instances of carrying or handling conducting objects, such as irrigation pipe, near (not touching) transmission lines (EPRI 2001).
- *Field Perception and Neurobehavioral Responses* – When the electric field under a transmission line is sufficiently strong, it can be perceived by hair raising on an upraised hand. This is the effect of harmless levels of static electricity, similar to the effect of rubbing feet with socks on a carpet.

Other Health Concerns

An additional safety concern in the immediate vicinity of electric power lines is the potential for people to climb support structures and either fall or receive a serious shock. Support structures can be designed in a manner to reduce unauthorized climbing of the structures by members of the public.

With the increasing trend of large farm equipment, sufficient clearance height should be considered to avoid contact with the lines either directly or indirectly, as provided by the National Electric Safety Code.

Smoke can also be a conductor of electrical current. When a fire is in the vicinity of a 230-kV transmission line, current could potentially arc through the smoke. Downed or damaged power lines sometimes ignite fires.

Corona Effects

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona is of concern for potential audible noise (60-cycle hum), radio, television, and GPS interference, visible light, and photochemical reactions. Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, or drops of water. During fair weather, the number of these sources is small and the corona effect is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater (DOE 2001). Corona effects of concern are listed below.

- *Audible Noise* – Corona-generated audible noise from transmission lines is generally characterized as a cracking/hissing noise. The noise is most noticeable during wet weather conditions. Audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the right-of-way. Refer to Section 3.12 for a description of existing noise in proposed Project area.
- *Radio, Television, and GPS Interference* – Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. GPS units are operated at frequencies of 1575.42 megahertz (MHz) and 1227.6 MHz (Enge and Hatch 1996) and no interference is expected with the 60 Hz frequency associated with transmission lines. Only AM receivers located very near to transmission lines have the potential to be affected by radio interference. The potential for interference from corona effects is more severe during damp or rainy weather.
- *DGPS* – Some precision farm equipment in the analysis area is believed to use DGPS. DGPS receivers with differential correction receive a radio signal at frequencies between 285 to 325 kilohertz. Transmission line generated radio noise can occasionally exceed DGPS broadcast radio strengths, especially in bad weather (EPRI 2000). Likewise, gap generated discharge radio frequency noise that is broadband may occasionally exceed DGPS broadcast band signal strengths and can extend above 1 GHz into the GPS satellite signal band (EPRI 2000). Transmission lines may sometimes reradiate AM radio signals and may also degrade DGPS signal reception (EPRI 2000). Lastly, it is possible, but not very likely, that presence of a power line or support structure may scatter GPS signals and cause a temporary loss of lock on a satellite signal.
- *Visible Light* – Corona may be visible at night as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors usually is observable only under the darkest conditions with the aid of binoculars.
- *Photochemical Reactions* – When coronal discharge is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidants is ozone, while the remaining 10 percent is composed principally of nitrogen oxides. Refer to Section 3.11 for a description of existing air quality.

3.4.3 Environmental Impacts

This section discusses the potential human health and environment effects of the proposed Project. Potential impacts on human hearing are addressed in Section 3.12.

3.4.3.1 Alternative 1 – No Action

Under the No Action alternative, MATL would not build the proposed transmission line and associated facilities as proposed. There would be no incremental EMF exposure associated with the project. EMF exposure from existing transmission lines and household appliances would be expected to continue. There would be no corona effects associated with the project. There would be no associated safety issues regarding co-location with a natural gas or oil pipeline.

3.4.3.2 Alternative 2 – Proposed Project

Electric and Magnetic Field Effects. Alternative 2 would use single-circuit, H-frame structures, with two overhead shield wires. Three-pole structures would be used at medium and heavy angles, and dead ends, strung with 230-kV conductors. The spacing of the structures would be in the range of 500 to 1,600 feet apart, and the conductors would be 21.2 feet above the ground. The minimum ground clearance of the conductors set forth in the National Electric Safety Code is 19.72 feet; therefore some additional ground clearance would help diminish the potential for induced current exposure.

Table 3.4–3 lists the EMF strength under normal anticipated load conditions for the 230-kV single-circuit transmission line using H-frame structures. For comparison, the EMF field strengths are also provided for monopole structures. These calculations are based on a maximum thermal capacity of 420 megavolt amperes. EMF strength is given for normal operating configurations that would be used by MATL. The electric field strengths and magnetic field strengths under normal operating conditions and optimized phasing configuration for transmission lines (H-frame structures) are shown in **Figure 3.4-2** and **Figure 3.4-3**, respectively (SNC-LAVALIN 2006). The distances given represent the distance of a receptor from the centerline of the transmission line and one meter above the ground. At a given distance, the electric and magnetic field strength would be nearly identical on both sides of the transmission line.

EMF effects are in **Table 3.4–3.** Long-term electric field exposure at the nearest residence to Alternative 2 (located within approximately 270 feet of the centerline) would be below the state of Montana standard of 1 kV/m at the edge of the right-of-way. The EMF strengths conform to those normally found in comparable lines. Most current exposure to EMF in the area is from household appliances. Average daily exposure to magnetic fields from some common household appliances is 0.08 (NIEHS 1999). The recommended biologically-based public exposure standard is 2 to 4 mG (BioInitiative Working Group 2007). Schools and commercial establishments would be located farther than 300 feet from the transmission line. The closest school to the transmission line would be Glacier Elementary at 0.86 mile to the west of Alternative 2. There are no known daycare centers, hospitals, or other areas of concentrated human occupancies near this alternative. Alternative 2 would produce EMF levels below the standard and within the biologically-based recommendation. Short-term exposures would still occur while driving under the transmission line.

TABLE 3.4-3
EMF EFFECTS

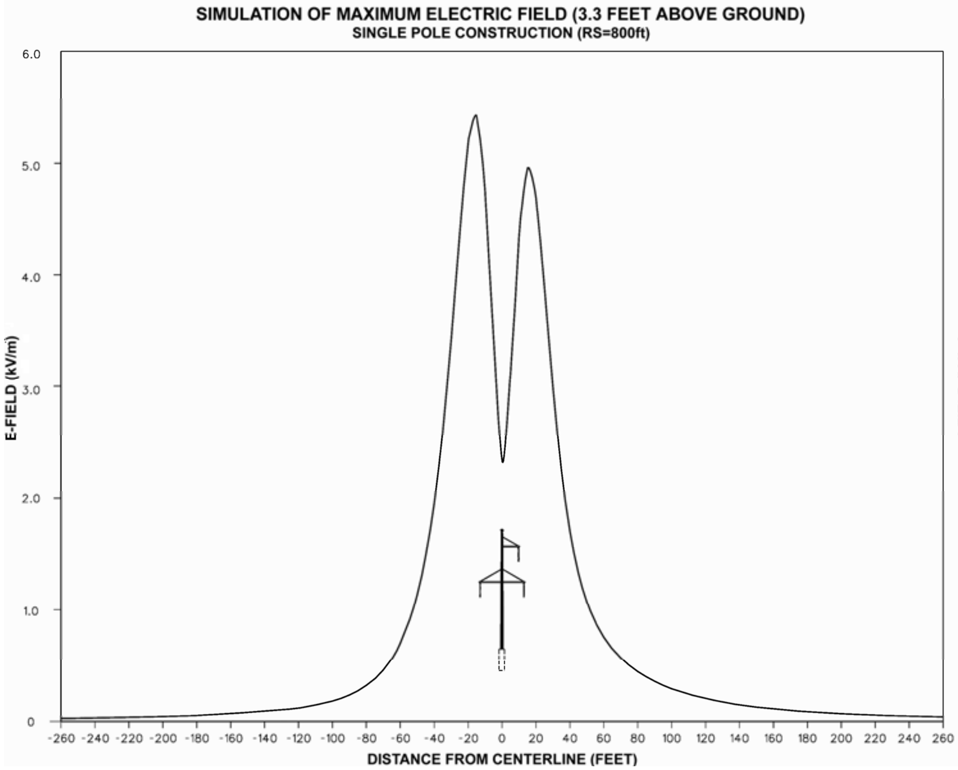
Structure Type	Location	Distance from Center Line (feet)	Electric Field (kV/m) (1 conductor side/2 conductor side)	Magnetic Field (mG) (1 conductor side/2 conductor side)
H-frame NESC Ground Clearance: 21.2 feet	Below Conductor	21.65	5.36	232.42
	Right-of-way Edge	22.5	5.39	228.13
	Safety Zone Edge	52.5	1.67	70.57
	Alignment Edge	250	0.01	3.8
Monopole NESC Ground Clearance: 21.2 feet	Below Top Conductor	10.83	NA/ 4.44	NA/ 215.41
	Below Bottom Conductor	14.11	5.30/4.84	225.34/201.67
	Right-of-way Edge	22.5	4.78/4.29	164.83/152.32
	Safety Zone Edge	52.5	1.02/0.99	48.47/42.25
	Alignment Edge	250	<0.01	<3.8

Note: Estimates calculated using Corona and Field Effects Program (Kingery 1991), and based on conductor ground clearance of 21.2 feet (NESC specification).
kV/m = kilovolts per meter
mG = milligauss
NA = not applicable

Safety. As described in Section 3.4.2, the electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and people. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, field perception and neurobehavioral responses and smoke and fire. The following describes the potential for effects on safety, and design measures that would be incorporated. The monopole steel structures are designed to deter climbing.

Induced Currents. The 230-kV transmission line would have a minimum ground clearance of 21.2 feet to reduce the potential for induced current shocks. In addition, permanent structures in the safety zone, such as fences, gates, and metal buildings would be grounded.

Steady-State Current Shocks. Features reducing the level of potential for induced current in objects near the transmission line also reduce the level of a possible induced current shock. The proposed lines would be constructed in accordance with industry and MATL standards to minimize hazardous shocks from direct or indirect human contact with an overhead, energized line. The proposed line is expected to pose minimal hazards to humans.



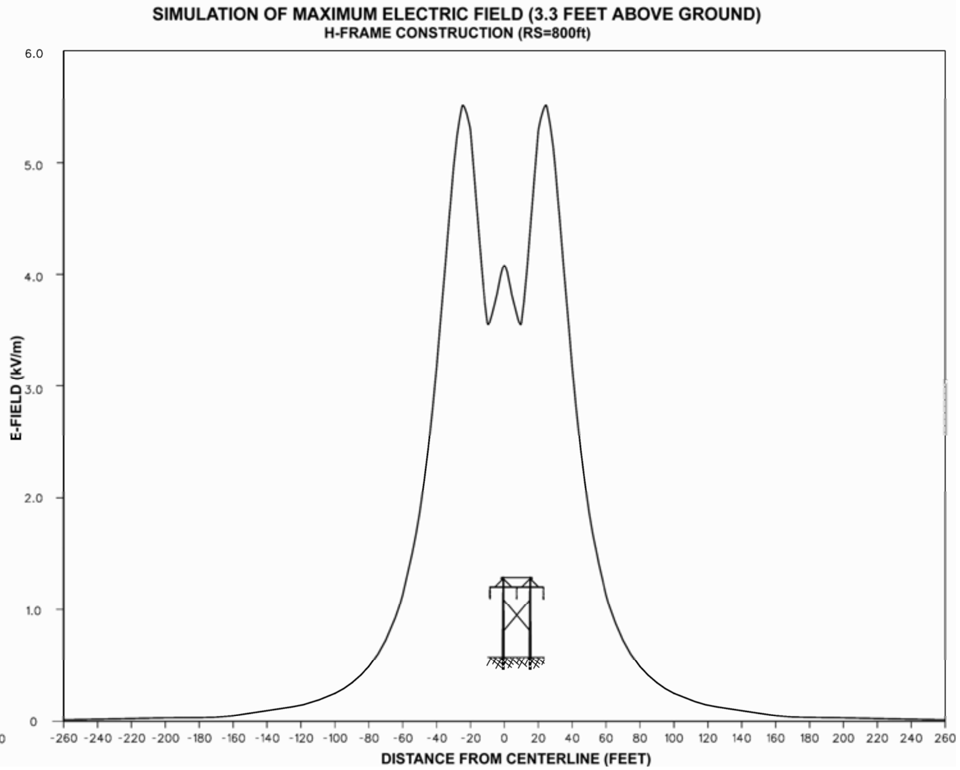
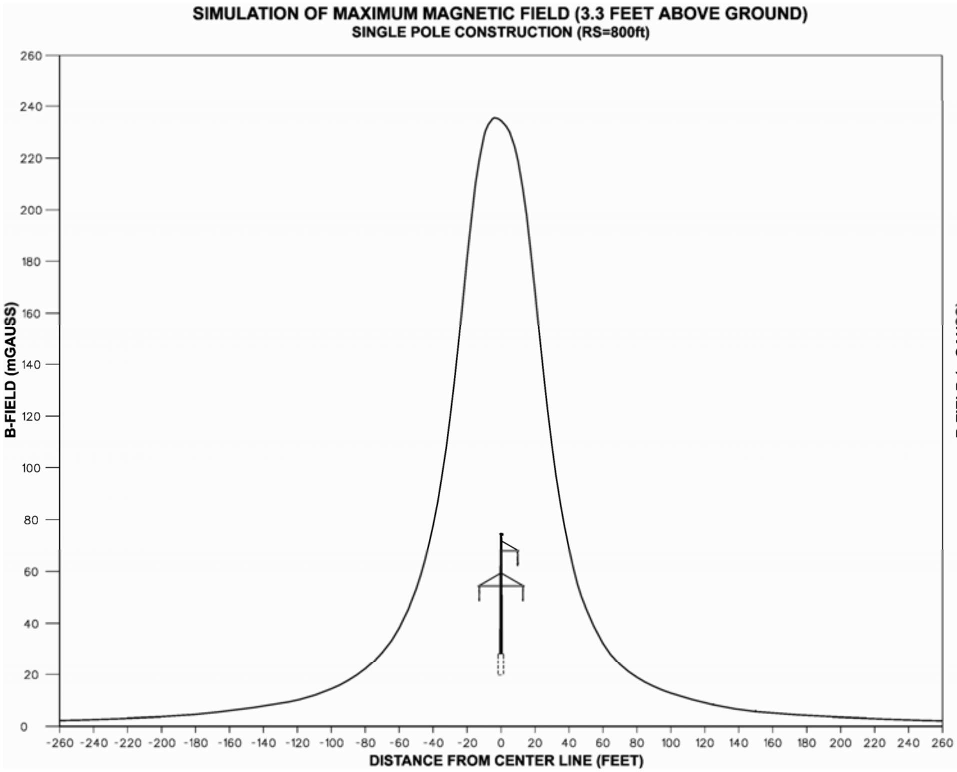


FIGURE 3.4-2
PROPOSED MATL POWERLINE ELECTRIC FIELD STRENGTH FOR NORMAL OPERATING CONDITIONS, OPTIMIZED PHASING

E-Field - Electric Field
kV/m - Kilovolts per Meter

Figure 3.4-2_Electric Field Strength.dwg - DWH - 10/22/2007 - F5683-01



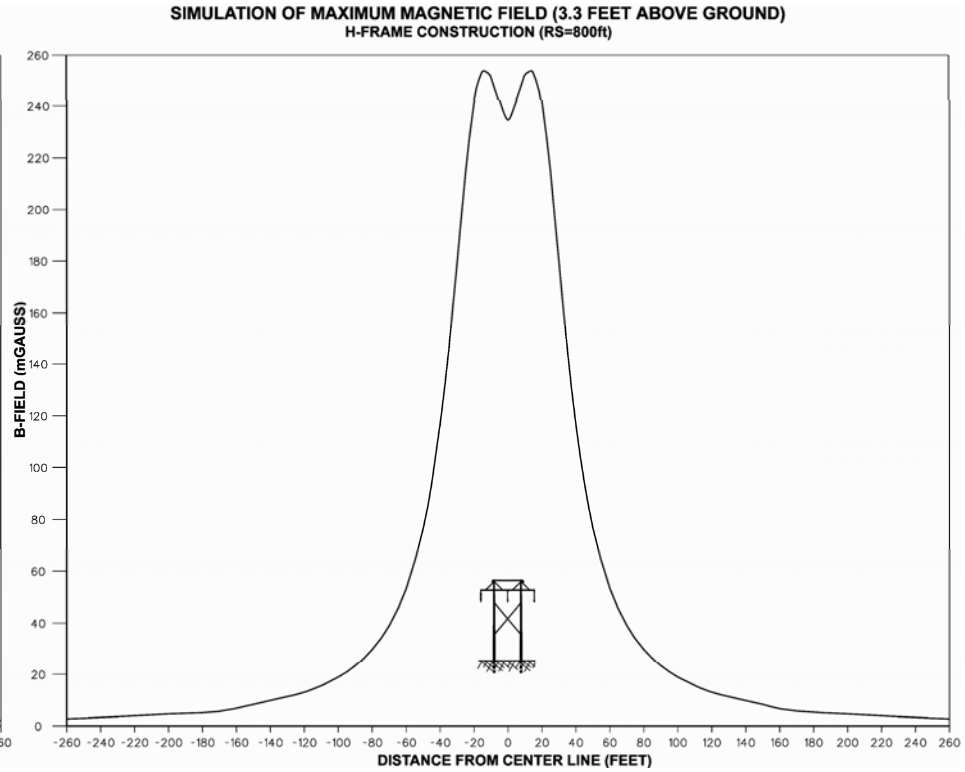


FIGURE 3.4-3
PROPOSED MATL POWERLINE MAGNETIC FIELD STRENGTH FOR NORMAL OPERATING CONDITIONS, OPTIMIZED PHASING

B-Field - Magnetic Field
mGAUSS - Milligauss

Spark Discharge Shocks. The magnitude of the electric field would be low enough that spark discharge shocks would occur rarely, if at all. The potential for nuisance shocks would be minimized through standard grounding procedures. Carrying or handling conducting objects, such as irrigation pipe, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if the section of pipe is inadvertently tipped up near the conductors. In order to minimize these effects, the transmission line would be constructed using the NESC minimum ground clearance. The use of farm augers under power lines should be consistent with the guidelines presented by the Occupational Health and Safety Administration (OSHA).

Field Perception and Neurobehavioral Responses. Perception of the field associated with the transmission lines would not be felt beyond the edge of the safety zone. Persons working in the right-of-way might feel the field. Studies of short-term exposure to electric fields have shown that fields may be perceived (for example, felt as movement of arm hair) by some people at levels of about 2 to 10 kV/m, but studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks (DOE 2001a). The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that short-term exposures be limited to 4.2 kV/m for the general public (International Commission on Non-Ionizing Radiation Protection 2003). The maximum exposures associated with the proposed Project are less than 1.67 kV/m at the edge of the safety zone for an H-frame and 1.2 kV/m for a monopole (**Figure 3.4-2**)

The ground clearance of the conductors would be a minimum of 21.2 feet, adequate clearance for safety considerations as related to most recreational activities.

Smoke and Fire. When a fire is in the vicinity of a 230-kV transmission line, firefighters should monitor smoke near the transmission line. Firefighters should remain at a distance that would not leave them vulnerable to the electric current or shock.

Corona Effects. Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. As described in Section 3.4.2, corona is of concern for potential audible noise, radio, television, and DGPS interference, visible light, and photochemical reactions.

Audible Noise. Noise levels generated by the transmission lines would be greatest during damp or rainy weather. For the proposed lines, low-corona design established through industry research and experience would minimize the potential for corona-related audible noise. The proposed lines would not add substantially to existing background noise levels in the area. Research by the Electric Power Research Institute (1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a 100-foot safety zone. During rainy or damp weather, an increase in corona-generated audible noise would be balanced by an increase in weather-generated noise. For additional assessment of the noise from the proposed Project and alternatives, refer to Section 3.12.

Radio, Television, DGPS Interference. Transmission line-related radio-frequency interference is one of the indirect effects of line operation produced by the physical interactions of transmission line electric fields. The level of such interference usually depends on the magnitude of the electric fields involved. The line would be constructed according to industry standards, which minimize the potential for surface irregularities (such as nicks and scrapes on the conductor surface), sharp edges on suspension hardware, and other irregularities around the conductor surface that would increase corona effects. However, if such corona interference were to be generated, no interference-related complaints would be expected given the distance of residents from the transmission lines. Federal Communications Commission regulations require each project owner to ensure mitigation of stationary radio and television interference to the satisfaction of the affected individual. Typical mitigation measures include: cleaning insulators, tightening line hardware, inspecting conductor surface for irregularities, relocating antennas, installing high-gain or directional antennas, connecting to a cable system or installing a translator station.

Transmission lines generated radio noise may degrade DGPS signal reception (EPRI 2000) which could possibly affect precision farm equipment. Manufacturers have different methods of shielding DGPS signals; therefore, each receiver would react differently in the environment surrounding power lines. Damaged power lines may cause interference with DGPS signals.

Visible Light. The corona levels associated with the proposed transmission line would be similar to those of existing transmission lines. The visible corona on the conductors would be observable only under the darkest conditions with the aid of binoculars.

Photochemical Reactions. The maximum incremental ozone levels at ground level produced by corona activity on the proposed transmission line would be similar to those produced by the existing lines in the area. During damp or rainy weather the ozone produced would be less than 1 part per billion. This level is low when compared to natural levels and their fluctuations (DOE 2001a).

Corona would be mitigated by using proper line design and by incorporating line hardware shielding. The design of electrical hardware and equipment considers the potential for corona effects.

Safety of Co-locating a Transmission Line and a Pipeline. There are a number of potential safety issues associated with constructing a transmission line near a buried natural gas or crude oil pipeline, related to electrical shock hazard and natural gas pipeline leaks and fire or explosion hazards should a natural gas leak occur.

A buried pipeline that shares an alignment with an alternating current transmission line, such as the one proposed for the project, could become energized by the EMF surrounding the power system in the air and soil. This alternating current interference may result in an electrical shock hazard for people touching the pipeline or metallic structures connected to the pipeline, and may cause damage to the pipeline coating, insulating flanges, or even damage to the pipeline's wall itself (Dawalibi 2004). However, the natural gas or oil pipelines would not carry electricity or otherwise present a shock hazard to residential gas users.

The transmission line would cross over several pipelines. Therefore, where feasible, a minimum distance of 132 feet from any above ground structures such as wellheads, would be maintained between the proposed transmission line and the edge of an existing pipeline right-of-way or the pipe itself. Additional mitigation measures that could be implemented by the pipeline companies or MATL include grounding mats, gradient wire controls, gradient control mats or grids and/or the installation of a cathodic protection system to the pipelines to minimize shock hazard and damage to the pipelines. MATL would consult with pipeline owners about the proposed Project and once an exact location for the structures is determined, MATL would help to implement the appropriate mitigation measure (MATL 2006b). In addition, the transmission line would comply with all Federal and State regulations concerning co-locating a transmission line near a buried gas pipeline (Dawalibi 2004).

There are potential safety issues associated with construction and maintenance vehicles driving over any gas or oil pipelines. MATL would consult with any pipeline owner after final siting of the transmission line structures regarding this issue (MATL 2006b).

3.4.3.3 Alternatives 3 and 4 – MATL B and Agency Alternative

Alternatives 3 and 4 would also involve the construction of 230-kV single-circuit transmission lines. **Table 3.4-3** lists the EMF strength under normal anticipated load conditions for the 230-kV single-circuit transmission line. **Figures 3.4-2** and **3.4-3** graphically illustrate the maximum electric and magnetic field strengths, respectively, for the optimized phasing configuration of the transmission lines. Field strengths under normal operating conditions are expected to be lower. The distances given represent the distance of a stationary receptor from the centerline of the transmission line. The Conrad Christian School is the closest school to any of the alternatives and is 0.4 mile to the northeast of Alternative 3. At a given distance, the EMF strength would be nearly identical on both sides of the transmission line safety zone. Impacts described in

Alternative 2 would be similar to those under Alternatives 3 and 4; however, the number of residences and the distances from the transmission line would be slightly different.

3.5 Water Resources

3.5.1 Analysis Methods

Surface water resources in the study area were evaluated using a GIS analysis for each alternative to identify locations where an alignment would cross a water body. For this evaluation it was assumed that:

- Disturbance for each alternative alignment could be within 250 feet to either side of the reference centerline.
- The probability for temporarily increasing sources of sediment to surface water is proportional to the number of water body crossings.

Since none of the action alternatives propose any beneficial use of groundwater and no project element has been identified that could possibly affect groundwater quality, groundwater resources are not considered for impact analysis.

Information Sources

Data on water resources in the analysis area were obtained from a variety of sources including literature review, reports from the Montana Natural Heritage Program (NHP), the DEQ 2006 Integrated 303(d)/305(b) Water Quality Report, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, the Montana NRIS, and the MFSA application (MATL 2006b). Surface water flow and quality information was obtained from the USGS, the MBMG, and DEQ. To the degree possible, information was verified by ground reconnaissance during a team field trip May 17-18, 2006.

Analysis Area

The water resources analysis area is the same as the study area and encompasses about 2,260 square miles in northcentral Montana from the Montana-Alberta border to the Great Falls area (**Figure 1.1-1**). This region includes portions of eight hydrologic subbasins in Montana, all of which contribute to the lower Missouri River Basin (**Figure 3.5-1)**.

The primary surface waters in the analysis area are Cut Bank Creek, the Marias River and the Dry Fork Marias River, Pondera Coulee, the Teton River, Benton Lake, Hay Lake, and the Missouri River. Isolated prairie potholes, lakes, and stock reservoirs are scattered throughout the analysis area.

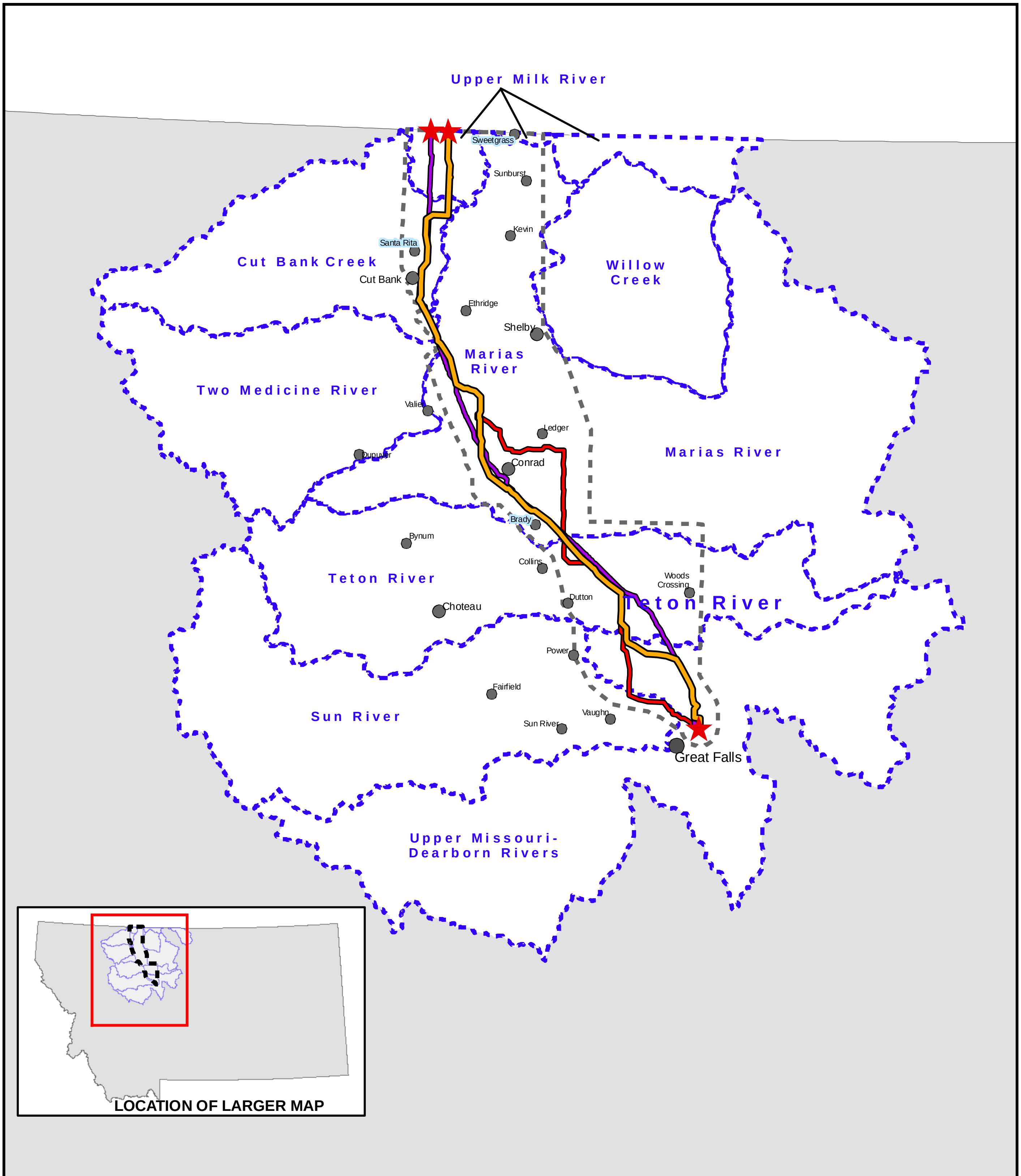


FIGURE 3.5-1
WATERSHEDS INTERSECTING THE STUDY AREA

LEGEND

- MAJOR WATERSHEDS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA BOUNDARY
- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_5-1_MATL_Water_Study_Area_letter_012207.mxd

3.5.2 Affected Environment

The water resources analysis area is generally one of low topographic relief, low precipitation, and agricultural vegetation types. Elevations range from about 4,372 feet above sea level in the northwest corner of the analysis area to about 3,016 feet above sea level on the Missouri River in the southeast corner of the analysis area.

Precipitation and Recharge

The region is semi-arid and precipitation patterns do not vary widely throughout the analysis area. Average annual precipitation varies from 11.6 inches per year near Cut Bank to 15.2 inches per year near Great Falls (Western Regional Climate Center [WRCC] 2006). Winters can be extremely cold with desiccating winds and snow. May and June are the wettest months. Perennial streams and rivers are sustained primarily with moisture from mountain snowpack.

Activities that Affect Resource Conditions

Water resources of the analysis area, including both surface water and groundwater, are affected directly or indirectly by human activities such as irrigation, livestock use, industry, oil and gas development, domestic consumption, and to a lesser extent by recreation and transportation. These interdependencies can affect human health, wildlife, engineered structures, and economics of the region. The primary beneficial uses of water in the analysis area include agriculture, support of domestic activities, and fish and aquatic life.

Water Quality

No specific areas of water quality problems have been recorded in the analysis area other than impaired water bodies identified by DEQ. The Federal Clean Water Act, Section 303(d) requires that each state submit a biennial report to the EPA that identifies water bodies that are water quality limited. The resulting 303(d) list provides the basis for systematically tracking state waters that do not meet water quality standards. Streams and rivers designated as 303(d) or impaired streams in the analysis area are: Old Maids Coulee (an intermittent stream), Pondera Coulee, Cut Bank Creek, Marias River, Teton River, Lake Creek, and the Missouri River. The 303(d) streams are shown on **Figure 3.5-2.** Benton Lake is listed as "impaired." Summary sheets describing the impaired river segments, the type of impairment, and the cause of the impairment are provided in **Appendix** I of the March 2007 document.

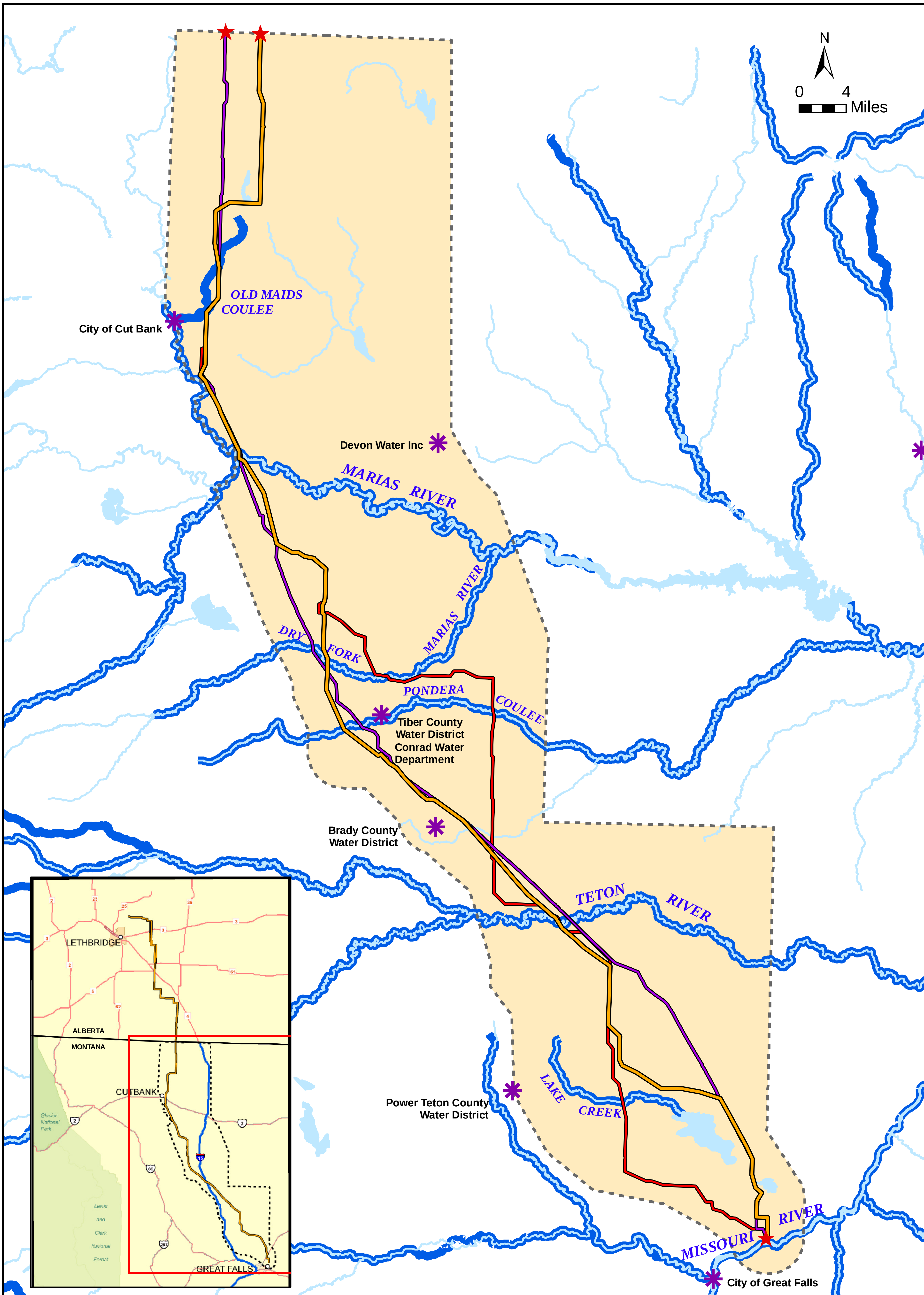


FIGURE 3.5-2
HYDROLOGIC FEATURES AND WATER QUALITY

LEGEND

- MUNICIPAL POTABLE WATER SOURCE (DEQ)
- RIVERS AND STREAMS
- IMPAIRED 303(d) STREAMS
- LAKES AND PONDS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA
- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_5-2_MATL_Water_Quality_012207.mxd

Water Rights

Existing water rights would not be affected by the proposed Project.

Surface Water

The analysis area is located within the Missouri-Marias watershed subregion in west central Montana. Portions of the analysis area fall within one or more of the following 4th level hydrologic unit codes (HUC): Upper Milk River, Cut Bank Creek, Marias River, Two Medicine River, Willow Creek, Teton River, Sun River and Upper Missouri-Dearborn rivers (USGS 2006a). Surface water flow data used in the analysis were retrieved from the USGS website (USGS 2006c).

One water body within the analysis area has been identified by the FWP as a blue ribbon or red ribbon fishery river depending on the stream reach (Missouri River). The locations at which all three alternatives cross the Marias and Teton rivers are considered habitat class 3 and sport class 4 fisheries. Some streams in the analysis area are perennial (typically have surface flow throughout the year). These streams are shown on **Figure 3.5-2**. However, most other streams in the analysis area are either ephemeral (flow only in response to snowmelt or rainfall) or intermittent (flow only in response to groundwater discharge and precipitation). There are numerous intermittent streams, lakes, reservoirs, and prairie potholes in the analysis area. A summary of surface water resources and water quality in the analysis area organized by HUC is provided in **Appendix J** of the March 2007 document. Surface water quality is also summarized in **Figure 3.5-2**.

Lakes and Reservoirs

The analysis area contains a number of lakes and reservoirs; however, there are some portions of the analysis area that are nearly devoid of lakes, such as the area between Benton Lake and the Teton River.

All surface water bodies of at least 5 acres crossed by an alternative alignment are in **Figure 3.5-2.** The largest of these water bodies is Benton Lake, in the southeastern portion of the analysis area. Benton Lake is a glacially formed 5,000-acre shallow wetland. Other large lakes include Aloe Lake and Hay Lake, both of which are located north of the Marias River. Numerous smaller lakes are found throughout the area. **Appendix J** of the March 2007 document lists the lakes in the analysis area that are at least 20 acres in size and all lakes greater than 5 acres that are crossed by one of the action alternatives.

Municipal Water in the Analysis Area

Most of the municipal water systems in the study area are supplied by groundwater sources, while a smaller number are supplied by surface water sources. Municipal watersheds with potable surface water bodies include the Cut Bank Watershed (Cut Bank Creek) and the Marias Watershed.

There are six water districts within the analysis area that rely on surface water for potable water. These include Cut Bank, Devon Water, Inc., Tiber County Water District (Conrad Water Department), Brady County Water District, Power Teton County Water District, and the City of Great Falls.

3.5.3 Environmental Impacts

Water resources and associated infrastructure that potentially could be affected by the proposed Project include perennial streams and rivers, ephemeral and intermittent drainages, floodplains, irrigation ditches, and canals. Temporary impacts to water are categorized as lasting less than 30 days, short-term impacts are less than 1 year, and long-term impacts are greater than 1 year. Adverse impacts to water (if they occur) would be considered major if they meet one or more of the following criteria:

- If the expected water use would exceed the capacity of the potable water system for a community or individual,
- If the quantities of stream flow affecting downstream beneficial uses would be altered,
- If groundwater withdrawals would affect either the quantity or quality of existing water supply wells within a 1-mile radius of the proposed withdrawal location,
- If stream bank disturbance would result in pronounced sedimentation or if disturbance would cause streambed erosion or sedimentation,
- If wastewater discharge would result in erosion contributing to sedimentation in surface water,
- If an alternative would result in a reduction in the quantity or quality of water resources to below Montana water quality standards or in violation of a TMDL plan for existing or potential future uses, and,
- If the proposed Project or alternatives would cause substantial flooding or erosion, or subject people or property to flooding or erosion.

All project alternatives were evaluated to identify adverse impacts to water resources using these criteria. No major impacts to water resources are predicted for any of the action alternatives. The only minor issue is the potential for soil erosion that could contribute to higher levels of suspended sediment at water body crossings. A comparison of alternatives showing the number of crossings is provided in **Table 3.5-1**.

TABLE 3.5-1 HYDROLOGY – COMPARISON OF ALTERNATIVES					
Alternative	Linear Miles	Mileage Difference Compared to Alternative 2	Stream or River Crossings[a]	Lake Crossings[a]	Total Crossings[a]
1	0	Not Applicable	0	0	0
2	129.9	Not Applicable	10	4	14
3	121.6	8 miles shorter	6	6	12
4	139.6	10 miles longer	17	2	19

Note: [a] A crossing is assumed if a water body is within 250 feet of the reference centerline, the width of the alignment that DEQ would approve. Actual disturbance from construction would typically be less than 100 feet wide as indicated in **Table 2.3-1**.

Figure 3.5-2 shows the locations of crossings for each alternative. The suspended sediment issue is further discussed below.

3.5.3.1 Alternative 1 — No Action

Under the No Action alternative, the existing water use and land use activities near surface water would continue. Activities described under the action alternatives would not take place. Since there would not be an alteration to area water resources due to transmission line installation and maintenance there would be no impacts to water resources.

3.5.3.2 Alternative 2 — Proposed Project

Impacts to Surface Water and Floodplains

Despite implementation of a storm water pollution prevention plan (SWPPP), Alternative 2 would likely result in minor, short-term, adverse impacts to surface water quality by temporarily increasing sources of sediment during the construction phase of the proposed Project. Stream crossing construction activities (such as pole placement, road construction, and staging areas for construction) could potentially take place in either a localized area, or parallel and adjacent to a stream. Construction activities in flowing or standing water would result in the greatest impact, and would be avoided. Minor short-term sediment impacts would continue until reclamation was complete and the surface was revegetated. Minor long-term adverse impacts to surface water quality could occur if temporary roads near water crossings were constructed and remained in use after project construction activities were complete.

The Alternative 2 alignment would cross up to 14 bodies of water, including eight perennial streams (Teton River, Pondera Coulee, Spring Coulee, Dry Fork Marias, Schultz Coulee, Bullhead Creek, Marias River, and Red River [three crossings]; and four lakes ranging in size from 7 acres to 121 acres (Black Horse Lake [west finger], an unnamed lake in the Marias River Basin, Hay Lake, and Grassy Lake).

Alternative 2 includes measures to mitigate or prevent adverse impacts to surface water. Structures would not be installed below the normal high-water mark. MATL proposes to prepare and implement a SWPPP and comply with all requisite permit conditions. These measures would effectively reduce short-term and long-term risk of sedimentation to surface water to minor adverse impacts.

3.5.3.3 Alternatives 3 and 4

Alternative 3

Adverse, short-term impacts for Alternative 3 are similar to, but slightly less than, Alternative 2. Overall, there is less potential to generate suspended sediment for Alternative 3.

The Alternative 3 alignment would cross bodies of water only 12 times, including six perennial streams (Teton River, Pondera Coulee, Spring Coulee, Dry Fork Marias, Bullhead Creek, and Marias River) and six lakes ranging in size from 7 acres to 116 acres (Black Horse Lake [west finger], an unnamed lake in the Missouri Sun-Smith Basin, two unnamed lakes in the Marias River basin, and two unnamed lakes in the Upper Milk River Basin).

Alternative 4

Adverse, short-term impacts for Alternative 4 are similar to, but slightly more than Alternative 2 and Alternative 3. Overall, there is more potential to generate suspended sediment for Alternative 4.

The Alternative 4 alignment would cross bodies of water up to 19 times, including eight perennial streams (Lake Creek, Pondera Coulee, Spring Coulee, Dry Fork Marias, Schultz Coulee [two crossings], Bullhead Creek, the Marias River, and Red River [three crossings]; and two lakes ranging in size from 115 acres to 121 acres (Hay Lake and Grassy Lake). Additional mitigation measures would be needed to reduce impacts at the stream crossings.

3.5.3.4 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.6 Wetlands and Floodplains

3.6.1 Analysis Methods

Wetlands are lands transitional between terrestrial and aquatic systems and are among the most biologically productive ecosystems in the world. Wetlands are defined as areas that are inundated or saturated by surface or groundwater at frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, fens, marshes, bogs, and similar areas (COE 1987). Under Executive Order 11990 (May 24, 1977), *Protection of Wetlands*, Federal agencies are required to consider the impact of proposed actions on wetlands.

Floodplains are defined in 10 CFR 1022.4 as "those portions of riverine and coastal floodplains nearest the source of flooding that are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest." Under Executive Order 11988 (May 24, 1977), *Floodplain Management*, Federal agencies are required to consider the impact of proposed actions on floodplains. To the extent possible, DOE has established policy and procedures under 10 CFR 1022 and Executive Orders 19988 and 19990 through applicable NEPA procedures such as this document.

Wetlands and floodplains are of critical importance to the protection and maintenance of a large array of plants and animals, including threatened and endangered species, by providing essential seasonal habitats. Wetlands and floodplains help protect the quality of surface water by impeding the erosive forces of moving water and trapping waterborne sediment and associated pollutants, protecting water supplies by assisting the purification of surface water and groundwater resources, maintaining base flow to surface waters through the gradual release of stored floodwaters and groundwater, and providing a natural means of flood control and storm damage protection through the absorption and storage of water during high-runoff periods.

Activities that involve a disturbance or backfilling of material in a wetland are typically regulated by local, state, and Federal government agencies through the authorities granted by Sections 401 and 404 of the U.S. Clean Water Act. Section 401 of the Clean Water Act provides the means for Montana local and state agencies to regulate and control the degree of impact of discharges on state waters, including wetlands. Montana's primary water quality protection is granted through the implementation of the Montana Water Quality Act. Section 404 of the Clean Water Act provides protection for wetlands that (1) meet three criteria (wetland hydrology, hydric soils, and hydrophytic vegetation) as defined in the Wetlands Delineation Manual (COE 1987), and (2) are connected through an inflow or outflow to a defined surface water drainage. Isolated wetlands, such as a prairie pothole or small ponds, are no longer protected by Section 404 of the Clean Water Act (COE 2001). However, any discharge of pollutants to isolated wetlands that contain water is still subject to provisions of the Montana Water Quality Act.

Analysis Area

The analysis area for the wetland and floodplain resources includes all wetlands (jurisdictional or non-jurisdictional) within the Project study area and regulatory floodplains within the alternative alignments (**Figure 1.1-1**). MATL has stated its goal is to avoid all impacts to floodplains and would be able to meet this goal by avoiding placement of any structure (or related construction impact) within a regulatory floodplain or below the ordinary high water mark (MATL 2006b). Jurisdictional wetlands and floodplains are defined in the glossary.

Information Sources

Wetlands within the Project study area are available from a FWS website (FWS 2006) on a format known as National Wetland Inventory (NWI) maps; however, there are no wetland data available for portions in Teton County from approximately the town of Brady south to just north of Benton Lake NWR. Floodplains are delineated by the Federal Emergency Management Agency (FEMA) for the National Flood Insurance Program with the information provided on Flood Insurance Rate Maps (FIRM). Some Montana counties, or portions of counties, have FIRMs available to download from the Montana NRIS website.

Not all unincorporated areas of the Project study area have been mapped or have floodplain maps on record. Cascade County has FIRMs available, but no specific floodplains are identified in Cascade County for the action alternatives. Teton County also has FIRMs available that identify the regulatory floodplains along the Teton River. FIRMs are not available for unincorporated parts of Pondera County, and the floodplain for the Marias River is not available for Pondera County. However, the Marias River floodplain in Glacier County has been delineated, and the flood hazard areas are shown on a FIRM for that area. Additional topographic information was noted during site visits to the Marias River crossing location on May 18, 2006 and the Teton River crossing location on April 27, 2007.

Other sources of data, including USGS 7.5-minute topographic maps, other FEMA maps, USGS Montana Flood-Frequency and Basin-Characteristic Data (http://mt.water.usgs.gov/freq?page_type=site+site_no+06108000) and the 2005 orthophotographs (Montana NRIS 2006a), were used for the Teton County area to determine potential wetlands and floodplains along the proposed and alternative alignments. In addition, the data provided in the MFSA application (MATL 2006b) were reviewed, and field investigations were conducted in July and August 2005 to ground-truth mapped wetlands and identify previously unmapped wetlands.

3.6.2 Affected Environment

The system used to classify the wetland types is based on the classification system developed by Cowardin and others (1979). Three basic types of wetlands, lacustrine (lakes), palustrine (ponds), and riverine (rivers and streams), were identified within the analysis area. Within these three types were 14 individual wetland classes (**Table 3.6-1**). The lacustrine wetlands include intermittent and permanently flooded lakes and reservoirs. The palustrine group includes all wetlands dominated by trees, shrubs, emergents, mosses, or lichens. Two main riverine wetlands (lower perennial and upper perennial) were identified within the analysis area. They typically contain natural or artificial channels that have either periodically or continuously flowing water. The mapped riverine wetland type generally corresponds with the same areas delineated as flood hazard areas on the FIRM for the Teton River crossing.

TABLE 3.6-1
WETLAND TYPES MAPPED IN ANALYSIS AREA

No.	Wetland Types	Wetland Class	Wetland Code
1	Lacustrine/Limnetic	Unconsolidated Bottom	L1UB
2	Lacustrine/Littoral	Aquatic Bed	L2AB
3	Lacustrine/Littoral	Unconsolidated Shore	L2US
4	Palustrine	Aquatic Bed	PAB
5	Palustrine	Emergent	PEM
6	Palustrine	Forested	PFO
7	Palustrine	Scrub-Shrub	PSS
8	Palustrine	Unconsolidated Bottom	PUB
9	Palustrine	Unconsolidated Shore	PUS
10	Riverine/Lower Perennial	Unconsolidated Bottom	R2UB
11	Riverine/Lower Perennial	Unconsolidated Shore	R2US
12	Riverine/Upper Perennial	Rock Bottom	R3RB
13	Riverine/Upper Perennial	Unconsolidated Bottom	R3UB
14	Riverine/Upper Perennial	Unconsolidated Shore	R3US

The following factors were considered when evaluating potential impacts to wetland and non-wetland waters of the U.S. from the transmission line alternatives:

- Net permanent loss of any wetland areas or functions,
- Net temporary loss of any wetland areas or functions,
- Effects on the condition and functional integrity of other wetlands that may be impacted but do not experience net loss,
- Potential for wetland filling from grading or construction activity or excavation and backfill,

- Potential for wetland flooding from construction activities, incorrect design or placement of culverts, or an increase in impervious areas adjoining wetlands that may raise water levels,
- Potential for wetland draining from grade changes that may divert surface flow that formerly fed wetlands in isolated depressions,
- Potential for wetland sedimentation resulting from surface soil disturbance adjacent to wetlands, and
- Wetland water quality degradation from contaminants in runoff.

Table 3.6-2 provides a percentage and area breakdown for all 14 wetland types that are sited in the analysis area. Because there are no wetland data available for portions of Teton County between approximately mileposts 23 and 45, the areas of wetlands in the table do not reflect the total amount of wetlands in the analysis area. **Figures 3.6-1, 3.6-2, and 3.6-3** show the location of all mapped wetlands within the study area.

TABLE 3.6-2
PERCENTAGE AND AREA OF WETLAND TYPES IN ANALYSIS AREA

Wetland Type	Percent of Total Wetland Area	Area (acres)
Lacustrine/Limnetic – L1UB	1.2	401
Lacustrine/Littoral – L2AB	4.2	1,429
Lacustrine/Littoral – L2US	11.4	3,909
Palustrine – PAB	4.9	1,694
Palustrine – PEM	69.0	23,635
Palustrine – PFO	0.02	7
Palustrine – PSS	0.4	146
Palustrine – PUB	0.3	106
Palustrine – PUS	3.6	1,240
Riverine/Lower Perennial – R2UB	2.5	865
Riverine/Lower Perennial – R2US	1.1	379
Riverine/Upper Perennial – R3RB	0.02	5
Riverine/Upper Perennial – R3UB	1.0	346
Riverine/Upper Perennial – R3US	0.3	100
Totals	**100.0**	**34,262**

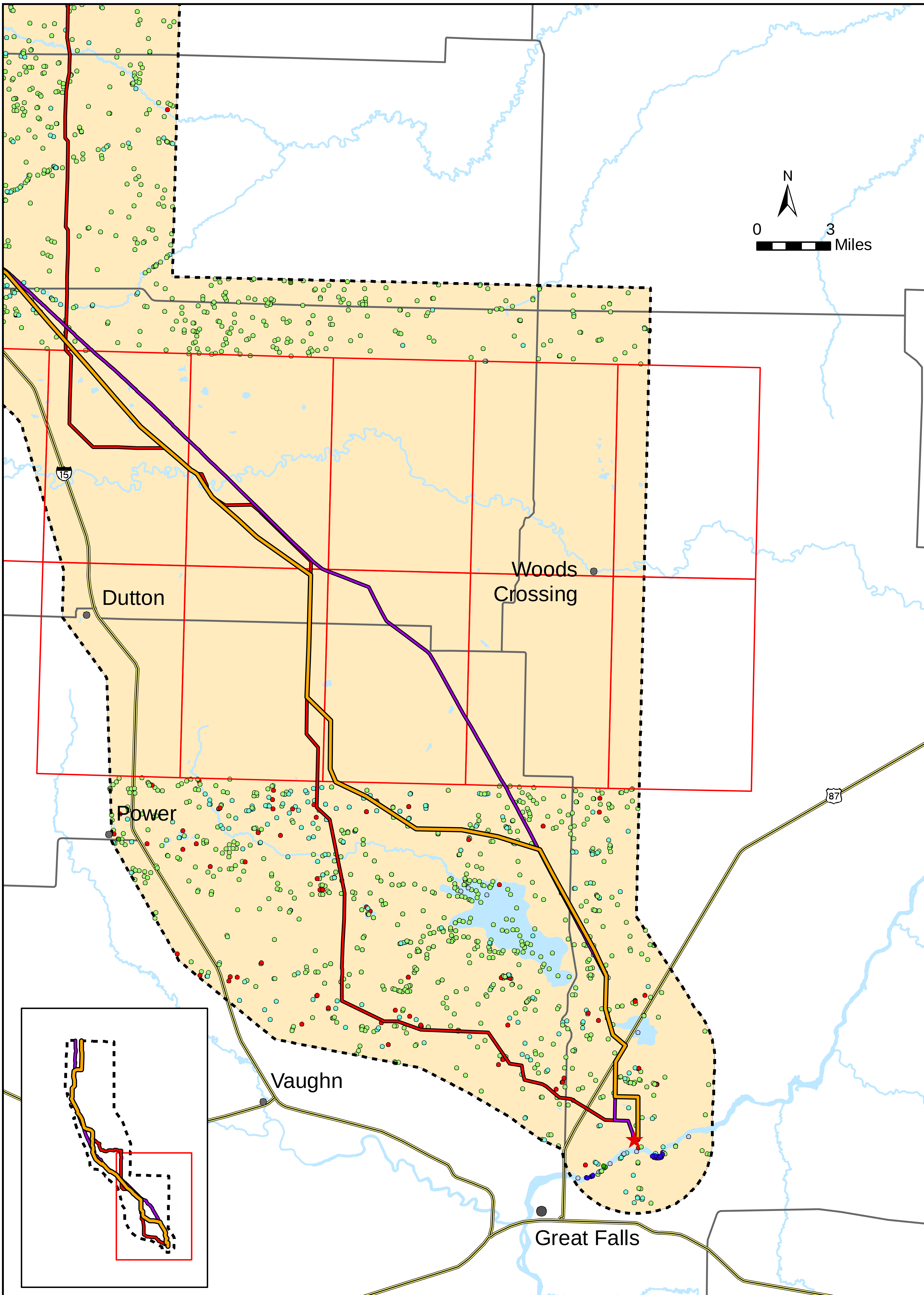


FIGURE 3.6-1
WETLANDS IN
STUDY AREA
SOUTH

LEGEND

WETLAND TYPE
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED - SHRUB WETLAND
- FRESHWATER POND
- RIVERINE WETLAND
- OTHER WETLAND
- LAKE
- 24K TOPO MAPS WITH NO WETLANDS DATA

NOTE: WETLANDS DATA FROM NATIONAL WETLANDS INVENTORY, USFWS.

- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT

- RIVERS AND STREAMS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_6-1_MATL_Wetlands_South_012007.mxd

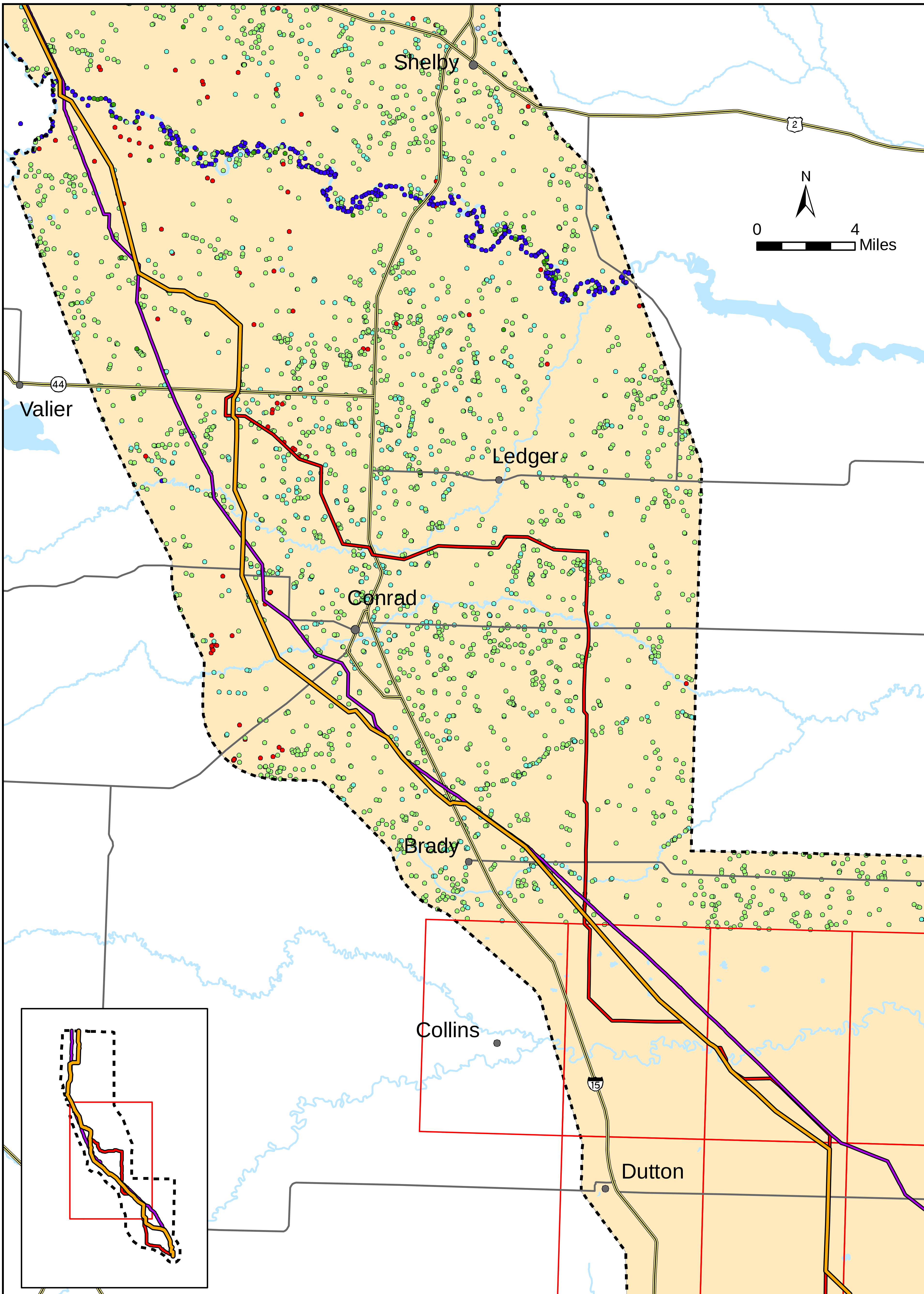


FIGURE 3.6-2
WETLANDS IN STUDY AREA MIDDLE

LEGEND

WETLAND TYPE
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED - SHRUB WETLAND
- FRESHWATER POND
- RIVERINE WETLAND
- OTHER WETLAND
- LAKE
- 24K TOPO MAPS WITH NO WETLANDS DATA

NOTE: WETLANDS DATA FROM NATIONAL WETLANDS INVENTORY, USFWS.

- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT

- RIVERS AND STREAMS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_6-2_MATL_Wetlands_middle_012007.mxd

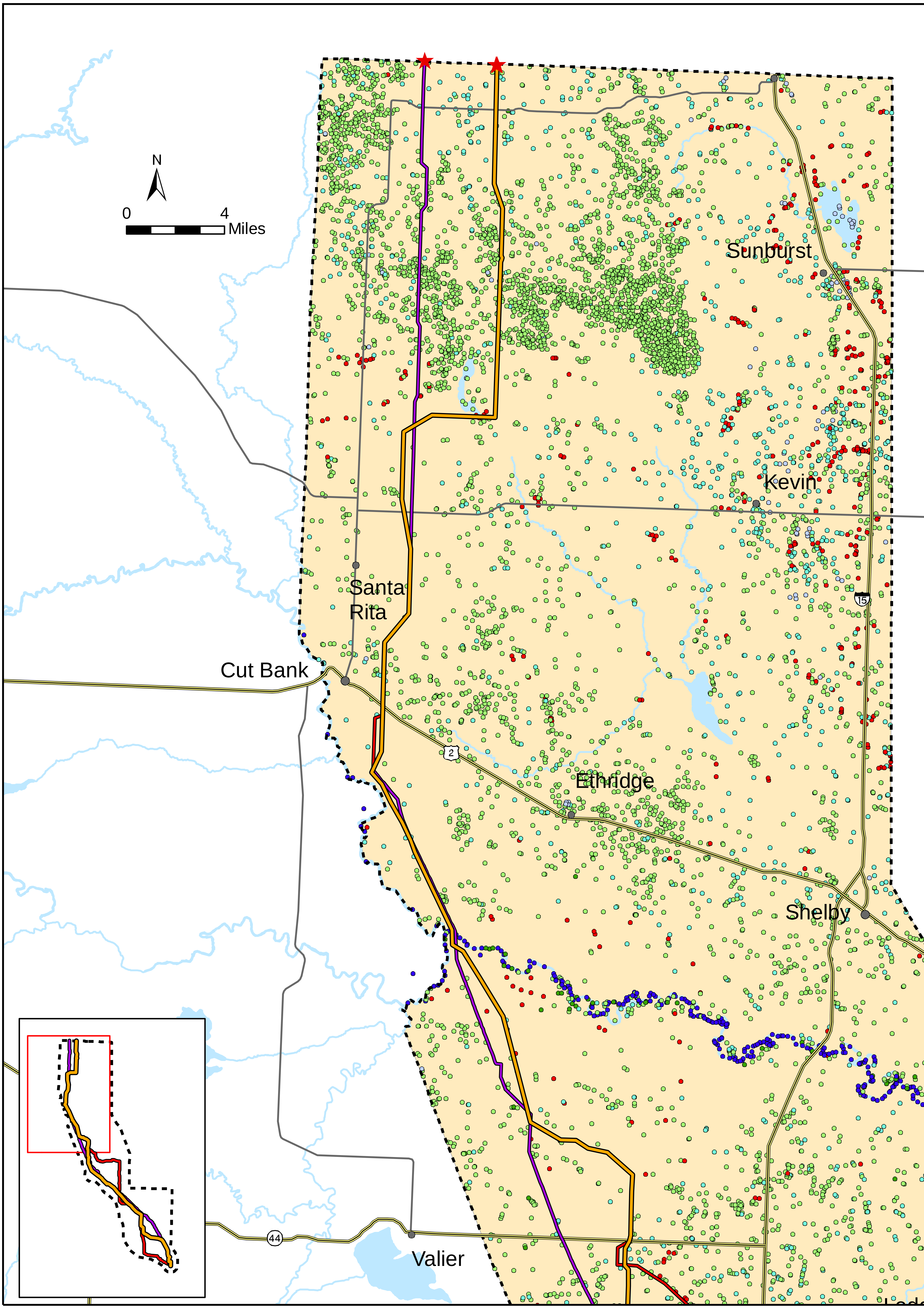


FIGURE 3.6-3 WETLANDS IN STUDY AREA NORTH

LEGEND

WETLAND TYPE

- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED - SHRUB WETLAND
- FRESHWATER POND
- RIVERINE WETLAND
- OTHER WETLAND
- LAKE
- 24K TOPO MAPS WITH NO WETLANDS DATA

NOTE: WETLANDS DATA FROM NATIONAL WETLANDS INVENTORY, USFWS.

- ALT2 - ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT
- RIVERS AND STREAMS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY AREA

NOTE:
ALT = ALTERNATIVE

GIS map by Ed Madej -TTEMI-HE Fig3_6-3_MATL_Wetlands_North_012007.mxd

Palustrine wetlands are the most common wetland type in the analysis area and are primarily found along creek channels, coulees, and in association with prairie potholes formed by depressions left by glaciation. Coulees often have a flat-bottomed valley enclosed by somewhat steep hillsides with the wetland areas generally restricted to the narrow incised stream channel (MATL 2006b). Many of the prairie potholes are less than 1 acre in size and may have permanent, semipermanent, or seasonal to temporary inundation (Montana Partners in Flight 2000). Prairie potholes can either be landlocked or have a drainage outlet to an adjacent stream or other potholes.

The palustrine emergent wetlands account for approximately 69 percent of the total wetlands (**Table 3.6-2**). Palustrine emergent wetlands are characterized by erect, rooted, herbaceous hydrophytic vegetation and are often dominated by perennial plants (Cowardin and others 1979). Drainages in the MATL analysis area contain overstory vegetative communities comprised of trees and shrubs, such as boxelder (*Acer negundo*), silver sagebrush, chokecherry, Woods' rose, willow, silver buffaloberry, and western snowberry (MATL 2006b). The palustrine emergent wetland areas are found primarily along the current channels and in older meander lobes within the drainage valley. Palustrine emergent vegetation may occur as an understory component in areas mapped as riparian or forested sections of the drainage. Where not previously cultivated, the vegetation types in the prairie pothole wetlands within the analysis area are dominated by herbaceous communities, including water sedge (*Carex aquatilis*), clustered field sedge (*Carex praegracilis*), narrow spike reedgrass (*Calamagrostis stricta*), Baltic rush (*Juncus balticus*), and tufted hairgrass (*Deschampsia caespitosa*), as well as shrubby cinquefoil (*Dasiphora floribunda*) (MATL 2006b).

Most of the prairie potholes in the analysis area have standing water for much of the growing season in years of normal or above normal precipitation. These depressional geomorphic features capture water from precipitation, snowmelt, and from groundwater (Hansen and others 1995). Typically the water is retained in the potholes due to a bottom soil layer with reduced permeability. Evaporation and transpiration are the major causes of water loss, although seepage and surface outflow can also be sizable for some potholes (Hanson and others 1995). However, during dryer periods, some portions of potholes often become incorporated into farming plans and are either planted to row crops (for example wheat) or are mowed as part of a haying operation. Prairie pothole wetland losses are estimated to be from 30 to 50 percent in Montana (Montana Partners in Flight 2000). Prairie pothole wetlands are often difficult to delineate and characterize because the wetland indicators and other parameters may be periodically lacking due to normal seasonal or annual variations in environmental conditions that result from causes other than human activities or catastrophic natural events (COE 1987). Prairie potholes occur throughout the analysis area; however, the potential to encounter prairie potholes declines in the southern portion of the analysis area due to changes in geomorphology and to agricultural practices that may have impacted or eliminated the smaller wetlands.

The most notable lacustrine wetland area in the analysis area is found in the southern portion. Benton Lake NWR is located about 10 miles north of Great Falls. It is at the western edge of the farmed Prairie Pothole region, a region characterized by millions of wetlands or potholes, which serve as the breeding ground for most of the nation's waterfowl (MATL 2006b). The 19-square-mile Benton Lake NWR was established in 1929 as a refuge and breeding ground for birds. Despite its name, Benton Lake is actually a 5,000-acre shallow wetland created by the last continental glacier thousands of years ago. During the late 1950s and early 1960s, a pump house and pipeline were built to bring water to the refuge from Muddy Creek. Dikes were built to divide the wetland into manageable units, and refuge roads and facilities were constructed. Water still flows from the original pump station on Muddy Creek, but the refuge wetlands have been further divided for more efficient water management.

The wetland areas provide valuable tree and understory plant diversity, stable coulee bottoms that can attenuate and alter flood flows, and valuable breeding areas for duck species, eared, horned, and red-necked grebes, Franklin's gull, Forster's terns, black terns, yellow-headed blackbirds, and Wilson's phalaropes. MATL project wetlands also provide important habitat for nesting and foraging for many birds and other wildlife species. In particular, the 5,000 acres of shallow wetlands associated with the Benton Lake NWR area are managed primarily to provide refuge and breeding ground for birds.

The riverine wetland types mapped within the analysis area are the seasonally and permanently flowing river channel bottoms associated with the Teton River, Pondera Coulee, Spring Coulee, Dry Fork Marias, Schultz Coulee, Bullhead Creek, Marias River, and Red River. The Marias, Dry Fork Marias, and Teton rivers support the most important forested riparian habitats in the analysis area (MATL 2006b). The riverine habitats typically have an understory of grasses and shrubs with an overstory of cottonwood trees (plains cottonwood and narrowleaf cottonwood) and other larger deciduous shrubs and trees (chokecherry, wild currant, Woods' rose, and willows) that intermittently line the rivers.

3.6.3 Environmental Impacts to Wetlands

This section describes the types of impacts that could occur and effects of these impacts on wetland resources specifically. **Table 2.3-4** addresses best management practices that MATL would implement to reduce potential impacts to wetlands and surface water resources.

Potential impacts to wetlands associated with the construction and operation of the MATL 230-kV transmission line project include:

- alterations to the wetland hydrology,
- alterations to the wetland plant communities, and
- loss of wetlands due to filling or sedimentation.

Alterations to the wetland hydrology would most likely occur during the construction phase when working in adjacent areas causes surface water flows to be changed or modified. Many of the wetlands in the analysis area are palustrine emergent wetlands. These wetlands are situated just below the high water line; thus, any small modification to the existing drainage pattern could potentially re-direct surface water flows away from these areas that depend on temporary flood waters to saturate the soils and create wetland conditions.

Alterations to the wetland plant community are also most likely to occur during the transmission line construction phase. A change in the composition of the wetland plant community may be associated with and result from an alteration to the wetland hydrology, or this impact may be unrelated. A wetland plant community may be physically altered by mechanical disturbance during the construction activities, or the vegetation could be only temporarily trampled from parking or driving across these areas.

No direct filling or covering of wetland areas is intended as a result of implementing any of the action alternatives. However, construction activities adjacent to wetlands may inadvertently result in a disturbance with sediment transport and deposition into wetlands as the result of exposed soils and concentrated runoff down vehicle tracks and roads. MATL would implement erosion and sediment control practices as required by the State of Montana (**Appendix F**). MATL would also reduce or avoid impacts to wetlands by implementing mitigation, avoidance, or other environmental protection measures (**Table 2.3-4**).

The areas of individual wetlands were determined based on the shape and size of the polygons in the existing NWI maps. MATL would avoid individual wetlands by working with the engineering designs to span across or align around all wetlands within the 500-foot-wide alignment (MATL 2006b). In addition, the Benton Lake NWR wetlands would not be directly affected by the action alternatives. Potential indirect impacts to the Benton Lake NWR wetlands would be associated with a potential reduction of habitat (Section 3.8).

In order to assess potential impacts of the MATL transmission line project to wetlands, typical construction and operational practices used in the utility industry were reviewed. Potential impacts were evaluated in association with the need to construct access roads and in relationship with the methods used and engineering constraints involved with spanning over and constructing around wetlands crossings. MATL may not require any Section 404 and 401 permits, if it avoids discharging sediment or fill materials into wetlands or Waters of the U.S. The wetland impact assessment assumes MATL would comply with all requisite permitting requirements.

Alternatives were evaluated to determine the potential number of wetlands, size of wetlands, and general location of wetland crossings. All of the alternatives considered would cross some wetlands and the Teton and Marias rivers. Surface water resources are described in Section 3.5.2.

3.6.3.1 Alternative 1 – No Action

The No Action alternative would produce no adverse impacts to wetland resources. However, negligible to minor, long-term adverse impacts would continue from existing land uses. Runoff and erosion, primarily from agricultural lands, would continue to carry sediments and possibly nutrients and other pollutants to wetlands and surface water resources causing potential impacts. Sedimentation is a major contributor to the impairment of streams and rivers and reduction of functions for wetlands in Montana and the U.S.

3.6.3.2 Alternative 2 – Proposed Project

Wetland types and amounts potentially impacted by Alternative 2 are provided in **Table 3.6-3**.

TABLE 3.6-3
WETLANDS POTENTIALLY AFFECTED BY ALTERNATIVE 2

NWI Wetland Class	Acres within 500-foot alignment
Palustrine Emergent (PEM)	59.1
Palustrine Unconsolidated Shore/Bottom/Aquatic Bed (PUS, PUB, & PAB)	5.3
Lacustrine (L2)	0.8
Riverine/Floodplain	2.4
Total	67.6

In total, about 67.6 acres of wetlands have been mapped within the 500-foot Alternative 2 alignment. The largest wetland crossing within the Alternative 2 500-foot alignment would be approximately 510 feet. This wetland could be spanned assuming a typical span length of 800 feet. The wetland total acreage does not include any wetlands that were visually identified by MATL (MATL 2006b) in the approximately 22 miles of the Alternative 2 alignment through Teton County, where no official NWI data currently exist. Aerial photographs from 2005 of the Alternative 2 alignment through Teton County were reviewed. In concurrence with MATL, several small wetland areas were observed on the photographs, but acreage quantification was not possible. No single large wetland or concentration of wetlands covering more than approximately 500 feet was noted.

Most of the potentially impacted wetlands (approximately 87 percent) were palustrine emergent wetlands with only about 2.4 acres of riverine wetlands impacted at the Teton River, Dry Fork Marias River, and Marias River crossings. The 2.4 acres of riverine wetlands include areas that would be delineated as flood hazard areas (Zone A) on the FIRMs produced by FEMA. Approximately 75 percent of the potentially impacted wetlands are located in the area north of Cut Bank (Milk River Pothole area) and an area east and south of Conrad (Teton River area). The potential impacts to these wetlands would be alterations to the hydrology, alterations to the plant communities, and some minor filling from local sediment. The greatest potential impact to wetlands would be during construction.

The Alternative 2 alignment does cross approximately 0.8 acre of a delineated seasonally flooded lacustrine area near milepost 5 by Black Horse Lake. MATL would install bird warning devices on the transmission line, across all wetlands and streams including an additional ½ mile on either side. MATL has stated that it would conduct a soil investigation of this area and use either self-supporting steel poles with concrete caisson foundations or 3-pole wood structures with poles installed inside pipe piles. Guy wire screw anchors would be installed to an adequate holding capacity depth for this specific location (Williams 2007). The remaining wetlands are scattered along the alignment, including near the Benton Lake NWR area. Overall with successful implementation of the MATL proposed environmental protection measures (**Table 2.3-4**) and the required DEQ environmental specifications (**Appendix F**), impacts to wetlands under Alternative 2 would be minor and primarily of short duration.

3.6.3.3 Alternative 3 – MATL B

Alternative 3 is 8.3 miles shorter than Alternative 2 (121.6 miles vs. 129.9 miles) due to more diagonal segments along the entire alignment. The wetland types impacted by this alternative are of a similar class as those under Alternative 2, but the area of potentially impacted wetlands is about 5.3 fewer acres under Alternative 3 (**Table 3.6-4**).

TABLE 3.6-4 WETLANDS POTENTIALLY AFFECTED BY ALTERNATIVE 3	
NWI Wetland Class	**Acres within 500-foot alignment**
Palustrine Emergent (PEM)	49.7
Palustrine Unconsolidated Shore/Bottom/Aquatic Bed (PUS, PUB, & PAB)	8.3
Lacustrine (L2)	0.8
Riverine/Floodplain	3.5
Total	62.3

A total of about 62.3 acres of wetlands within the 500-foot alignment has been mapped along the Alternative 3 alignment, compared to 67.6 acres along the Alternative 2 alignment. The total wetland area does not include any wetlands visually identified by MATL (MATL 2006b) during the baseline field work in the 25 miles of this alternative alignment where no official NWI data currently exist. Aerial photographs from 2005 of the 25-mile section where no wetland data exist were reviewed. In concurrence with MATL, several small wetland areas were observed on the photographs, but exact acreage quantification was not possible. All single large wetlands or groups of wetlands can be spanned by the typical 800-foot ruling span length.

Most of the impacted wetland acres (58 acres or 93 percent) are palustrine emergent or palustrine unconsolidated wetlands. Approximately 3.5 acres of riverine wetlands (which generally corresponds to the flood hazard areas shown on FIRMs) would be impacted at the Teton, Dry Fork of the Marias, and the Marias river crossings. This Alternative 3 alignment is similar to Alternative 2 with approximately 75 percent of the potentially impacted wetlands located north of Cut Bank (Milk River Pothole area) and east and south of Conrad (Teton River area). The Alternative 3 alignment would also cross approximately 0.8 acre of the seasonally flooded lacustrine area near milepost 5 by Black Horse Lake. MATL would enact the same procedures for any structures placed in this area, as described for Alternative 2 above. The remaining wetlands are scattered along the alignment, including near the Benton Lake NWR area.

3.6.3.4 Alternative 4 – Agency Alternative

Alternative 4 is 139.6 miles in length, which is about 9.7 miles longer than the proposed Project (139.6 miles compared to 129.9 miles). This alternative is composed of 60.9 miles of the Alternative 2 alignment and 78.7 miles of agency-developed alignments that branch off the Alternative 2 alignment. The 78.7 miles of agency alignments were developed to address identified local scoping issues and concerns, but were not specifically developed to mitigate any potential impacts to wetland resources. The wetland types impacted by this alternative are similar to those under the Alternative 2 and Alternative 3. However, the higher proportion of coulees and unfarmed drainages that would be crossed by Alternative 4 in order to avoid farmed land does result in an increased number of wetlands potentially impacted by the Alternative 4 alignment. The wetland types impacted under this alternative are shown in **Table 3.6-5**.

TABLE 3.6-5 WETLANDS POTENTIALLY AFFECTED BY ALTERNATIVE 4	
NWI Wetland Class	**Acres within 500-foot alignment**
Palustrine Emergent (PEM)	69.8
Palustrine Unconsolidated Shore/Bottom/Aquatic Bed (PUS, PUB, & PAB)	4.2
Lacustrine (L2)	0.0
Riverine/Floodplain	2.4
Total	76.4

In total approximately 76.4 acres of wetlands have been mapped within the 500-foot Alternative 4 alignment, compared to 67.7 acres along the Alternative 2 alignment. The total wetland area does not include any wetlands visually identified by MATL (MATL 2006b) during the baseline field work in the approximately 25 miles of this alternative alignment where no official NWI data currently exist. Aerial photographs from 2005 of the 25-mile section where no wetland data exist were reviewed. In concurrence with MATL, several small wetland areas were observed on the photographs, but exact acreage quantification was not possible. All single large wetlands or groups of wetlands can be spanned by the typical 800-foot ruling span length.

Alternative 4 traverses around the southern and western sides of Benton Lake NWR area and would potentially impact fewer acres of wetlands from Great Falls to milepost 27.3, compared to Alternative 2, for this area. Several smaller palustrine and lacustrine wetlands, directly north of Great Falls (Black Horse Lake area) and along the western side of Benton Lake NWR, would be avoided by the Alternative 4 alignment.

The Alternative 4 alignment would cross Lake Creek, Teton River, Dry Fork Marias River, Marias River, and several major coulees (South Pondera, Pondera, Favot, and Big Flat). The higher proportion of coulees and unfarmed drainages that would be crossed by Alternative 4 in order to avoid farmed land does result in an increased number of wetlands potentially impacted by the Alternative 4 alignment compared to alternatives 2 and 3. The Alternative 4 alignment east of Conrad crosses slightly larger and more defined drainages due to its more eastern location. Drainages generally flow west to east in this area and tend to have more defined channels as they flow toward the Missouri River.

Most of the potentially impacted wetland acres (74 acres or 97 percent) are palustrine emergent or palustrine unconsolidated wetlands with only about 2.4 acres of riverine wetlands impacted at the Teton, Dry Fork of the Marias, and Marias river crossings. Alternative 4 would avoid the small seasonally flooded lacustrine area at Black Horse

Lake. Overall, with successful implementation of the MATL proposed environmental protection measures (**Table 2.3-4**) and the required DEQ environmental specifications (**Appendix F**), impacts to wetlands under Alternative 4 would be minor and primarily of short duration.

3.6.4 Environmental Impacts to Floodplains

This section describes the types of impacts that could occur and effects of these impacts on floodplains specifically. **Table 2.3-4** lists mitigation measures and best management practices that would be implemented to reduce potential impacts to wetlands, floodplains, and surface water resources. As stated above, MATL has committed to avoid all impacts to floodplains and would meet this goal by avoiding placement of any structure (or related construction impact) within a regulatory floodplain or below the ordinary high water mark (MATL 2006b).

Impacts to floodplains from all three action alternatives (Alternatives 2, 3, and 4) would be similar in nature and extent because all alternatives would cross delineated floodplains at the Teton, Dry Fork Marias, and Marias river crossings. The total acres of floodplains within the 500-foot-wide right-of-way have not been quantified because not all flood-prone areas within the Project study area have been delineated. However, the amount of riverine wetlands (comparable to floodplains by landscape position) within the Project study area is available from NWI maps for all of the Project study area except for portions in Teton County from approximately the town of Brady south to just north of Benton Lake NWR. The amount of riverine wetlands generally corresponds with the amount of flood hazard areas shown on the FIRMs. The acres of riverine wetlands that would potentially be impacted by the MATL transmission line range from 2.4 acres for Alternatives 2 and 4 and 3.5 acres for Alternative 3.

Numerous small drainages in the project area would be bisected; because they are situated generally west to east and the transmission line alignment would run primarily north and south. The typical ruling span of 800 feet, and the ability to span up to 1,600 feet, makes it feasible to cross most drainages and associated flood-prone areas in one span, without creating adverse impacts to any associated floodplains. The defined river channels and delineated flood hazard areas shown on the FIRMs for the Teton and Marias rivers would be crossed with a single span.

In June 1964, the Teton River near Dutton, MT, recorded a peak discharge of 71,300 cubic feet per second (cfs) that exceeded an estimated 500-year flood event of 50,000 cfs at this location. One transmission line structure would be sited on a north-side terrace of the Teton River that may have been flooded by the June 1964 event but is outside the 100-year floodplain (USGS 2007).

MATL has committed to avoid locating any structures within the regulatory 100-year floodplains or below the high-water marks of any major rivers (MATL 2006b). No major adverse impact on floodplains is expected. No direct filling or modification to the surface elevation is expected within the Teton, Dry Fork Marias, or Marias river floodplains. Any transmission line structures located on lower stream terraces along the Teton and Marias rivers would be outside and above the 100-year floodplain boundary.

Surface disturbance within the Teton River and Marias River bottomlands would be restricted to access roads to the structure sites. Earthmoving would be minimal. Construction could result in erosion and sedimentation to surface water, especially if flooding occurred during construction. Construction would not occur in flowing or standing water. Floodplain storage volumes would not be affected and flood stages would not increase measurably due to the presence of a structure on a lower river terrace. Little or no riparian vegetation would be disturbed during construction or operation of the transmission line. No adverse impacts from altered flooding patterns are expected to adjacent or downstream property owners. Impacts resulting from a structure placed on a lower Teton or Marias river terrace would be negligible. Impacts to floodplains would be further minimized by locating any needed access roads on naturally elevated areas.

No impacts to floodplains would be expected from the No Action alternative. Overall, with successful implementation of the MATL proposed environmental protection measures (**Table 2.3-4**) and the required DEQ environmental specifications (**Appendix F**), impacts to floodplains under the No Action and three action alternatives would be negligible and could occur only during construction.

Potential Mitigation and Best Management Practices

Mitigation measures have been developed by MATL to help avoid and minimize impacts to wetlands and floodplains from the proposed Project and alternatives. MATL’s mitigation measures are not necessarily exclusive for wetland and stream crossings and may provide concurrent benefits for impacts to soils and other biological resources. MATL’s stated measures to mitigate potential impacts to wetlands and floodplains include:

1) Avoiding existing wetlands, floodplains, and drainage channels to the maximum extent possible by completely spanning all wetlands, prairie pothole wetlands, riparian vegetation, coulees, Marias River, and Teton River.
2) Avoiding placement of transmission line structures in riparian vegetation areas.
3) Implementing erosion and sediment control best management practices during construction, as required by the State of Montana.

4) Completing timely seeding of all areas affected by project activities with native and/or non-invasive seed mixes to prevent soil erosion.

Agency-developed mitigation measures applicable to wetlands and floodplains would be attached to DEQ's Environmental Specifications (**Appendix F**). One agency mitigation measure for wetlands would be for MATL to delineate all wetlands, waters of the U.S., and floodplains along any selected alignment that traverses Teton County where no official NWI or updated FIRM data exists. To help avoid locating a structure in a floodplain, the southern side of the Marias River floodplain in Pondera County should be identified (temporarily delineated) to verify that the proposed structure location is outside the floodplain. Delineating the wetlands, floodplains, and other potential jurisdictional areas would assist in minimizing potential alterations to the hydrology and plant communities during construction and allow placement of mitigation measures at the appropriate locations. Additional mitigation measures specific to wetlands and Waters of the U.S. may be required by the U.S. Army Corps of Engineers under a Nationwide #12 Permit (Utilities Line Activities), if any construction, maintenance, or repair of utility lines and associated facilities is required within a jurisdictional wetland and Waters of the U.S. The additional wetland mitigation measures would help ensure no net loss of wetland acreage and a consistent approach for mitigating potential impacts to wetlands associated with the MATL transmission line project.

3.6.5 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.7 Vegetation

3.7.1 Analysis Methods

Analysis Area

Quantitative analysis of acres for various vegetation communities in each alignment was derived from orthophotograph interpretation of cover types along the proposed alternatives. Assumptions associated with GIS derived acreages of vegetation resources include:

- GIS data are based on 2005 orthophotographs (USDA NAIP 2005) that were hand digitized in 2006. Some misidentification may have occurred due to orthophotograph resolution and changes in vegetation type and condition since the photographs were taken.
- The analysis area consists of 250 feet on either side of each alignment centerline.
- Except as noted, all newly constructed access roads would be located within the 500-foot alignments.

All common and scientific plant names are based on the USDA PLANTS Database (NRCS 2006b).

Information Sources

Vegetation community types and noxious weeds are discussed in this section. Threatened, endangered, candidate, and sensitive species including special status plant species are discussed in Section 3.10. Community type and distribution data are based on field evaluations conducted in 2005 by MATL. Additional data sources include the NHP (2006b) and the Montana NRIS. Montana Gap Analysis Program (GAP) (Redmond and others 1998) data were reviewed and determined to be inappropriate for vegetation classification at this scale and inaccurate due to land cover changes since publication of the data set.

3.7.2 Affected Environment

This section addresses the environmental baseline conditions for vegetation resources in the Project area. The large spatial extent of the Project area encompasses many different vegetation types and communities. Vegetation communities in Montana are generally determined by topography, soil type, and climate (NHP 2002). In general, dominant vegetative communities include irrigated and non-irrigated farmland, fallow crops, CRP areas, native shrub and grassland communities, and riparian and wetland communities.

Three Level IV Ecoregions, described by Woods and others (2002), are found within the Northwestern Glaciated Plains Ecoregion: North Central Brown Glaciated Plains, Foothill Grasslands, and Milk River Pothole Uplands. Ecoregions are areas with general similarity in the type, quality, and quantity of environmental resources and are relevant to integrated ecosystem management (Woods and others 2002). The Northwestern Glaciated Plains is characterized as the transition zone between the more level, moister Northern Glaciated Plains to the east and the dryer, irregular Northwestern Great Plains to the west and southwest. The Northwestern Glaciated Plains is well suited for agriculture with much of the area having been converted to farmland. **Table 3.7-1** presents the environmental attributes of the three Level IV Ecoregions found in the Project area.

TABLE 3.7-1
PROJECT AREA LEVEL IV ECOREGIONS

Level IV Ecoregion	Elevation (feet)	Precipitation Mean Annual (inches)	Potential Natural Vegetation
North Central Brown Glaciated Plains	2,500 to 4,200	11 to 15	Grama- needlegrass-wheatgrass
Foothill Grasslands	3,500 to 5,500	11 to 22	Wheatgrass-fescue
Milk River Pothole Uplands	3,700 to 4,350	11 to 14	Grama- needlegrass-wheatgrass

Notes:
Sources: Woods and others (2002) and Kuchler (1964).

Potential natural vegetation for the Project area is dominated by the grama-needlegrass-wheatgrass and wheatgrass-fescue community types (Woods and others 2002). Mixed grass prairie in these areas is typified by open (40 to 60 percent canopy cover) graminoid dominated vegetation. Dominant native graminoids throughout the Project area include bluebunch wheatgrass (*Pseudoroegneria spicata*) and blue grama (*Bouteloua gracilis*) (**Table 3.7-2**). Bluebunch wheatgrass often shares dominance with needle-and-thread (*Hesperostipa comata*); blue grama is usually present in differing amounts depending on past grazing history. Western wheatgrass (*Pascopyrum smithii*) is also important in localized areas. Shrub cover is typically less than 10 percent in these communities with dominant species including broom snakeweed (*Gutierrezia sarothrae*), plains pricklypear (*Opuntia polyacantha*), and occasionally rubber rabbitbrush (*Ericameria nauseosa*)(NHP 2006a). Saline areas support alkali grass (*Puccinellia* spp.), wild barley (*Hordeum* spp.), greasewood (*Sarcobatus vermiculatus*), saltwort (*Salicornia rubra*), and Pursh seepweed (*Suaeda calceoliformis*)(MATL 2006b).

TABLE 3.7-2 DOMINANT PLANT SPECIES COMBINATIONS IN THE PROJECT AREA		
Common Name	**Scientific Name**	**Location**
Short- and Mid-grass Prairie		
Blue Grama	*Bouteloua gracilis*	Breaks above Marias and Teton rivers
Thickspike Wheatgrass	*Elymus lanceolatus*	North of Cut Bank, some CRP
Needle-and-thread	*Hesperostipa comata*	Breaks above Marias and Teton rivers, coulees
Northern Porcupine Grass	*Hesperostipa curtiseta*	Breaks above Marias and Teton rivers
Green Needlegrass	*Nassella viridula*	Southern, below 230-kV switch yard
Western Wheatgrass	*Pascopyrum smithii*	Breaks above Marias and Teton rivers, coulees
Foxtail Barley	*Hordeum jubatum*	Saline soil patches
Badlands		
Silver Sagebrush	*Artemisia cana*	Kevin Rim, Dry Fork Marias River
Thickspike Wheatgrass	*Elymus lanceolatus*	North of Cut Bank
Creeping Juniper	*Juniperus horizontalis*	Trunk Butte, Kevin Rim
Shrublands		
Silver Sagebrush	*Artemisia cana*	Marias and Teton rivers; Kevin Rim
Blue Grama	*Bouteloua gracilis*	Missouri Plateau breaks/Rim north of Great Falls; Marias and Teton rivers
Needle-and-thread	*Hesperostipa comata*	Missouri Plateau breaks/Rim north of Great Falls; Marias and Teton rivers
Western Wheatgrass	*Pascopyrum smithii*	Breaks above Marias and Teton rivers, coulees
Silver Buffaloberry	*Shepherdia argentea*	Red River; coulees north of Cut Bank and central area
Riparian		
Boxelder	*Acer negundo*	Kevin Rim; coulees
Silver Sagebrush	*Artemisia cana*	Marias, Teton, Dry Fork Marias rivers
Sedge	*Carex spp.*	Marias and Teton rivers, coulees
Spikerush	*Eleocharis spp.*	Teton River, coulees
Western Wheatgrass	*Pascopyrum smithii*	Marias and Teton rivers, coulees
Plains Cottonwood	*Populus deltoides*	Marias and Teton rivers
Narrowleaf Cottonwood	*Populus angustifolia*	Marias and Teton rivers
Chokecherry	*Prunus virginiana*	Marias and Teton rivers, coulees
Wild Currant	*Ribes spp.*	Marias and Teton rivers, coulees
Woods' Rose	*Rosa woodsii*	Marias and Teton rivers, coulees
Peachleaf Willow	*Salix amygdaloides*	Dry Fork Marias River, coulees
Willow	*Salix spp.*	Rivers, coulees
Silver Buffaloberry	*Shepherdia argentea*	coulees
Western Snowberry	*Symphoricarpos occidentalis*	Rivers, draws, coulees

Notes:
Table is not intended to be a comprehensive list, rather a characterization of dominant species in the Project Area.
Source: MATL 2006b.

Shrublands are comparatively rare and occupy a very small portion of the Project area. These communities tend to be small and isolated and are generally located in badlands, upland draws, and terraces along riparian zones. The primary upland shrub community throughout the northern portion of the Project area is silver buffaloberry, which occurs as small, isolated patches in protected draws, drainage heads, and swale bottoms. Silver sagebrush occurs in relatively mesic sites and is generally found as stringers on the upper floodplain terraces of the larger creeks and rivers in the area, particularly the Dry Fork Marias River (MATL 2006b) (**Table 3.7-2**).

Historically, drought, fire, and periodic grazing were the dominant disturbance factors in this area (USDA Forest Service 1994). Conversion of native grasslands to agricultural uses has yielded highly fragmented native communities and altered historic disturbances. Other disturbances such as livestock grazing and rangeland managed under the CRP have produced native communities in a variety of ecological and successional conditions, in turn providing opportunity for the introduction of noxious weed species. CRP rangelands are dominated by introduced wheatgrasses (*Agropyron* spp.), alfalfa (*Medicago* spp.), clover (*Trifolium pratense*), and annual weeds, for example, yellow salsify (*Tragopogon dubius*)(MATL 2006b).

3.7.2.1 Riparian Vegetation

Riparian vegetation plays an important role in many physical processes within riparian areas. Riparian vegetation dissipates energy and filters and retains sediment during peak flow periods. The vegetation also immobilizes, stores, and transforms chemical inputs such as nitrogen. Riparian communities also stabilize streambanks and moderate instream conditions, such as temperature, to provide valuable fish and wildlife habitat (Schultz and others 1994). Data characterizing riparian vegetation in the Project area rely predominately on MATL field investigations and were taken from the MATL MFSA application (MATL 2006b), unless otherwise noted.

Riparian communities within the Project area are generally restricted to the Marias River, Teton River, coulees, and small ephemeral tributaries of the Marias and Teton rivers. The character of these riparian zones is directly related to soil moisture as determined by drainage basin size and dimensions, the annual flooding regime, and the proximity to the head of the drainage. These drainages experience large seasonal and annual hydrologic variability, resulting in relatively undeveloped floodplains in most of the Project area. Riparian habitats are better developed and more complex along the Marias River and Teton River. The coulees and smaller streams are relatively xeric and do not support substantial riparian vegetation. Generally, riparian zones within the Project area consist of herbaceous (*Carex* spp.) and willow communities in the wettest zones, which transition to western snowberry, Woods' rose, and silver sagebrush-western wheatgrass communities on the upper floodplain terraces. The Marias River and Teton River support narrow, discontinuous cottonwood stands interspersed by broader terraces supporting silver sagebrush-western wheatgrass. Willow, cottonwood, and box-elder trees are found on shaded slopes of valleys and river terraces (**Table 3.7-2**).

The Marias and Teton rivers support the most important forested riparian habitats in the Project area including oxbow marshes and shrub-dominated terraces. The defining feature, however, is the cottonwood stands that line the rivers in places. Despite the fact that these riparian forests have been reduced and fragmented by conversion of the floodplain to irrigated agriculture and pasture (Jones 2003), they remain the only important native forested habitat within the Project area. The width of the cottonwood stands varies up to 500 feet.

In places, mature cottonwood trees dominate the Marias River and Teton River riparian communities. Mesic floodplains support a diverse understory that may include box elder, peachleaf willow, yellow willow, and chokecherry. Xeric floodplain terraces support a less diverse shrub layer dominated by western snowberry and Woods' rose, or lack a shrub component altogether. The native grasses that once characterized these stands have been largely replaced by exotic species like Kentucky bluegrass (*Poa pratensis*). Grazing has greatly altered the shrub composition in these communities (Jones 2003). Teton River terraces are subjected to less frequent seasonal flooding due to upstream reservoirs and when not farmed often support a silver sagebrush-western wheatgrass community. Lack of flood disturbance has changed the ecological dynamics by suppressing cottonwood regeneration and facilitating the colonization of invasive species such as Russian olive (*Elaeagnus angustifolia*).

<u>Noxious Weeds</u>

Invasive plants are often early successional, pioneer species that colonize quickly following disturbance. They typically produce large quantities of seed that germinate quickly and are highly competitive. Both native and non-native invasive plants are found throughout Montana. Noxious weeds are defined as "any exotic plant species established or that may be introduced in the state that may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities" (7-22-2101, MCA). Noxious weeds are highly aggressive and lack native insects and diseases that aid in limiting the spread and distribution of the species. Some species can establish without soil disturbance and displace healthy native communities, resulting in noxious weed monocultures. Localized areas of spotted knapweed were found in the floodplain of the Marias River near Sullivan Bridge (Glacier County) and in the floodplain of the Teton River near Kerr Bridge (Teton County). Leafy spurge is also broadly distributed along the Marias River. Two additional noxious weeds, Canada thistle and field bindweed are located in the Project area. Canada thistle was found in the terraces above the Dry Fork Marias River (MATL 2006b). Montana Noxious Weed Survey and Mapping project data, hosted on NRIS, indicate populations of Dalmatian toadflax near Conrad, Russian knapweed along the Marias and Teton river corridors, and leafy spurge scattered throughout the Project area (Montana Noxious Weed Survey and Mapping 1998). **Table 3.7-3** lists several other noxious weed species located within counties in the Project area. Although not listed as a noxious weed, cheatgrass (*Bromus tectorum*), an annual grass, is considered a weed by many agricultural producers in the area.

TABLE 3.7-3
CATEGORY ONE AND TWO NOXIOUS WEEDS FOUND IN COUNTIES WITHIN THE PROJECT AREA

Common Name	Scientific Name	Habitat
Category 1- Widespread Noxious Weeds		
Canada thistle	*Cirsium arvense*	Reported in all project area counties.
Common tansy	*Tanacetum vulgare*	Reported in Glacier, Cascade and Chouteau counties. Historically present in Toole and Pondera counties.
Dalmatian toadflax	*Linaria dalmatica*	Reported in all project area counties.
Diffuse knapweed	*Centaurea diffusa*	Reported in all project area counties.
Field bindweed	*Convolvulus arvensis*	Reported in all project area counties.
Houndstongue	*Cynoglossum officinale*	Reported in all project area counties.
Leafy spurge	*Euphorbia esula*	Reported in all project area counties.
Ox-eye daisy	*Chrysanthemum leucanthemum*	Reported in Glacier, Cascade and Chouteau counties. Historically present in Pondera and Teton counties.
Russian knapweed	*Acroptilon repens*	Reported in all project area counties.
Spotted knapweed	*Centaurea stoebe*	Reported in all project area counties.
St. Johnswort	*Hypericum perforatum*	Reported in Glacier, Cascade and Chouteau counties. Historically present in Teton County.
Sulfur cinquefoil	*Potentilla recta*	Reported in Glacier, Pondera, Cascade and Chouteau counties. Historically present in Toole County.
Whitetop or hoary cress	*Cardaria draba*	Reported in all project area counties except Glacier County (historically present).
Yellow toadflax	*Linaria vulgaris*	Reported in all project area counties.
Category 2- Established Invaders		
Dyers woad	*Isatis tinctoria*	Historically present in Pondera and Chouteau counties, but not currently reported.
Meadow hawkweed complex	*Hieracium pratense, H. floribundum, H. piloselloides*	Historically present in Pondera and Chouteau counties.
Perennial pepperweed	*Lepidium latifolium*	Reported in Toole, Pondera, Teton, Cascade and Chouteau counties.
Purple loosestrife or Lythrum	*Lythrum salicaria, L. virgatum*	Reported in Pondera and Cascade counties. Historically present in Toole County.
Tall buttercup	*Ranunculus acris*	Reported in Glacier county. Historically present in Teton County.
Tamarisk	*Tamarix* spp.	Reported in Cascade and Chouteau counties. Historically present in Teton County.

Source: MATL 2006b

3.7.3 Environmental Impacts

3.7.3.1 Alternative 1 - No Action

Alternative 1 would not have any effects on vegetation resources (riparian vegetation, species of concern, or weed control) in the analysis area.

3.7.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Rangeland vegetation, such as grassland, improved pasture, seeded grasslands, shrubland, badland, and riparian and wetland areas, would be removed by the construction of access roads and structures and at construction staging areas. Impacts to riparian and wetland areas would be minimal as these areas would only be disturbed when absolutely necessary. Maintenance activities would not often result in additional ground disturbance. Alternative 4 impacts the greatest amount of rangeland cover types (47.4 miles) and is 9.6 miles longer than Alternative 2. The increased crossing in rangeland/pasture land cover types would result in more tower structures and access roads, thus increasing rangeland/pasture land impacts. Disturbance due to maintenance activities would also increase over the life of the Project due to increased structure and road placement in rangeland vegetation. Linear miles of rangeland cover types affected by alternative are in **Table 3.7-4**. Disturbance resulting from staging areas would be similar for all alternatives. Off right-of-way access roads would be necessary on the approaches to the Teton and Marias River crossings. The anticipated off right-of-way access roads in these two areas would be on rangeland/pasture land.

TABLE 3.7-4
NATIVE VEGETATION COVER TYPES
CROSSED BY ALTERNATIVES 2, 3, AND 4

Rangeland Cover Types	Alternative 2		Alternative 3		Alternative 4	
	Miles	Cover Types (percent)	Miles	Cover Types (percent)	Miles	Cover Types (percent)
Grassland/ Shrubland	32.7	25.2	22.5	18.5	47.8	34.2
Riparian	1.4	1.1	1.7	1.4	1.9	1.4
Forest (Cottonwood)	0.0	0.0	0.1	0.1	0.1	0.1
Total	34.1	26.3	24.3	20.0	49.8	35.7
Total Line Length	129.9	--	121.6	--	139.6	--

Notes:
Source: Orthophotographs 2005 (Montana NRIS 2006a) interpretation of land cover in vegetation analysis area, October 2006.
-- Not applicable

Monopole structures would be used in cropland and CRP and would disturb approximately 28 square feet. H-frame structures would be placed in areas of native vegetation and would disturb approximately 44 square feet (**Table 2.3-1**).

Construction disturbance would include assembling structure disturbance, vehicle turn-around areas disturbance, and line pulling and tensioning area disturbance, construction road disturbance, and pole installation disturbance areas. Construction activities could result in accidental exposure to contaminants or fire. Accidental spills during equipment maintenance or refueling could result in temporary exposure to hazardous contaminants. Spill prevention plans would, however, be in place and impacted areas would be immediately reclaimed; so exposure would be temporary and restricted to the site of spill. Thus, impacts to vegetation would be restricted to those at the site of the spill. Accidental fires associated with construction and maintenance vehicles would result in the temporary loss of plants. These areas would be revegetated; thus, only the area occupied by structures would be impacted for the life of the Project.

Operational disturbance, the actual area occupied by the poles, would be approximately 8 square feet for H-frames. Operational disturbance would include H-frame structure base disturbance, other pole base disturbance, and access road disturbance. **Table 3.7-5** shows the estimated amount of operational disturbance associated with H-frame structures in native cover types by alternative. Although MATL proposes to avoid riparian disturbance wherever possible (MATL 2006b), structures may be placed in riparian habitat. Therefore, riparian land cover is included in the analysis of ground disturbance resulting from H-frame structures (**Table 3.7-5**). Cottonwood stands were not included in the analysis because these areas are scarce and could be avoided and not disturbed (**Table 3.7-4**).

TABLE 3.7-5
ESTIMATED OPERATIONAL DISTURBANCE FOR H-FRAME STRUCTURES BY NATIVE COVER TYPE

Rangeland Cover Types	Alternative 2		Alternative 3		Alternative 4	
	Percent Land Cover	Operational Disturbance (square feet)[a]	Percent Land Cover	Operational Disturbance (square feet)[a]	Percent Land Cover	Operational Disturbance (square feet)[a]
Grassland/ Shrubland	25.2	1,736	18.5	1,192	34.0	2,504
Riparian	1.1	73.9	1.5	95	1.4	100.3

Notes:

a Average 800-foot span between structures and assuming 8 square feet of operational disturbance per H-frame.

Access road construction and maintenance would impact native vegetation during line construction and project maintenance. Following construction, many of the road beds would be revegetated and treated to control noxious weeds resulting in resource recovery in 3 to 5 years. During vegetation recovery the likelihood of noxious weed invasion would increase. Implementation of the proposed weed control program would greatly reduce the establishment of weed species.

The major threat to vegetation resources from maintenance activities is the introduction of noxious weed species. Project maintenance would create minor vegetation disturbance throughout the life of the project. Vegetation would not be greatly affected by occasional trampling from maintenance vehicles; however, the resulting ground disturbance and physical plant damage provide an opportunity for weed invasion. Adherence to the proposed weed management plan would reduce the likelihood of weed establishment as a result of maintenance activities.

Estimates of total ground disturbance from construction activities (assuming 28 square feet per structure and roadbed plus 20 percent for access roads) total approximately 214 acres under Alternative 2, 206 acres under Alternative 3, and 240 acres under Alternative 4 (**Table 2.3-2**). The total acreage of construction disturbance would be more than that for operational disturbance. Construction disturbance would be of varying intensity, with most areas, such as staging areas, requiring reseeding. All areas of disturbance would require noxious weed monitoring and possible weed treatment.

Estimates of total ground disturbance from operational activities include approximately 7 acres for Alternative 2, 11 acres for Alternative 3, and 15 acres for Alternative 4. Short- and long-term ground disturbance is greatest under Alternative 4.

Proposed practices to reduce potential vegetation loss and noxious weed invasion would include seeding disturbed areas with appropriate weed-free seed mixes, using weed-free borrow materials, and inventorying and treating noxious weeds according to the Noxious Weed and Invasive Plant Control Plan (MATL 2006b). The combination of the proposed revegetation and weed control measures along with vehicle cleaning and follow-up monitoring by DEQ would reduce the potential for native species displacement and noxious weed spread during project construction and long-term maintenance.

Riparian Vegetation

DEQ would apply its environmental specifications (**Appendix F**) to the project. The specifications include the requirement that MATL avoid placing poles or roads in designated 100-year floodplains. MATL has stated it would avoid riparian vegetation by completely spanning these areas to the maximum extent possible.

Weed Control

Ground disturbance and increased travel during line construction and maintenance could increase the risk of noxious weed spread. Weed infestations are actively controlled in cropland and along country roads and other rights-of-way; however, resources are often limited when treating weeds in native vegetation. The weed control area for this project is defined by MATL as:

> All lands disturbed by construction activities plus a 30-foot buffer area around disturbances. Newly constructed roadways, where needed, are expected to be about 14 feet wide with varying widths of cut and fill slopes. To buffer all disturbed areas it is estimated that the 'weed control area' would consist of an approximately 100-foot corridor along all roadways and tensioning sites that are used for construction, and all lands within 50 feet of each new transmission line structure. (MATL 2006b)

The proposed weed control program incorporates a baseline inventory and marking of existing noxious weed populations; preventative measures (that is, washing vehicles, flagging weed populations to be avoided, and seeding following disturbance); and an integrated control program involving spraying target species in coordination with the BLM, state weed coordinator, and county weed boards and groups. Mitigation practices such as washing vehicles and equipment would occur throughout construction and continue during future line maintenance activities. MATL would report annually to Federal, state, and county personnel on the condition and progress of this effort. The MATL integrated weed control plan would reduce the threat of noxious weed invasion following ground disturbance resulting from project construction and long-term maintenance. This weed control program would be implemented for the life of the project or as required by designated Federal, state, and county personnel to ensure long-term noxious/invasive plant control measures are met in the weed control area (MATL 2006b).

In addition to noxious weed invasion, unlisted weed species are likely to increase due to ground disturbance and increased traffic and activity in the study area. It is assumed MATL would treat these species in conjunction with noxious weeds. On farmland, it is assumed landowners would manage these species with the methods currently used.

3.7.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.8 Wildlife

3.8.1 Analysis Methods

This section discusses the occurrence and distribution of vertebrates (mammals, birds, reptiles, and amphibians) within the analysis area.

Analysis Area

The analysis area includes wildlife habitat potentially impacted by the implementation of the proposed Project. This area was defined as 1 mile on either side of the proposed and alternative transmission line alignments. Figures showing the alignments are in Chapter 2.

Information Sources

Information on the distribution of wildlife in the analysis area was obtained from a variety of sources, including: literature review, reports from the Natural Heritage Program (NHP) and FWP, technical reports, peer-reviewed journal articles, and field investigations conducted during May, June, and August 2005 and April and May 2006. Field investigations were conducted to evaluate biological resources in the vicinity of the proposed transmission line alignments. The potential for occurrence of wildlife species not observed during field investigations was assessed based upon evaluation of species distribution and habitat use and information from previous research studies and biological reports (MATL 2006b).

Threatened, endangered, candidate, and sensitive species found in the analysis area are discussed in **Section 3.10.**

3.8.2 Affected Environment

The analysis area encompasses the following Level IV ecoregions of Montana: the North Central Brown Glaciated Plains, the Foothill Grassland, and the Milk River Pothole Upland (Woods and others 2002). Human development and conversion to agricultural cropland have fragmented the native vegetation communities and reduced the quality of these areas as habitat for grassland species**.** Areas such as Benton Lake NWR, WPAs, CRP lands, river corridors, and the Kevin Rim are important wildlife habitats in the analysis area. The WPAs provide habitat for wildlife, especially waterfowl. CRP lands, which comprise approximately 17.7 percent of the area, also provide valuable cover and forage for various species of wildlife.

The Marias and Teton rivers represent the most important fisheries in the analysis area, and the associated cottonwood stands are the only sizeable woodlands in the area. The extent of a shrub-steppe community (silver sagebrush-western wheatgrass) is limited to the Kevin Rim in the northeast corner of the analysis area and lands southeast of Shelby north of the Marias River.

A list of wildlife species observed during field investigations is in **Table 3.8-1**. This table is not intended to be an exhaustive list of every species that occurs in the area, but rather to provide insight into current habitat conditions and general taxonomic groups that are found in the analysis area.

TABLE 3.8-1
SPECIES OBSERVED IN THE ANALYSIS AREA DURING FIELD INVESTIGATIONS

Common Name	Scientific Name	Location
Birds		
Golden eagle	*Aquila chrysaetos*	West of Benton Lake NWR
Northern harrier	*Circus cyaneus*	West of Benton Lake NWR
Swainson's hawk	*Buteo swainsoni*	West of Benton Lake NWR; Bullhead Road; Kevin Rim
Red-tailed hawk	*Buteo jamaicensis*	West of Benton Lake NWR; Bullhead Road; north of Teton River
Ring-necked pheasant	*Phasianus colchicus*	McLean State Game Preserve; Bullhead Road
Sharp-tailed grouse	*Tympanuchus phasianellus*	West of Benton Lake NWR; Marias River; north of Shelby
Horned lark	*Eremophila alpestris*	North of Marias River
Meadow lark	*Sturnella neglecta*	Throughout
Common snipe	*Gallinago gallinago*	McLean State Game Preserve
Long-billed curlew	*Numenius americanus*	Throughout
Northern shoveler	*Anas clypeata*	North of Cut Bank
Blue-winged teal	*Anas discors*	North of Cut Bank
Mallard	*Anas platyrhynchos*	North of Cut Bank
Gray (Hungarian) partridge	*Perdix perdix*	Kevin Rim; McLean State Game Preserve
Mammals		
Coyote	*Canis latrans*	South of Cut Bank
American pronghorn	*Antilocapra americana*	Throughout
White-tailed jackrabbit	*Lepus townsendii*	Kevin Rim
Red fox	*Vulpes vulpes*	Bullhead Road
Mountain cottontail	*Sylvilagus nutalli*	Kevin Rim
Mule deer	*Odocoileus hemionus*	North of Teton River

Notes:
Source: MATL 2006b

3.8.2.1 Mammals

Mammal species found in the grasslands are numerous and include mule deer, American pronghorn, badger (*Taxidea taxus*), Richardson's ground squirrel (*Spermophilus richardsonii)*, coyote, mountain cottontail (*Sylvilagus nutalli*), and white-tailed jackrabbit (*Lepus townsendii*), and a variety of small rodents. These species are relatively common in grassland and sagebrush steppe habitats in northcentral Montana.

Badgers occur at low densities in grasslands throughout the analysis area. Richardson's ground squirrel occurs in relatively low to moderate densities (Olson 2005a), including several active ground squirrel burrows in the Kevin Rim area (Zelenak 1996). Black-tailed prairie dogs (*Cynomys ludovicianus*) also occur in the analysis area east of Interstate 15 and are further discussed in **Section 3.10**. Riparian habitats along the Marias River and Teton River support additional mammal species, including raccoons (*Procyon lotor*), red fox, (*Vulpes vulpes*) and a variety of small rodents.

<u>Ungulates</u>

Mule deer (*Odocoileus hemionus*) occur in the analysis area south of the Marias River in low to moderate densities along coulees and draws and irrigated lands east of Conrad. **Figures 3.8-1**, **3.8-2**, and **3.8-3** illustrate the winter distribution of mule deer within or adjacent to the analysis area. Although the NHP Animal Field Guide indicates that white-tailed deer (*Odocoileus virginianus*) are generally restricted to the southern portion of the analysis area, not reaching as far north as the Marias River (NHP 2004), landowners along the Marias River reported observing white-tailed deer in this area. The NHP Animal Field Guide reports that within the southern portion of the analysis area, white-tailed deer stay close to riparian habitats along the Teton River and its tributaries. Data indicate that white-tailed deer do not have winter ranges within the analysis area; however, the species' range east of the continental divide varies greatly from year to year depending on climatic conditions (Montana NRIS 2005).

American pronghorn occur in low to moderate densities throughout the central and southern portions of the analysis area. Pronghorn were observed in grasslands, sagebrush steppe, and croplands during field investigations. NHP data indicate that pronghorn do not have a winter distribution within the analysis area (Montana NRIS 2005); however, pronghorn populations tend to fluctuate with environmental conditions. NHP and FWP data indicate that elk (*Cervus elaphus*) do not generally occur within the analysis area. The closest elk population is northeast of Shelby, outside the analysis area, in the Sweet Grass Hills.

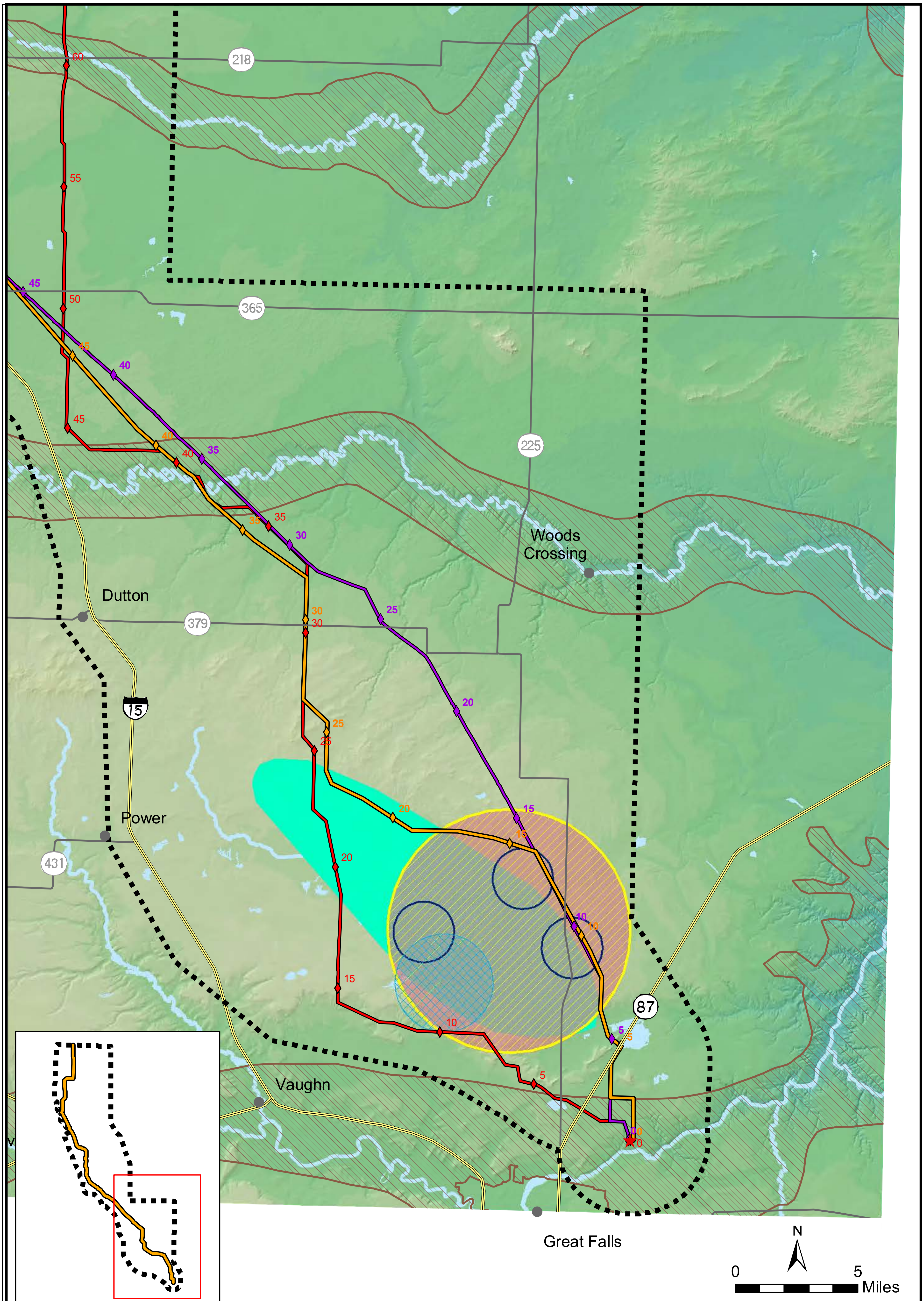


FIGURE 3.8-1
PROPOSED MATL POWERLINE
MULE DEER WINTER RANGE AND SPECIES OF SPECIAL CONCERN
SOUTH

LEGEND

- MULE DEER WINTER RANGE (MTFWP)
- BLACK-CROWNED NIGHT-HERON (Nycticorax nycticorax)
- BLACK-NECKED STILT (Himantopus mexicanus)
- BURROWING OWL (Athene cunicularia)
- FERRUGINOUS HAWK (Buteo regalis)
- PEREGRINE FALCON (Falco peregrinus)
- SHARPTAIL GROUSE LEKS PROTECTION BUFFER AREA
- ALT2 - ALIGNMENT
- MILE MARKERS
- ALT3 - ALIGNMENT
- MILE MARKERS
- ALT4 - ALIGNMENT
- MILE MARKERS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY_AREA
- MAJOR HIGHWAYS
- SECONDARY ROADS
- RIVERS AND STREAMS

GIS map by Patricia Williams -TTMTI 3-8-1-MuleDeerWinterRng-TnESpp-South.mxd

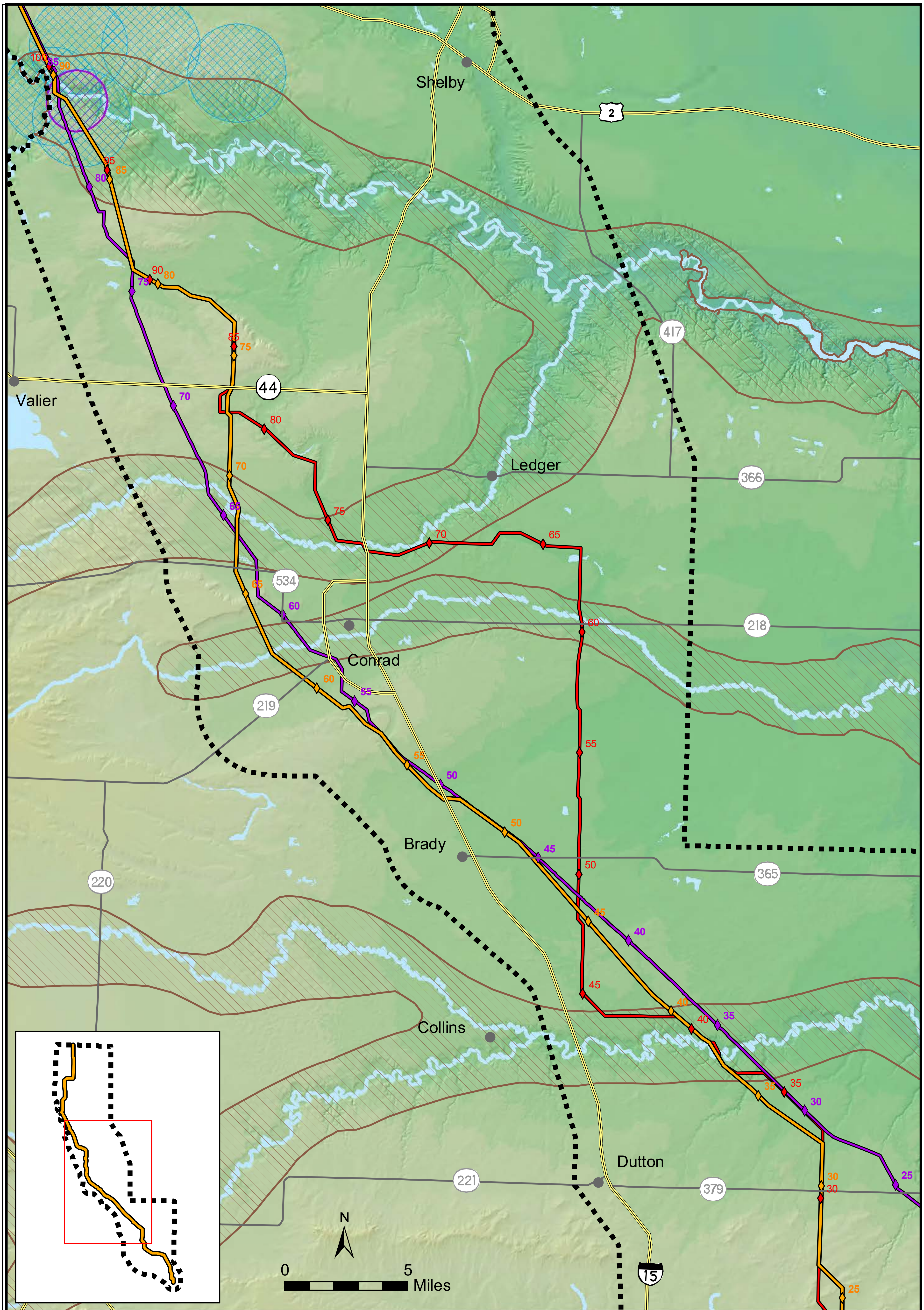


FIGURE 3.8-2
PROPOSED MATL POWERLINE
MULE DEER WINTER RANGE AND SPECIES OF SPECIAL CONCERN
MIDDLE

LEGEND

- MULE DEER WINTER RANGE (MTFWP)
- BLACK-CROWNED NIGHT-HERON (Nycticorax nycticorax)
- BLACK-NECKED STILT (Himantopus mexicanus)
- BURROWING OWL (Athene cunicularia)
- FERRUGINOUS HAWK (Buteo regalis)
- PEREGRINE FALCON (Falco peregrinus)
- SHARPTAIL GROUSE LEKS PROTECTION BUFFER AREA
- ALT2 - ALIGNMENT
- MILE MARKERS
- ALT3 - ALIGNMENT
- MILE MARKERS
- ALT4 - ALIGNMENT
- MILE MARKERS
- CITIES AND TOWNS
- ALIGNMENT END AND EXIT POINTS
- STUDY_AREA
- MAJOR_HIGHWAYS
- SECONDARY_ROADS
- RIVERS AND STREAMS

GIS map by Patricia Williams -TTMTI 3-8-2-MuleDeerWinterRng-Middle.mxd

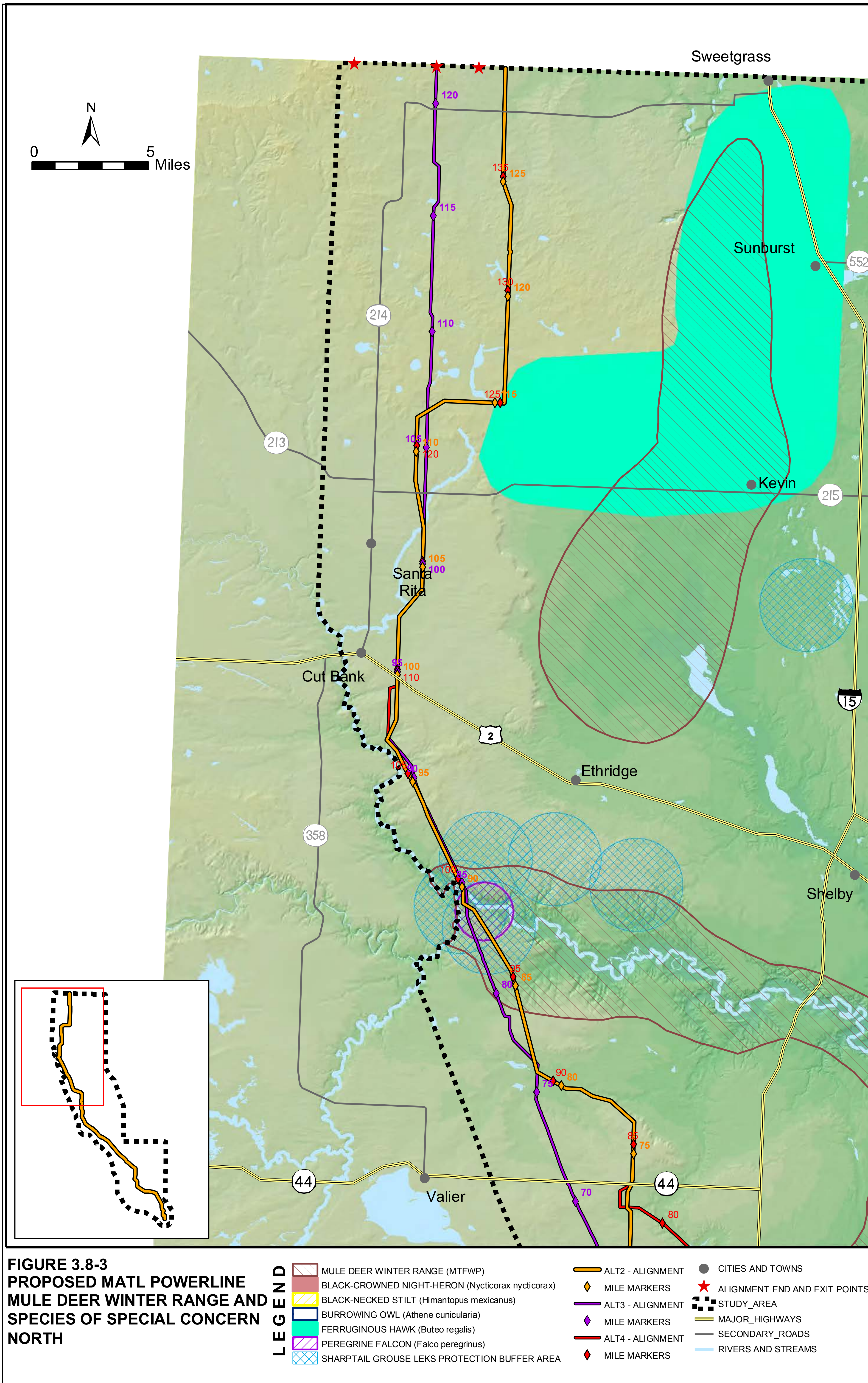


FIGURE 3.8-3
PROPOSED MATL POWERLINE MULE DEER WINTER RANGE AND SPECIES OF SPECIAL CONCERN NORTH

GIS map by Patricia Williams -TTMTI 3-8-3-MuleDeerWinterRng-North.mxd

Bats

The analysis area is within the known range of eight species of bats, representing one family and five genera (**Table 3.8-2**). All are insectivorous, preying upon nocturnal insects using highly evolved echolocation and foraging behavior. Bats use grasslands and riparian areas as foraging habitat. Some species are migratory, flying south for the winter (for example, the hoary bat and silver-haired bat), while others flock to local caves or mines for the lengthy winter hibernation (for example, *Myotis* spp. and the big brown bat). Migratory and wintering habits are poorly understood for many species. Townsend's big-eared bat is classified as a sensitive species by BLM and has a State rank of S2 (imperiled because of rarity and/or other factors making it vulnerable to extinction). The NHP did not have element occurrence data for this particular species of concern within the analysis area.

TABLE 3.8-2
BAT SPECIES LIKELY TO OCCUR IN THE ANALYSIS AREA[a]

Common Name	Scientific Name	Roosting Habitat[b]	Status[c]	Migration[d]
Silver-haired bat	*Lasionycteris noctivagans*	Tree cavities in mature coniferous/mixed forest	C	Migratory
Hoary bat	*Lasiurus cinereus*	Trees	C	Migratory
Big brown bat	*Eptesicus fuscus*	Tree cavities, buildings	C	Not known
Townsend's big-eared bat	*Corynorhinus townsendii*	Caves, abandoned mines	U	Year-round resident
Western small-footed myotis	*Myotis ciliolabrum*	Caves, abandoned mines, rock crevices	U	Not known
Long-eared myotis	*Myotis evotis*	Tree cavities and exfoliating bark in mature conifers	U	Not known
Little brown myotis	*Myotis lucifugus*	Buildings, trees, rock crevices	C	Probably migratory
Long-legged myotis	*Myotis volans*	Trees, buildings, rock crevices	U	Probably migratory

Notes:

Source: MATL 2006b

a Based upon NHP distribution data

b Primary hibernacula and roost habitats used by the species (Bat Conservation International 2002).

c General abundance/distribution in North America: C= common, U=uncommon (Bat Conservation International 2002).

d Current knowledge of migration status (Genter and Jurist 1995).

Due to local geologic and physiographic conditions, few if any caves or abandoned mines occur in the analysis area. Rock faces/crevices are found sparingly along parts of the Marias River and along the Kevin Rim. Accordingly, Townsend's big-eared bat and western small-footed myotis are unlikely to roost in much of the analysis area. Furthermore, the analysis area is at the distributional limits for these species, and suitable roosting habitat does not exist in the area, thus the potential for occurrence of these species as residents is relatively low. In addition, the only known location of Townsend's big-eared bat north of the Missouri River in northeastern Montana is in the Little Rocky Mountains approximately 130 miles to the east (Hendricks 2000).

The cottonwood stands along the Marias River and Teton River represent potential roosting habitat for those species that roost in tree cavities and exfoliating bark. These species may occur in low densities given the limited availability of forested habitats within the analysis area. Habitat generalists, such as the big brown bat, little brown myotis, or the long-legged myotis, are likely to be the most abundant bat species in the area, given their capacity to use both natural and man-made structures for day and night roosts. No roosts or hibernacula are known to occur in the vicinity of the analysis area.

3.8.2.2 Birds

The vegetative communities provide habitat for a number of migratory and resident bird species within the analysis area. These species can generally be classified as upland game birds, grassland birds, waterfowl and shore birds, and raptors. The Marias River and Teton River cottonwood stands are the only large tracts of relatively contiguous forests in the analysis area and provide potential habitat for bird species that use forested and riparian habitats. The prairie grasslands along the river breaks and coulees provide potential habitat for a number of obligate grassland species. The WPAs, Benton Lake NWR, and various prairie potholes provide potential habitat for waterfowl and shore birds.

Upland Game Birds

Upland game bird species known to occur in the analysis area include: the ring-necked pheasant, the gray (Hungarian) partridge, and the sharp-tailed grouse. Ring-necked pheasant and gray partridge habitat consists of a mosaic of open grasslands, cropland, and brushy cover. Extensive tracts of prairie grassland do not provide good pheasant habitat (Mussehl and Howell 1971). Pheasants occur throughout the analysis area, but primarily near waterways.

Although the greater sage grouse (*Centrocercus urophasianus*) is classified as sensitive by the BLM and sharp-tailed grouse is considered uncommon by the State, they are currently considered game species by FWP and are subject to a legal harvest season. Generally, the greater sage grouse is a sagebrush obligate that relies on big sagebrush habitats in all seasons. Due to the low occurrence of big sagebrush habitat (Section 3.7.2), distribution data indicate that sage grouse do not occur within the analysis area. The closest distribution of sage grouse is near Tiber Reservoir along the Marias River, approximately 30 miles east of the study area.

Sharp-tailed grouse inhabit grasslands interspersed with woody draws and shrub coulees. The entire analysis area contains potential habitat for sharp-tailed grouse (NHP 2005). Except for areas close to the Marias River, Teton River, and Benton Lake NWR, the analysis area contains lower quality sharp-tailed grouse habitat due to habitat loss and fragmentation associated with agricultural activities. During field investigations seven sharptail leks (courtship display areas) were recorded. Three of the leks were observed visually and four leks were only identified by sound. Although FWP did not have specific locations of leks, it identified water crossings, draws, and coulees that are not cultivated as probable locations for leks, specifically Benton Lake NWR, Cut Bank Creek breaks (including where the Two Medicine River and Cut Bank Creek come together to form the Marias River), Teton River, east of Dutton along coulees and draws, Big Flat Coulee, the Dry Fork of the Marias River, and the Kevin Rim (Olson 2005a).

Grassland Birds

The intact mid- and shortgrass prairie communities along the Marias River, Teton River, and several draws and coulees within the analysis area have been subjected to light to moderate grazing intensities and represent relatively high quality wildlife habitat. Several obligate grassland species may occur in the aforementioned areas. FWP identified the following grassland birds as having the potential to occur:

- McCown's longspur (*Calcarius mccownii*);
- Mountain plover (*Charadrius montanus*);
- Sprague's pipit (*Anthus spragueii*);
- Chestnut collared longspur (*Calcarius ornatus*); and
- Baird's sparrow (*Ammodramus bairdii*).

None of these species was observed during field investigations. All five of these species are identified by the state as species of concern. Baird's sparrow was identified by the NHP as known to occur within the analysis area and is discussed further in **Section 3.10**. The quality and relative intactness of the grassland prairie habitats declines with distance away from the Marias and Teton rivers due to increasing agricultural land uses.

Waterfowl and Shore Birds

Several waterfowl species are known to occur in the analysis area, the majority of which have been observed on Benton Lake NWR (**Figure 3.6-1**). Breeding bird surveys on Benton Lake NWR have documented 20 species of ducks, including 12 species that nest on the refuge (FWS 2000). These species likely use areas adjacent to the refuge for foraging. Birds have been documented to migrate into the refuge from all directions and no specific migratory pathways or low-level flight feeding pathways have been identified (Johnson 2005). Waterfowl habitat within the analysis area includes lakes, wetlands, stock ponds, the Marias River, and the Teton River. Wetlands and stock ponds tend to be small and isolated. Since most stock ponds lack emergent and/or wetland vegetation, nesting habitat is limited. Surface waters that possess potential nesting habitat include Benton Lake, Hay Lake, Grassy Lake, WPAs, and a few of the larger, undisturbed prairie potholes. The Marias and Teton rivers also provide waterfowl habitat, although hydrologic changes and channel incision have reduced the availability of quality nesting habitat along both rivers. Riparian communities along ephemeral streams that bisect the analysis area do not provide quality waterfowl habitat. Wetlands, stock ponds, Hay Lake, Marias and Teton rivers, and Benton Lake NWR also provide stopover habitat for migrating waterfowl.

Approximately 32 species of shore birds are known to occur in the analysis area, primarily on Benton Lake NWR (**Table 3.8-3**). These species nest in native grassland prairie habitats in proximity to mesic grasslands or shallow wetlands. Habitat for these species occurs primarily in the northern and central portions of the analysis area where native prairie grasslands are interspersed with small ponds, wetlands, and riparian areas. Habitat for other shore bird species includes the wetlands and stock ponds that are dispersed throughout the analysis area. With the exception of Hay Lake, the small size and lack of emergent wetland vegetation in most of the water bodies reduce their quality as shore bird habitat. The Marias and Teton rivers and adjacent areas also represent potential shore bird habitat.

TABLE 3.8-3
WATERFOWL AND SHORE BIRDS SIGHTED ON BENTON LAKE NWR SINCE 1961

Shore birds	Swans, Geese, and Ducks
Black-bellied Plover	Tundra Swan (Whistling Swan)
American Golden Plover (Lesser Gol-Pl.)	Trumpeter Swan
Semi-palmated Plover	Greater White-fronted Goose
Piping Plover	Snow Goose
Killdeer	Ross' Goose
Black-necked Stilt	Canada Goose
American Avocet	Wood Duck
Greater Yellowlegs	Green-winged Teal
Lesser Yellowlegs	American Black Duck
Solitary Sandpiper	Mallard
Willet	Northern Pintail
Spotted Sandpiper	Blue-winged Teal
Upland Sandpiper	Cinnamon Teal
Whimbrel	Northern Shoveler
Long-billed Curlew	Gadwall

TABLE 3.8-3 (Continued) WATERFOWL AND SHORE BIRDS SIGHTED ON BENTON LAKE NWR SINCE 1961	
Shore birds	**Swans, Geese, and Ducks**
Hudsonian Godwit	Eurasian Wigeon
Marbled Godwit	American Wigeon
Ruddy Turnstone	Canvasback
Red Knot	Redhead
Sanderling	Ring-necked Duck
Semipalmated Sandpiper	Greater Scaup
Western Sandpiper	Lesser Scaup
Least Sandpiper	Oldsquaw
Baird's Sandpiper	White-winged Scoter
Pectoral Sandpiper	Common Goldeneye
Dunlin	Barrow's Goldeneye
Stilt Sandpiper	Bufflehead
Short-billed Dowitcher	Hooded Merganser
Long-billed Dowitcher	Common Merganser
Common Snipe	Red-breasted Merganser
Wilson's Phalarope	Ruddy Duck
Red-necked Phalarope	

Note:

Source: MATL 2006b

Raptors

Raptor species are known to occur in the analysis area and have been observed during breeding bird surveys and field investigations conducted for this project. The Kevin Rim Area of Critical Environmental Concern and the Marias and Teton River breaks provide potential habitat for raptors. A list of raptors observed by other researchers along Kevin Rim from 1993-1994 is in **Table 3.8-4** (Zelenak 1996).

While these species are present in the analysis area during breeding season, potential nesting sites, aside from Kevin Rim and the bluffs around the Marias and Teton rivers, are limited to small shrubs in draws and coulees, riparian cottonwood trees, and ornamental spruce trees near farms or residential areas (Olson 2005a). A historic peregrine falcon eyrie is located where Cut Bank Creek and Two Medicine River flow together to form the Marias River. The eyrie is discussed further in **Section 3.10**. Intermittent cottonwood stands along the Marias and Teton rivers are used by bald eagles during the winter, and indirect evidence of breeding has been observed in these areas (NHP 2005). Bald eagles and peregrine falcons are often seen in the spring on Benton Lake NWR (FWS 2000).

TABLE 3.8-4 RAPTORS OBSERVED AT THE KEVIN RIM, 1993-1994[a]	
Common Name	**Scientific Name**
Ferruginous hawk	*Buteo regalis*
Prairie falcon	*Falco mexicanus*
American kestrel	*Falco sparverius*
Red-tailed hawk	*Buteo jamaicensis*
Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsoni*
Great-horned owl	*Bubo virginianus*
Burrowing owl	*Athene cunicularia*
Northern harrier	*Circus cyaneus*
Short-eared owl	*Asio flammeus*

Notes:
Source: MATL 2006b
[a] Source: Zelenak 1996

Potential raptor prey sources include colonial rodents, lagomorphs (rabbits and hares), waterfowl, young grouse, and carrion. Although prey populations in the analysis area have not been assessed, prey densities are generally low (Olson 2005a). Ground squirrels comprised the majority of prey items recorded in ferruginous hawk nests in 1993 and 1994, followed by lagomorphs and birds (Zelenak 1996). A black-tailed prairie dog town is known to exist east of Interstate 15 southeast of Shelby north of the Marias River. Rabbits and hares are common, and, while these populations are subject to large annual fluctuations, field investigations indicated that current lagomorph densities are relatively low. The five WPAs provide waterfowl concentration areas, which may serve as raptor prey sources. Carrion is available on ungulate winter ranges where bald eagles and other scavengers are attracted to the area by over-winter mortalities (Olson 2005a). Dead livestock may also provide carrion for scavenging raptors.

Migratory Birds

The analysis area contains rolling hills, gentle ridges, and plateaus bisected by small drainages. There are no obvious "funnels," such as prominent ridgelines or mountain gaps that could potentially serve as a large scale or regional migratory pathway. The relatively small ridges within the analysis area may serve as local pathways for birds passing through as part of a large, broad front migration. Thousands of tundra swans, and snow and Ross' geese stop at the Benton Lake NWR for a week or more while migrating from their wintering grounds in central California to nesting areas in arctic Alaska and Canada. Twenty species of ducks, including 12 species that stay to nest on the refuge, also migrate into and through this area. Aside from Benton Lake NWR, a limited amount of stopover habitat for migrating waterfowl is available within the analysis area (Johnson 2005). Hay Lake and Aloe Lake also provide stopover habitat. Riparian habitats can also provide stopover habitat for neotropical migrants. Examples of neotropical migrant birds include species of plovers, terns, hawks, cranes, warblers, and sparrows.

3.8.2.3 Reptiles and Amphibians

Although fragmented by agricultural cropland, the upland, riparian, and aquatic communities within the analysis area may provide habitat for a variety of reptile and amphibian species. Field surveys were not conducted specifically for reptiles and amphibians; however, species distribution information suggests that 10 reptile and amphibian species are likely to occur in the analysis area (FWS 2000). **Table 3.8-5** is a list of reptiles and amphibians that are likely to occur based upon observations of habitat during field investigations, the Benton Lake NWR wildlife list, previous NHP field studies, and the NHP Animal Field Guide database. The greater short-horned lizard is classified as a sensitive species by BLM and has a State rank of S3 (vulnerable because of rarity, or found in restricted range even though it may be abundant at some locations). The NHP did not have occurrence data for this particular species of concern within the analysis area. The species listed in **Table 3.8-5** occupy a broad range of habitat types, ranging from ponds to mesic grasslands to xeric uplands, and may occur in appropriate habitats throughout the analysis area. No known critical breeding habitats or hibernacula for any reptile or amphibian species occur within the analysis area.

3.8.3 Environmental Impacts

For impacts of alternatives, the analysis focuses on assemblages of species that are of concern for reasons of public importance, sensitivity to disturbance, or regulatory issues. Potential impacts were determined mainly based upon the habitat type crossed and the known (that is, mule deer winter range) or potential (that is, sharp-tailed grouse leks) sensitive wildlife resources within that habitat type. Short-term direct impacts on wildlife resources would include loss of individuals during construction or direct disturbance of species during critical periods in their life cycles. Long-term direct impacts could include alteration and/or fragmentation of habitat and collisions. Indirect impacts could include fragmentation and disturbance caused by providing access to areas not previously accessible.

3.8.3.1 Alternative 1 – No Action

Under the No Action alternative, the proposed Project would not be implemented. Existing electrical transmission service would be maintained and operated at its current level. Selection of the No Action alternative would not result in any construction or operation of additional transmission lines within the analysis area; thus, no impacts to wildlife or their habitat would occur.

TABLE 3.8-5 REPTILE AND AMPHIBIAN SPECIES LIKELY TO OCCUR IN THE ANALYSIS AREA[a] MONTANA ALBERTA TIE LTD., LETHBRIDGE, AB – GREAT FALLS, MT		
Common Name	**Scientific Name**	**Habitat**
Reptiles		
Short-horned lizard[b]	*Phrynosoma hernandesi*	Sparse, shortgrass and sagebrush habitats with exposed soils or rock
Racer	*Coluber constrictor*	Open habitats, particularly common in shortgrass prairie
Gopher snake	*Pituophis catenifer*	Arid sagebrush and grassland habitats
Western Rattlesnake	*Crotalus viridis*	Open, arid habitats with south-facing slopes and rock outcrops
Common Garter Snake	*Thamnophis sirtalis*	Numerous, prefer moist habitats along streams and ponds
Western Terrestrial Garter Snake	*Thamnophis elegans*	Nearly all habitats
Plains Garter Snake	*Thamnophis radix*	Numerous, including shortgrass prairie near water (ponds and coulees)
Amphibians		
Tiger Salamander	*Ambystoma tigrinum*	Breeds in ponds and streams; burrows in prairie or agricultural habitats
Western Chorus Frog	*Pseudacris triseriata triseriata*	Mesic grasslands and marshes near ponds and small lakes
Painted Turtle	*Chrysemys picta*	Lakes, ponds, reservoirs, and sloughs that contain some shallow water areas and a soft bottom; also river backwaters and oxbows with little current

Notes:
Source: MATL 2006b
[a] Source: NHP 2004.
[b] BLM: Sensitive; State rank: S3 - potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas.

3.8.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Potential adverse impacts to wildlife associated with development of the transmission line can be separated into impacts associated with project construction (short term) and those related to operation and maintenance (long term). The primary potential impacts include direct mortality, habitat loss and fragmentation, disturbance and displacement of individual animals, interference with behavioral activities, and disturbance resulting from increased public access.

Short-term Impacts

Installation and development of the proposed transmission line and activities such as site clearing and grading, construction of access roads and support facilities, and off-road travel during construction could cause direct injury or mortality to wildlife. Species with higher likelihood to be impacted include species with limited mobility, species that burrow, or avian species, as nests and burrows could be destroyed during construction. Construction related disturbances would be short term (6 to 7 months) and confined to the construction site or adjacent storage areas.

Disturbance associated with the installation and development of the transmission line would result in some habitat loss and fragmentation. Construction activities such as site clearing, site grading, and development of access roads and support facilities would result in a temporary loss of approximately 72 to 80 acres of potential habitat in the analysis area, depending on the action alternative (MATL 2006b). While a portion of disturbed areas would be reclaimed upon completion of construction activities, permanent habitat loss would occur within the footprints of support structures, and access roads.

Construction activities would result in disturbance and behavioral interference. Noise, fugitive dust, and activities associated with site clearing and grading, installation of support structures, construction of access roads and support facilities, and associated equipment could disturb and displace wildlife within and adjacent to impact areas. All wildlife species within or near impact areas would be susceptible to disturbance. Disturbance would have the greatest impact during migration and breeding seasons. Some species with small home ranges or limited dispersal ability might experience a greater impact. These disturbances would be short term (6 to 7 months) and concentrated within the activity area.

The construction activities could also result in accidental exposure to contaminants or fire or increased legal and illegal killing of wildlife. Accidental spills during equipment maintenance or refueling could result in temporary exposure to hazardous contaminants. Because spill prevention plans would be in place and impacted areas would be immediately reclaimed, and exposure would be temporary and restricted to the site of spill, impacts to wildlife would be unlikely. Accidental fires associated with construction and maintenance vehicles would result in the temporary loss of habitat. The increased public access as a result of increased access roads may result in additional legal hunting and poaching.

Long-term Impacts

Collisions

Direct impacts to avian species could occur as a result of collisions with the proposed transmission line. Operation of the proposed transmission line would have the greatest potential impact on bird species, due to the collision threat posed by structures, transmission lines, guy wires, and ground wires. Most other wildlife would not be as impacted, since the presence of the transmission line, structures, and access roads generally does not present a barrier to migration, create excessive noise, or otherwise cause major behavior changes.

A variety of factors influence avian transmission line collisions: configuration and location of transmission lines; specific avian species and their tendency to collide with transmission lines; and the environment, such as weather, topography, and habitat (Avian Power Line Interaction Committee [APLIC] and FWS 2005). Line placement with respect to other structures and topography can influence the collision rate. Collisions usually occur near water or migration corridors and more often during inclement weather. Less agile birds, such as heavy-bodied birds or birds within flocks, are more likely to collide with overhead lines as they lack the ability to quickly negotiate obstacles. Some bird species, usually waterfowl, are prone to collisions with power lines, especially the grounding wires located at the top of the structures (Meyer 1978, James and Haak 1979, Beaulaurier 1981, Beaulaurier et al. 1982, Faanes 1987) though collisions with guy wires also occur. Raptor species are less likely to collide with power lines, perhaps due to their excellent eyesight and tendency to not fly at dusk or in low visibility weather conditions (Olendorff et al. 1981). Smaller migratory birds are at risk, but generally not as prone to collision because of their small size, ability to quickly maneuver away from obstacles, and because they often migrate high enough above the ground to avoid transmission lines. Permanent-resident birds that fly in tight flocks, particularly those in and near wetland areas, may be at higher risk than other species.

The action alternatives would implement environmental protection measures that would reduce the potential for avian collisions. Areas with a higher likelihood for avian collisions, such as known flyways, were avoided. In addition, MATL would apply *Suggested Practices for Avian Protection on Power Lines*: *The State of the Art in 2006* developed by the EEI, APLIC and the California Energy Commission (2006), as appropriate, during design and construction of overhead structures and the substation additions. Avian collisions would be reduced as approved line marking devices would be installed, at intervals suggested by manufacturer's recommendations, on overhead ground wires within all stream, river and wetland crossings, such as crossings of the Marias River, the Dry Fork Marias River, Teton River, east of the Benton Lake NWR boundary and within a ½ mile of the refuge boundary. Line marking devices would also be placed within a ¼ mile buffer on either side of streams, rivers, or wetlands.

These marking devices have been reported to reduce mortality by approximately 40 to 90 percent. Annual mortality surveys would be conducted by MATL in these areas to ensure that the line marking devices are functioning properly. If the markers were found to be ineffective, alternative designs and configurations would be tried until mortality rates are reduced. In addition, to ensure that adverse effects would be avoided, MATL would complete and submit to the USFWS an Avian Protection Plan (APP) that would outline the elements of the MATL project that would reduce the avian risks and avian mortality.

Electrocutions

New transmission lines could potentially impact large birds, such as raptors, through electrocution. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. Two factors influence the potential for avian electrocution: environmental factors such as topography, vegetation, available prey, and behavior; and inadequate separation between energized conductors and grounded hardware providing two points of contact (APLIC and FWS 2005). MATL transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution. MATL's line would entail "avian safe" structures, which provide adequate clearance to accommodate a large bird between energized and/or grounded parts. These structures typically have 60 inches of horizontal separation, which can accommodate the wrist-to-wrist distance of an eagle. In addition, vertical separation of at least 48 inches can accommodate the height of an eagle from its feet to the top of its head (APLIC and FWS 2005).

Increased Predation

Impacts could occur from increased raptor predation within the areas surrounding the support structures. In areas where suitable prey habitat is within view, perch sites can provide an energy efficient method for hunting. There is the concern that raptors may use the horizontal cross arms of H-frame transmission structures or single pole structures as perches while scouting for food. Concerns have been raised in some circumstances that the raptors could impact the prairie nesting bird populations due to this. The proposed segments do not go through any major prairie bird nesting area, and the segments that have been identified to be within 2 miles of an identified lek would have perch guards installed on support structures in order to deter raptor perching. The 2-mile radius has been identified by FWP biologists (Northrup 2006) and peer reviewed management guidelines (Connelly et al. 2000) as an adequate buffer area to ensure that leks would be protected from an increase in raptor predation.

<u>Impacts to Wildlife Species</u>

All action alternatives would cross through similar habitat types with predominantly agricultural lands and scattered grasslands. Impacts to specific wildlife species are discussed below. Because only minor differences occur between the action alternatives, impacts are discussed together with differences addressed within the discussion.

Big Game Species

Impacts on big game species would not be expected. Pronghorn and mule deer does with fawns could be displaced by activities during late spring and early summer, but disturbance within a given portion of the line would be temporary, and animals could easily use adjacent habitat during disturbance periods. Activities would not disturb wintering animals as the construction activities would occur during the spring and summer months. In the event that activities would occur in the winter, animals could be disturbed and potentially displaced; however, disturbance in a specific area would be temporary. The proposed and alternative transmission line alignments would cross through mule deer winter range, and there would be some permanent loss of habitat as a result of structures and access roads (**Table 3.8-6).** Under Alternative 2, approximately 0.5 to 2 miles of the transmission line bisecting mule deer winter range may vary in its location depending on the local realignment option selected. This habitat loss would not impact mule deer as this is a minor loss relative to the amount of available habitat within the region.

TABLE 3.8-6
MULE DEER WINTER RANGE IMPACTED BY ALTERNATIVES

Mule Deer Winter Range	Alternative		
	2	3	4
Linear Miles of Mule Deer Winter Range Bisected by Transmission Line	19	20	28

Sharp-tailed Grouse

Potential sharp-tailed grouse habitat along alternative alignments is patchy due to fragmentation by agricultural land. The primary suitable habitat is in the grasslands above the Marias River where two leks were observed and two leks were identified by sound. In total, three leks are within the 2-mile buffer area of the alignments. Although no leks were observed above the Teton River during field investigations, the area where the action alternatives would cross the Teton is potential sharp-tailed grouse habitat.

Impacts on sharp-tailed grouse leks could result from disturbance during the breeding season in April and early May, and to nesting hens during May and early June. However, based on MATL's commitment to curtail construction in any sharp-tailed grouse nesting habitat during the nesting season and to use raptor perch deterrents as appropriate, few impacts to breeding sharp-tailed grouse would be expected from implementation of the alternatives. Based on consultation with the FWP (Northrup 2006) and the "Guidelines for management of sage grouse populations and habitats" (Connely at al. 2000), all support structures that would cross within the 2-mile buffer area around the documented leks would be fitted with raptor perch deterrents to reduce predation. For all action alternatives, this would result in approximately 73 support structures (11 miles of transmission line) to be fitted with raptor perch deterrents.

Raptors

Raptor nest surveys conducted along the action alternative alignments found no raptor nests within ½ mile of the alignments. Nesting habitat occurs in cottonwood groves found along the Marias and Teton rivers and in ornamental trees found near residences, generally greater than 1 mile away from the alignments (Olson 2005b). Impacts to raptors would not be expected; in the event that a raptor nest was identified during construction activities, MATL would consult with the FWP and take precautions to minimize impacts on nesting raptors**.**

Migratory Birds

Disturbance to migratory birds from noise, vehicles, and human presence during construction would be localized and of short duration. Bird nests could be destroyed if birds are nesting within the disturbed areas. However, many of the birds would re-nest if the first attempt were unsuccessful. No long-term impacts associated with operating and maintaining the line are expected.

Wetlands are an essential component of waterfowl nesting habitat, and nesting can occur up to a mile from wetlands (Ringelman 1992). Alternative alignments would not come within 1 mile of any of the five WPAs or any known nesting colonies in the Project study area. Peterson WPA, located in Glacier County northwest of Hay Lake, is approximately 1.7 miles from the Alternative 2 alignment and 1.4 miles from the Alternative 3 alignment. Nesting colonies of white pelicans, great blue herons, or double-crested cormorants are not known to occur within a 1-mile buffer area of any of the alternative alignment (Olson 2005b and Johnson 2005). Waterfowl nesting tends to be concentrated within uplands adjacent to wetlands (Ringelman 1992); thus, the construction and operation of the transmission line would not be expected to impact waterfowl nesting associated with the WPAs.

The alignments cross land to the east and west of Benton Lake NWR. Alternative 2 and 4 routes are approximately 0.9 mile away from Benton Lake NWR, while Alternative 3 is 0.8 mile away. Birds approach Benton Lake NWR during spring and fall migration.

As discussed above, impacts to birds would be minimized and avoided through the implementation of environmental protection measures. MATL's line would entail "avian- safe" structures, which provide adequate clearance to avoid electrocutions. MATL would apply *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*, developed by the EEI, APLIC and the California Energy Commission (2006), as appropriate, during design and construction of overhead structures and substation additions. Areas with a higher likelihood for avian collisions, such as known flyways, were avoided. Avian collisions would be reduced as approved line marking devices would be installed, at intervals suggested by manufacturer's recommendations, on overhead ground wires within all stream, river and wetland crossings, such as crossings of the Marias River, the Dry Fork Marias River, Teton River, east of the Benton Lake NWR boundary and within a ½ mile of the refuge boundary. Line marking devices would also be placed within a ¼ mile buffer on either side of streams, rivers, or wetlands, and such marking devices have been reported to reduce mortality by approximately 40 to 90 percent. Annual mortality surveys would be conducted within these areas to ensure that the line marking devices are functioning properly. In addition, to ensure that adverse effects would be avoided, MATL would complete an Avian Protection Plan that would outline the elements of the MATL project that would reduce the avian risks and avian mortality.

3.8.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.9 Fish

3.9.1 Analysis Methods

The following section discusses the occurrence and distribution of fish species within the Project area. Threatened, endangered, candidate, and sensitive fish species found within the Project area are discussed in Section 3.10.

Analysis Area

The analysis area includes all fish bearing waterways within the MFSA application Project study area (**Figure 1.1-1**). These waterways include: the Missouri River, the Marias River, the Teton River, their associated tributaries, and several man-made stock ponds and reservoirs.

Information Sources

Information on fisheries within the Project area was obtained from a variety of sources, including: literature review, reports from the NHP and FWP, technical reports, and peer-reviewed journal articles. Species lists, valuable information, and mapping of sensitive species and important habitats were obtained through meetings and correspondence with personnel from the FWS and FWP (MATL 2006b).

3.9.2 Affected Environment

The Project area crosses one sub-basin of the Milk Watershed and seven sub-basins of the Marias Watershed. The sub-basins crossed are: Upper Missouri-Dearborn Rivers, Sun River, Teton River, Marias River, Two Medicine River, Willow Creek, and Cut Bank Creek sub-basins in the Marias Watershed and the Upper Milk River sub-basin in the Milk Watershed. The only water body identified by the FWP as a blue ribbon or red ribbon river in the Project area is the Missouri River. The river miles at which all three alternatives cross the Marias and Teton rivers are considered Habitat Class 3 and Sport Class 4 fisheries.

Several intermittent gulches, coulees, creeks, and rivers cross the Project area. The majority of the water bodies act as tributaries to three major rivers within the Project area, the Marias, Teton, and Missouri. Both the Marias and Teton rivers drain into the Missouri River.

The gulches and coulees in the Project area are typically dry during the summer and do not support fisheries. Lakes are predominately man-made stock ponds, reservoirs, or prairie potholes. Water bodies and lakes that hold water year-round are generally capable of supporting both warm-water and cold-water fish species. A list of fish species known to occur within the Project area is in **Table 3.9-1.**

TABLE 3.9-1
FISH SPECIES KNOWN TO OCCUR IN THE PROJECT AREA

Game Fish		Rough Fish/Non-Game Fish		Forage Fish	
Common Name	***Scientific Name***	***Common Name***	***Scientific Name***	***Common Name***	***Scientific Name***
Brown Trout	*Salmo trutta*	Common Carp	*Cyprinus carpio*	Emerald Shiner	*Notropis atherinoides*
Brook Trout	*Salvelinus fontinalis*	Bigmouth Buffalo	*Ictiobus cyprinellus*	Fathead Minnow	*Pimephales promelas*
Rainbow Trout	*Oncorhynchus mykiss*	Freshwater Drum	*Aplodinotus grunniens*	Flathead Chub	*Platygobio gracilis*
Burbot	*Lota lota*	River Carpsucker	*Carpiodes carpio*	Lake Chub	*Couesius plumbeus*
Channel Catfish	*Ictalurus punctatus*	Shorthead Redhorse	*Moxostoma macrolepidotum*	Longnose Dace	*Rhinichthys cataractae*
Northern Pike	*Esox lucius*	Smallmouth Buffalo	*Ictiobus bubalus*	Longnose Sucker	*Catostomus catostomus*
Shovelnose Sturgeon	*Scaphirhynchus platorynchus*			Mottled Sculpin	*Cottus bairdi*
Walleye	*Sander vitreus*			Mountain Sucker	*Catostomus platyrhynchus*
Yellow Perch	*Perca flavescens*			White Sucker	*Catostomus commersoni*
Smallmouth Bass	*Micropterus dolomieu*			Goldeye	*Hiodon alosoides*
Mountain Whitefish	*Prosopium williamsoni*			Plains Minnow	*Hybognathus placitus*
Sauger S2	*Sander canadensis*			Blue Sucker S2, S3	*Cycleptus elongatus*
Sauger X Walleye Hybrid				Spottail Shiner	*Notropis hudsonius*
Golden Trout	*Oncorhynchus mykiss aguabonita*			Western Silvery Minnow	*Hybognathus argyritis*
Paddlefish S1, S2	*Polyodon spathula*			Sturgeon Chub S2	*Macrhybopsis gelida*
				Stonecat	*Noturus flavus*
				Cisco	*Coregonus artedi*

Notes:
Source: MATL 2006b and Montana Fisheries Information System Database (2005).
S1: Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction.
S2: Imperiled because of rarity and/or other factors making it vulnerable to extinction.
S3: Vulnerable because of rarity, or found in restricted range even though it may be abundant at some of its locations.

3.9.3 Environmental Impacts

3.9.3.1 Alternative 1 - No Action

Under the No Action alternative, the proposed Project would not be implemented. There would be no construction activities or associated activities related to a new transmission line and, existing electrical transmission service would be maintained and operated at its current level. This would result in no additional impacts to fish in the Project area.

3.9.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Since all action alternatives would entail the proposed transmission line crossing fish-bearing water bodies, and impacts on the water bodies would not vary substantially between alternatives, impacts to fish and their habitat for all action alternatives are addressed within this section.

Potential impacts on the fish-bearing water bodies center around several disturbance related issues, such as: an increase in sediment transport due to increased erosion from disturbed and newly exposed areas; degradation of water quality as a result of contaminants (that is, herbicides or petroleum products); increased temperatures within water bodies as a result of removed riparian and streamside vegetation; or direct impacts or disturbance to fish and their habitats. None of the alternative alignments closely parallel streams or lakes where fish are present. Most crossings of stream habitats are short.

Impacts related to increased erosion and sediment transport would be mitigated and reduced through the implementation of best management practices and environmental protection measures. An erosion control plan would be developed and implemented during construction. Erosion control measures, such as water bars, drainage contours, straw bales, and filter cloths would reduce erosion within disturbed areas and largely prevent sediment transport to water bodies. In addition, disturbed areas would be contoured and seeded after completion of construction activities, which would reduce erosion and sediment transport. Due to the implementation of the environmental protection measures, increased sediment within water bodies as a result of the action alternatives would likely not occur, and fish and their habitat would likely not be impacted.

Implementation of a spill prevention plan and environmental protection measures would ensure that water quality is protected from petroleum products and herbicides, and impacts on fish or their habitat would not likely occur.

Impacts on fish habitat as a result of the removal of streamside vegetation and increased water temperatures would not be expected to occur because structures would not be sited within fish-bearing water bodies and there would be little or no removal of streamside vegetation as a result of construction or related activities.

The structures for Alternatives 2, 3, and 4 would not be sited within any water bodies, and construction activities would not occur within water bodies that support fish populations. Implementation of the action alternatives would not be likely to impact any fish populations or species distribution.

3.9.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.10 Threatened, Endangered, and Candidate for Listing Species

3.10.1 Analysis Methods

Analysis Areas

This section addresses the current occurrence, distribution of, and potential impacts to species that are listed as threatened and endangered species under the Endangered Species Act (ESA), species that are candidates for listing, and those that have been proposed for listing. In addition, species with limited members or distribution as indicated by the NHP and the FWP and BLM sensitive species also are discussed in this section. Only species in the Project area are discussed. Analysis areas for vegetation, wildlife, and fish are the same as described in Sections 3.7.1, 3.8.1, and 3.9.1.

Information Sources

Vegetation information sources are the same as described in Section 3.7.1. Wildlife and fish information sources are the same as described in Sections 3.8.1 and 3.9.1.

3.10.2 Affected Environment

3.10.2.1 Vegetation

Species of concern in Montana are those species that are at risk or potentially at risk due to a combination of rarity, restricted distribution, habitat loss, or other limiting factors (MATL 2006b). A variety of habitats in the Project area could support species of concern. Five plant species of concern have been reported to occur within or adjacent to the Project area (**Table 3.10-1).** Of these species, two (both non-vascular) are historic records. The three vascular species documented in Glacier and Cascade counties are found in similar habitats: wet soils or shallow water around ponds and meadows along streams.

TABLE 3.10-1
PLANT SPECIES OF CONCERN REPORTED TO OCCUR WITHIN OR ADJACENT TO THE PROJECT AREA

Common Name	Scientific Name	State Rank	County	Habitat
Vascular Plants				
Many-headed Sedge	*Carex sychnocephala*	S1[a]	Glacier; Cascade	Moist soil of meadows along streams and ponds in the valleys and on the plains.
Long Sheath Waterweed	*Elodea longivaginata*	S1	Glacier	Shallow water of ponds and lakes on the plains.
Chaffweed	*Centunculus minimus*	S2[b]	Cascade	Vernally wet, sparsely vegetated soil around ponds and along rivers and streams in the valleys and on the plains.
Non-vascular Plants				
Entosthodon moss	*Entosthodon rubiginosus*	SH[c]	Cascade	Seasonally damp and alkaline, usually silt or clay-rich soil at the edges of ponds, lakes, and sloughs, and on seepage slopes in relatively dry environments.
American funaria moss	*Funaria americana*	SH	Cascade	Little information is available; however, it is thought that this species prefers limestone caves and cliffs.

Notes:

Source: MATL 2006b

[a] S1: Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction.

[b] S2: Imperiled because of rarity and/or other factors making it vulnerable to extinction.

[c] SH: Historical, known only from records over 50 year ago; may be rediscovered.

3.10.2.2 Wildlife

Special status animal species the NHP reported as occurring within or adjacent to the Project area are in **Table 3.10-2.**

TABLE 3.10-2
SPECIAL STATUS WILDLIFE SPECIES REPORTED TO OCCUR WITHIN OR ADJACENT TO THE PROJECT AREA BY NHP

Common Name	Scientific Name	Status[a]		
		FWS	BLM	State
Burrowing Owl	*Athene cunicularia*	--	Sensitive	S2B
Ferruginous Hawk	*Buteo regalis*	--	Sensitive	S2B
Baird's Sparrow	*Ammodramus bairdii*	--	Sensitive	S2B
Black-necked Stilt	*Himantopus mexicanus*	--	--	S3 S4B
Black-crowned Night-heron	*Nycticorax nycticorax*	--	--	S3B
Peregrine Falcon	*Falco peregrinus*	--	Sensitive	S2B
Common Tern	*Sterna hirundo*	--	--	S3B
White-faced Ibis	*Plegadis chihi*	--	Sensitive	S1B
Franklin's Gull	*Larus pipixcan*	--	Sensitive	S3B
Black-tailed Prairie Dog	*Cynomys ludovicianus*	C	Sensitive	S3
Long-billed Curlew	*Numenius americanus*	--	Sensitive	S2B
Bald Eagle	*Haliaeetus leucocephalus*	--	--	S3B, S3N
Black-footed Ferret	*Mustela nigripes*	E, XN	Sensitive	S1

Notes:

Source: MATL 2006b.

[a] FWS: E = endangered; C = candidate; XN =experimental, nonessential - - = not listed

BLM: Sensitive = either known to be imperiled and suspected to occur on BLM lands, suspected to be imperiled and documented on BLM lands, or needing further study for other reasons; -- = not listed

State:

B = a state rank modifier indicating breeding status for a migratory species;

N = non-breeding.

S1 = critically imperiled because of extreme rarity, or because of some factor of its biology making it especially vulnerable to extirpation;

S2 = Imperiled because of rarity, or because of other factors demonstrably making it very vulnerable to extinction throughout its range;

S3 = vulnerable because of rarity, or found in restricted range even though it may be abundant at some of its locations;

S4 = apparently secure, though it may be quite rare in parts of its range, especially at the periphery;

Bald Eagle

The bald eagle is primarily a species of riparian and lacustrine habitats (forested areas along rivers and lakes), especially during the breeding season. Montana Fish, Wildlife and Parks delineated the project area as predominantly year-long habitat, with some winter habitat. Important year-round habitat includes wetlands, major water bodies, spring spawning streams, ungulate winter ranges, and open water areas. Wintering habitat may include upland sites. Nests are typically within 1 mile of permanent water (Anthony and Isaacs 1989). Nesting site selection is dependent upon maximum local food availability and minimum disturbance from human activity (Montana Bald Eagle Working Group 1994). Perch and roost sites are also important habitat components for bald eagles. Preferred perch sites include live trees and snags that provide good visibility and are near nest sites or foraging areas.

The cottonwood stands along the Marias and Teton rivers may be used by bald eagles during the winter; however, they are not known to nest in the Project area (Olson 2005b). The majority of birds nesting in Montana are found in the western third of the state, although breeding pairs may be found along many of the major rivers and lakes in the central portion of the state and along the Yellowstone and Missouri rivers to the eastern prairie lands (NHP 2004). East of the Continental Divide, the presence of bald eagles may be somewhat more seasonally dependent than in the western part of the state. Migrants from northern climates travel through Montana to reach wintering grounds further south.

The bald eagle has officially been removed from the Federal threatened and endangered species list (Final Rule published July 9, 2007, and effective August 8, 2007) and FWS has issued new guidelines for management of this species under the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act (May 2007).

Black-footed Ferret

Black-footed ferret habitat occurs within the project area as they are closely associated with prairie dog populations, and prairie dogs occur within the project area. Black-footed ferrets use open habitat, such as grasslands, steppe, and shrub steppe. The ferrets do not dig their own burrows and rely on abandoned prairie dog burrows for shelter. Only large prairie dog complexes (several hundred acres of closely spaced colonies) can support and sustain a breeding population of black-footed ferrets (Miller et al. 1996). A black-tailed prairie dog town is located southeast of Shelby in Toole County north of the Marias River.

All known populations of black-footed ferrets are a result of the reintroduction of captive bred ferrets. In 1998, a total of 217 kits were allocated for reintroduction and field breeding programs. Seventy-seven ferret kits were allocated to two separate release sites on a Montana experimental reintroduction area: 55 kits to the Ft. Belknap

Indian Reservation and 22 kits to the Charles M. Russell National Wildlife Refuge. The Fort Belnap Reservation is the closest release site to the project area, and it is approximately 125 miles away from the eastern boundary of the project area. Reintroduced black-footed ferret populations have been designated "non-essential experimental" populations under the Endangered Species Act. This designation allows Federal, state, and tribal resource managers and private citizens more flexibility in managing new populations. The Fish and Wildlife Service can develop special management regulations which are more flexible than the rules for species listed as endangered.

Ferruginous Hawk

A breeding population of approximately 20 pairs of ferruginous hawks was located in 1994 in the Kevin Rim and Buckley Coulee area in the northeastern and north-central portions of the Project area. NHP and FWP biologists indicate this species continues to breed along Kevin Rim (Olson 2005a). This area is a mix of privately owned land and state trust land in Toole County. Kevin Rim is a sandstone escarpment that runs approximately 8 miles, generally north-south, and faces east. The cliffs and adjacent badlands, grasslands, and draws host a very high density of raptor nests, primarily ferruginous hawks and prairie falcon. Two biologists walked along approximately 3 miles of Kevin Rim in early May 2005 surveying for raptor nests. No nests and no raptors were observed at that time (MATL 2006b).

Ferruginous hawks also occur in and around Benton Lake NWR in Cascade, Chouteau, and Teton counties. The area is a mix of Federally managed land (Benton Lake NWR), privately owned land, and state trust land. A breeding population of at least two pairs has been recorded within the refuge. The full extent of occupied breeding habitat is unknown. The habitat of ferruginous hawks in Montana has been studied extensively and described as mixed-grass prairie, shrub-grasslands, grasslands, grass-sagebrush complex, and sagebrush steppe (NHP 2004).

Peregrine Falcon

An historical peregrine eyrie is known to occur on private land near the confluence of Cut Bank Creek and Two Medicine River, where the Marias River forms in Glacier County. Eyries have a high potential for re-occupancy. It is unknown when peregrine falcons last occupied this eyrie. Peregrine falcons arrive in northern breeding areas in late April-early May, and departure begins in late August-early September. Nests typically are situated on ledges of vertical cliffs, often with a sheltering overhang. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey. Substitute man-made sites can include tall buildings, bridges, rock quarries, and raised platforms (NHP 2004).

Black-tailed Prairie Dog

A black-tailed prairie dog town is located southeast of Shelby in Toole County north of the Marias River. This particular population is at the western extent of this species' known distribution (Olson 2005a). Prairie dog colonies are found on flat, open grasslands and shrub/grasslands with low, relatively sparse vegetation. The most frequently occupied habitat in Montana is dominated by western wheatgrass, blue grama, and big sagebrush. Colonies are associated with silty clay loams, sandy clay loams, and loams. Fine to medium textured soils are preferred, presumably because burrows tend to retain their shape and strength better than in coarse, loose soils. In Montana, colonies tend to be associated with areas heavily used by cattle, such as near water tanks and long-term supplemental feeding sites (NHP 2004).

Baird's Sparrow

Baird's sparrow nests and individual birds have been reported in Teton County on private land. The most recent data available are from the early 1990s. This species is more common east of the Continental Divide in Montana. The majority of observations of the species in the state occur at the earliest in May and the latest in July (NHP 2004). Baird's sparrows prefer to nest in native prairie, but habitat structure may be more important than plant species composition. Nesting may take place in cultivated grasses (nesting has been observed in crested wheat, while smooth brome is avoided). This sparrow has also been found to use drier areas during unusually wet years and wet areas during unusually dry years. Because a relatively complex structure is so important for nesting, areas with little to no grazing activity are required (NHP 2004).

Burrowing Owl

Burrowing owl nesting sites are known to occur on Benton Lake NWR in Cascade and Chouteau counties and also in Pondera County. Fledglings have been observed on at least two nest sites on the refuge. Burrowing owls are migratory in the northern portion of their range, which includes Montana. The extreme dates of observation for burrowing owls in Montana are, at the earliest, March and, the latest, October (NHP 2005). The majority of the spring observations of this species occur in April with most fall observations in September (NHP 2004).

Burrowing owls are found in open grasslands, where abandoned burrows dug by mammals such as ground squirrels, prairie dogs, and badgers are available. Black-tailed prairie dog and Richardson's ground squirrel colonies provide the primary and secondary habitat for burrowing owls in the state. The burrows may be enlarged or modified, making them more suitable. Burrowing owls spend much time on the ground or on low perches, such as fence posts or dirt mounds (NHP 2004).

Burrowing owl nesting site surveys were conducted in July 2005 to help assess use of the Project area by the species. With the guidance of a FWP biologist (Olson 2005a) surveys were focused north of the Marias River, north of Highway 2, and along the Kevin Rim. Point-count surveys were used to survey for burrowing owls in July 2005 (Conway and Simon 2003). Point-count survey routes were selected based on habitat and anecdotal observation information by landowners and the FWP biologist. At each survey point, the observer pulled the vehicle off the road, parked on the shoulder, exited the vehicle, and performed a 6-minute point-count survey listening for burrowing owl calls and, using binoculars, scanning the surrounding landscape for owls. The biologists did not observe any burrowing owls during field investigations; however, landowners have reported seeing them within 1 mile of the proposed routes, north of the Marias River and in another area near the alignment off Bullhead Coulee road (Jacobson 2006).

Black-necked Stilt

Approximately 25 black-necked stilt nests were found in 1988 on Benton Lake NWR in Cascade, Chouteau, and Teton counties. This species continues to migrate to and nest on the refuge (Johnson 2005). Extreme migration dates in Montana are April, reported at Benton Lake NWR, and September, reported at Helena Valley Regulating Reservoir. In Montana, black-necked stilts nest in medium to large wetland complexes of open marshes and meadows, often in alkali areas.

Black-crowned Night-Heron

The first confirmed nesting of this species in Montana was in 1979, although records indicate presence of the birds as early as 1967 in the Benton Lake NWR area. The earliest records for Montana indicate arrival in April, with sightings throughout the summer months extending into September, when most of the individuals begin their southerly movement. In 2000, one individual was found in the Chester area and stayed until October. Although highly adaptable to a variety of habitats, the black-crowned night-heron is likely to use shallow bulrush (*Scirpus* spp.) or cattail (*Typha* spp.) marshes, most often within a grassland landscape. In addition, they will nest in cottonwoods, willows, or other wetland vegetation that allows them to nest over water or on islands that may afford them protection from mammalian predators. Most colonies are located in large wetland complexes, typically with a one-to-one ratio of open water and emergent vegetation (NHP 2004).

Common Tern

Approximately 75 common tern nests were found on Benton Lake NWR in 1988, and this species continues to nest on the refuge (Johnson 2005). The earliest migration date for common tern in Montana is in April, but the most concentrated arrival of birds is in

May. Breeding has been recorded in May, June, and July, with fall departure beginning in late August and continuing into September. Nesting in Montana generally occurs on sparsely vegetated islands in large bodies of water. Nest substrate at these locations includes sandy, pebbly, or stony substrate surrounded by matted or scattered vegetation (NHP 2004).

White-faced Ibis

Approximately 15 white-faced ibis nests were found in 1988 on Benton Lake NWR. The number and location of their nests on the refuge vary greatly from year to year. It is reported that they often nest with the black-crowned night heron. White-faced ibises usually leave their wintering grounds in late March to early April. The observation in Montana was at Lee Metcalf NWR in March, but the most concentrated arrival in Montana occurs in May. In Montana, most begin their southern movement in August, and by September they are usually gone from the state (NHP 2004).

The white-faced ibis breeding habitat is typically freshwater wetlands, including ponds, swamps, and marshes with pockets of emergent vegetation. They also use flooded hay meadows and agricultural fields as feeding locations. In Montana, these ibises usually use old stems in cattails, hardstem bulrush, or alkali bulrush over shallow water as their nesting habitat (DuBois 1989). Because water conditions usually determine whether nesting occurs in a particular area, their nesting sites can often move around from year to year. However, it is a fairly adaptable species, and the primary breeding requirement is colony and roosting site isolation (NHP 2004).

Franklin's Gull

In 1994, approximately 13,000 Franklin's gull nests were estimated to have occurred on Benton Lake NWR. The Franklin's gull generally returns to the state in mid-April and is gone by early to mid-October. Preferring large, relatively permanent prairie marsh complexes, they build nests over water on a supporting structure of emergent vegetation. Nesting over water differs from the nesting habits of Montana's other, generally ground nesting, gulls. Franklin's gulls prefer to nest at sites with intermediate vegetation density, interspersed with open water of various sizes. One key feature of selected nesting sites is that the water levels remain high enough throughout the nesting period, or at least until the young can fledge, in order to provide protection from predators. During migration, the Franklin's gull can be found feeding on dry land, especially in cultivated fields prior to planting (NHP 2004).

Long-Billed Curlew

The long-billed curlew is ranked as S2B by the state and is considered at risk because of very limited and/or declining numbers, range, and/or habitat. The NHP did not have any element occurrence records for this species within the Project area; however, long-billed curlews were observed within the Project area. The long-billed curlew is a migratory summer resident that breeds and nests in Montana. The species inhabits shortgrass prairie communities, with grassland structure more important than species composition, and appears to require large blocks of grasslands with diverse foraging habitats. The long-billed curlew nests in well-drained native grasslands, sagebrush, and agricultural lands with a gently rolling topography. The species migrates from coastal habitats in California, Texas, and Mexico to Montana, where it is typically present between May and August.

3.10.2.3 Fish

Four fish species identified within the Project area are listed by the NHP as threatened, endangered, or of special concern under the Montana Endangered Species Act (**Table 3.9-1**). The NHP species of concern occurrence report did not include any fish species of concern. However, a search of the Montana Fisheries Information System found that three special status fish species potentially occur in the Teton River within the Project area. These three species are sauger, blue sucker, and sturgeon chub.

The sauger is considered at risk by the State because of very limited and/or declining numbers, range, and/or habitat. The current distribution of the sauger in Montana includes the main stem of the Missouri River and portions of several tributaries, including the Teton River near where the transmission line would cross. The sauger is physiologically adapted for turbid environments, and the species typically inhabits large turbid rivers and shallow lakes. Saugers spawn in large tributaries, and juveniles rear in off-channel habitats during spring and summer before shifting to main channel habitats in autumn.

The blue sucker is considered at risk/potentially at risk by the State. Eastern Montana is the home of the blue sucker, and it appears to inhabit the larger streams, primarily the Missouri and Yellowstone rivers. They make long spawning movements from the lower Missouri River to upstream areas and tributary streams, followed by dispersal downstream. They prefer waters with low turbidity and swift current (NHP 2004). The Montana Fisheries Information System indicates that the blue sucker can be found in the Teton River within the Project area. This would be the western extent of this species' distribution within Montana.

The State considers the sturgeon chub at risk. The sturgeon chub is one of several native minnows found east of the continental divide. Sturgeon chubs are rarely seen or collected, so little is known about them. Their food habits are unknown, but the ventral mouth and short intestine indicate they feed on bottom-dwelling insects. Sturgeon chubs are found in turbid water with moderate to strong current over bottoms ranging from rocks and gravel to coarse sand (NHP 2004).

3.10.3 Environmental Impacts

3.10.3.1 Alternative 1 – No Action

Under the No Action alternative, the proposed Project would not be implemented. There would be no construction activities or associated activities related to a new transmission line, and existing electrical transmission service would be maintained and operated at its current level. This would result in no impacts to special status plant species, special status wildlife species, or special status fish or their populations within the Project area.

3.10.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Vegetation

Potential impacts to special status plant species for each alternative transmission line alignment were assessed through an evaluation of existing conditions and potential Project-related effects. These effects could include temporary disturbance, such as trampling, during construction and maintenance activities, habitat loss and fragmentation associated with structure footprints and access roads, the creation of new public access into undisturbed habitats, and possible noxious weed competition resulting from seed introduction from construction and maintenance activities. See **Section 3.7.3** for further discussion of the proposed transmission line effects on native plants. Three state sensitive wetland species occur in or adjacent to the Project area; however, no Federally listed species were located in the area. The state sensitive species are many-headed sedge, long sheath waterweed, and chaffweed (**Table 3.10-1**). Historic occurrences of the state sensitive non-vascular species entosthodon moss and American funaria moss were recorded south of the Missouri River, outside of the study area.

The effects on special status vegetation species associated with construction, operation, and maintenance of the proposed transmission line would not differ from those discussed in **Section 3.7.3**. All special status vegetation species known are located outside of the analysis area and are therefore not likely to be affected by the alternative transmission line alignments.

Of the action alternatives, Alternative 2 has the least likelihood of affecting species of concern, because it crosses less riparian habitat than Alternatives 3 and 4 (**Table 3.7-4**).

Wildlife

Informal consultation with the USFWS under section 7 of the ESA is ongoing. A biological assessment of the potential impact of the proposed Project was prepared and submitted to FWS with a request for concurrence with its conclusion that the proposed Project may affect, but is not likely to adversely affect, bald eagles or their critical habitat and would have no effect on black-footed ferrets or their critical habitat.

Potential impacts to special status wildlife species for each alternative transmission line alignment were assessed through an evaluation of existing conditions and potential project-related effects. These effects could include temporary disturbance during construction and maintenance activities, habitat loss and fragmentation associated with clearing and grading of structure sites and access roads, and the creation of new public access into undisturbed habitats. For a more detailed discussion of general impacts of the proposed transmission line on wildlife see **Section 3.8.3**. Sensitive or important wildlife habitats for species of concern within the project area include intact native prairie grasslands that provide habitat for sharp-tailed grouse, long-billed curlew, and other grassland bird species, and mature riparian cottonwood stands that represent a unique habitat type and potential bald eagle winter habitat. Alternatives 3 and 4 would cross cottonwood stands on the Marias and Teton rivers.

The alternative alignments traverse the known habitat range of five species of concern. **Table 3.10-3** lists the linear miles of special status species' habitat range along each of the three action alternatives.

TABLE 3.10-3
LINEAR MILES OF SPECIAL STATUS SPECIES' HABITAT RANGE BY ALTERNATIVE

Common Name	State Rank	Alternative		
		2	3	4
Black-crowned night-heron	S3B	11.2	9.1	2.6
Black-necked stilt	S3, S4B	11.2	9.1	2.6
Burrowing owl	S2B	4.2	3.9	0
Ferruginous hawk	S2B	6.5	0	7.0
Peregrine falcon	S2B	2.5	2.2	3.0
Total for All species (Minus the overlap)	--	19.9	11.3	11.7

Notes:

Source: NHP. 2005. GIS Analyses of Element Occurrence Data. Montana Natural Heritage Program, Helena, Montana. Available at: http://nhp.nris.state.mt.us/mbd,.

State: S2 = Imperiled because of rarity, or because of other factors demonstrably making it very vulnerable to extinction throughout its range; B = a state rank modifier indicating breeding status for a migratory species; S3 = vulnerable because of rarity, or found in restricted range even though it may be abundant at some of its locations; S4 = apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
-- = not applicable

Bald Eagles
Bald eagles within the project area would be minimally affected by the construction activities related to the transmission line as disturbance would be short term, and breeding habitat would not be impacted. Project construction activities could result in disturbance and behavioral interference of wintering bald eagles within the project area. Noise, fugitive dust, and activities associated with site clearing and grading, installation of support structures, construction of access roads and support facilities, and associated equipment could disturb and temporarily displace bald eagles within and adjacent to impact areas. Disturbance associated with the installation and development of the transmission line would result in some habitat loss and fragmentation. Project construction activities, such as site clearing, site grading, and development of access roads and support facilities, would result in a temporary loss of approximately 72 to 80 acres of potential of upland winter foraging habitat in the project area (MATL 2006a). While a portion of disturbed areas would be reclaimed upon completion of construction activities, permanent habitat loss would occur within the footprints of support structures, and access roads.

New transmission lines could potentially impact bald eagles through electrocution. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. Several factors influence the potential for avian electrocution: topography, vegetation, available prey, behavior, and inadequate separation between energized conductors and grounded hardware providing two points of contact (APLIC and FWS 2005). MATL transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution. MATL's line would entail "avian safe" structures, which provide adequate clearance to accommodate a large bird between energized and/or grounded parts. These structures typically have at least 60 inches of horizontal separation, which can accommodate the wrist-to-wrist distance of an eagle. In addition, vertical separation of at least 48 inches can accommodate the height of an eagle from its feet to the top of its head (APLIC and FWS 2005). MATL would apply *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*, developed by the EEI, APLIC, and the California Energy Commission (2006), as appropriate, during design and construction of overhead structures and substation additions.

The operation of the proposed transmission line could potentially impact bald eagles that may use the project area. As with all birds and raptors, there is the potential for transmission line related collisions. Raptor species, such as eagles, are less likely to collide with power lines, perhaps due to their excellent eyesight and tendency to not fly at dusk or in low visibility weather conditions (Olendorff et al. 1981). Impacts would be avoided as the proposed action would implement environmental protection measures that would reduce the potential for avian collisions. Areas with a higher likelihood for avian collisions, such as known flyways, were avoided.

Avian collisions would be reduced as approved line marking devices would be installed, at intervals based on manufacturer's recommendations, on overhead ground wires within ¼ mile of all stream, river, and wetland crossings, such as crossings of the Marias River, the Dry Fork Marias River, and Teton River. In addition, line markers would be placed within a ½ mile of the east boundary of Benton Lake NWR. These marking devices would also be placed on any additional important flyway or migration routes that may be identified during pre-construction or construction activities.

Annual mortality surveys by MATL would be conducted within these areas to ensure that the line marking devices are functioning properly. In addition, to ensure that adverse effects would be avoided, MATL would complete and submit to the USFWS an Avian Protection Plan (APP) that would outline the elements of the MATL project that would reduce the avian risks and avian mortality.

As outlined in the Montana Bald Eagle Management Plan (MBEWG 1994), the management goal for Montana populations of bald eagles is to facilitate population growth until the number of viable bald eagle breeding areas peaks. The transmission line design would follow the management plan guidelines and would be in compliance with the management goal as there would likely be no adverse effects to bald eagles. The transmission line design would also be in compliance with the USFWS National Bald Eagle Management Guidelines that were released in May 2007.

Black-footed Ferrets (Federally Endangered)

Since there are no known occurrences of black-footed ferrets within or adjacent to the project area, impacts to ferrets could potentially occur by way of destruction of habitat (prairie dog towns). The only known prairie dog town in the project area is located southeast of Shelby in Toole County, north of the Marias River. It would not be disturbed by the proposed action. This particular population is at the western extent of this species' known distribution (Olson 2005b).

Installation and development of the proposed transmission line could cause direct injury or mortality to undocumented prairie dog towns within the impact areas. Activities such as site clearing and grading, construction of access roads and support facilities, and off-road travel during construction could destroy any undocumented prairie dog towns. Construction related disturbances would be short term (6 to 7 months) and confined to the construction site or adjacent storage areas. Since black-footed ferrets are not known to occur within the project area, they would not be directly impacted by the proposed action. Any indirect impacts by way of disturbance to undocumented prairie dog towns would be temporary and would not affect current populations of black-footed ferrets.

Burrowing Owl (State Sensitive)
The transmission line alignments would pass through burrowing owl habitat along the east side of Benton Lake NWR. While biologists did not observe any burrowing owls during field investigations, FWP biologists (Olson 2005b) and landowners have reported seeing this species within 1 mile of the action alternative alignments, north of the Marias River and along Bullhead Coulee. The installation of support structures may disturb undetected burrows and displace burrowing owls. However, the amount of habitat loss would be relatively minor, and displaced owls would have adjacent burrow habitat to occupy in the event of disruption of burrows. Operation of the proposed transmission line could increase owl collisions. This would be expected to be rare as owls have excellent vision, and MATL would be using line-marking devices within designated areas. For more discussion of avian collisions and electrocutions from transmission lines see **Section 3.8**.

Black-necked Stilt and Black-crowned Night-heron (State Sensitive)
The transmission line alignments pass through the eastern edge of potential nesting grounds for the black-necked stilt and black-crowned night heron just outside the eastern boundary of Benton Lake NWR. This area is a potential migration corridor on the east side of Benton Lake NWR. Nesting stilts and herons may be disturbed and displaced during nesting season as a result of construction activities. This may interfere with the nest success of birds within or adjacent to the construction areas; however, construction activities would be temporary, and the opportunity for re-nesting would likely occur. Permanent habitat loss would be limited to the footprint of the support structures and access roads. This habitat loss would be a relatively minor amount with respect to the available habitat within the area.

Ferruginous Hawk (State Sensitive)
Ferruginous hawk habitat is known to occur within and adjacent to the Project area. Impacts to ferruginous hawks would not vary from impacts to other raptors. A discussion of impacts to raptors is in **Section 3.8**.

Long-billed Curlew (State Sensitive)
Long-billed curlews were observed in wheat-stubble fields and CRP land during field investigations throughout the summer 2005 (MATL 2006b) and in 2007 (DEQ 2007). Long-billed curlews would experience temporary disturbance and displacement during installation; however, construction activities would be temporary, and the opportunity for re-nesting would likely occur. There would be habitat loss as a result of support structures and access roads; however, this would be relatively minor and would not impact populations within the area. See **Section 3.8** for further discussion of the proposed transmission line impacts on birds.

Peregrine Falcon (State Sensitive)
The transmission line alignments cross the location of a historic peregrine falcon eyrie along the Marias River. In May, July, and August 2005 biologists surveyed the confluence of Cut Bank Creek and Two Medicine River looking for the eyrie and signs of peregrine falcons. Neither eyries nor peregrine falcons were observed (MATL 2006b). It is unknown when peregrine falcons last occupied or were sighted around this eyrie (Olson 2005b). The construction activities associated with the proposed transmission line could potentially disturb the eyrie, if occupied. Disturbances would be temporary and would not directly disturb any occupied nest sites. For a discussion of collision and electrocution impacts on raptors see **Section 3.8**.

Fish

A search of the Montana Fisheries Information System indicated that three special status (State Sensitive) fish species potentially occur in the Teton River within the Project area. These three species are: sauger, blue sucker, and sturgeon chub. No Federally threatened, endangered, or candidate fish species were identified in the Project area.

Effects on special status fish associated with the implementation of the proposed transmission line would not differ from those discussed in **Section 3.9.3**.

3.10.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.11 Air Quality

3.11.1 Analysis Methods

Potential impacts to air quality from installation of the power transmission line were evaluated using criteria pollutant emission rates from sources (for example, equipment engines and dust from construction activities) and air regulations (including emission standards, as applicable) pertinent to the project.

Analysis Area

The analysis area for air resources is the MFSA application Project study area (**Figure 1.1-1**) and the surrounding air shed within a distance of 10 miles. The analysis area is located in north central Montana and exhibits terrain described as rolling hills with elevations ranging from 3,400 feet (Great Falls) to 3,800 feet (Cut Bank) above mean sea level.

Information Sources

Base information for the analysis of air resources was derived from the Montana MFSA application (MATL 2006b). Base information includes data such as the alignments, area impacted by construction activities, equipment type, and duration of construction. Comparative information, such as ambient air quality, atmospheric conditions, and existing air emission sources, was derived from databases maintained by National Oceanic and Atmospheric Administration (NOAA) (2006), EPA (2006a, 2006b), WRCC (2006), and DEQ (2006a). Regulatory standards for air quality (for example, criteria pollutants) were obtained from EPA (2006b) and DEQ (2006a, 2006b).

3.11.2 Affected Environment

Air quality in the analysis area is affected by activities currently conducted within the area. Examples of such activities include fixed facilities such as petroleum refining plants (refineries), crude oil pumps and natural gas compressor stations, petroleum product terminals, coal-fired electrical generating plants, concrete mix plants, asphalt mix plants, and crematoriums. Portable source examples include facilities such as gravel crushers, associated processing equipment, asphalt plants, and farming. Smoke from grass and forest fires from late spring through early fall can degrade air quality depending on the year.

Climate

Climate is influenced by major topographic features, including the plains of northern Montana and, 40 to 60 miles to the west, the Rocky Mountains. The continental divide and Rocky Mountains traverse the western half of Montana in roughly a north-south direction. The continental divide exerts a marked influence on local climate. Climate characteristics east of the continental divide are decidedly continental. In general, the analysis area (east of the continental divide) is colder, is characterized by lower precipitation, and is windier than conditions west of the divide.

Plains in the analysis area range in elevation from about 3,400 to 3,800 feet above mean sea level. Summers typically receive 1 to 2 inches of precipitation per month, and temperatures range from warm to hot. Winters, while usually cold, have few extended cold spells. Between cold waves, there are periods of mild but often windier weather called "chinook" weather. Wind speed and direction data for the subject area from NOAA show varying speeds and direction. Based on data collected at Great Falls, the typical wind speed averages 10.5 miles per hour and blows primarily from the southwest. Chinook winds frequently reach speeds of 25 to 50 miles per hour or more and can persist, with little interruption, for several days.

Temperature and Precipitation

Based on long-term data collected in Great Falls, Montana, the average daily temperature of the study area ranges from 30°F in January to 83°F in July. Average monthly precipitation ranges from 0.6 inch in February to 2.5 inches in May. The largest amount of precipitation occurs during the spring in May and June. Summer precipitation is often associated with thunderstorms. Total annual precipitation from 1961 to 1990 averaged 15.2 inches per year.

Fall and winter are cool to cold with few extended cold spells. Most precipitation during this period is in the form of snow; annual snowfall ranges from 14 to 60 inches with heavier accumulations generally recorded closer to Great Falls.

Air Quality

DEQ and the Federal government have established ambient air quality standards for criteria air pollutants, including carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), particulate matter smaller than 10 microns (PM_{10}), ozone, and nitrogen oxides (NO_x). In 1997, the EPA revised the Federal primary and secondary particulate matter standards by establishing annual and 24-hour standards for particles 2.5 micrometers in diameter or smaller ($PM_{2.5}$).

Table 3-11.1 lists Federal and state air quality standards. National primary standards are levels of air quality necessary, with an adequate margin of safety, to protect public health. National secondary standards are levels of air quality necessary to protect public welfare from known or anticipated adverse effects of a regulated air pollutant.

The attainment status for pollutants within the project area is determined by monitoring levels of criteria pollutants for which National and Montana Ambient Air Quality Standards exist. Air quality in the analysis area is designated as attainment for all criteria pollutants. The attainment designation means that no violations of Montana or national air quality standards have been documented in the area. Great Falls was reclassified in 2002 by the EPA from non-attainment for carbon monoxide to attainment.

TABLE 3.11-1
STATE OF MONTANA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Air Quality Standard Concentration [a]	
		Montana	National
Ozone	1 hour	196 μg/m³ (0.10 ppm)	235 μg/m³ (0.12 ppm)
	8 hour	--	157 μg/m³ (0.08 ppm)
Carbon Monoxide	1 hour	26,450 μg/m³ (23 ppm)	40,000 μg/m³ (35 ppm)
	8 hour	10,000 μg/m³ (9.0 ppm)	10,000 μg/m³ (9.0 ppm)
Nitrogen Oxides	Annual Mean	94 μg/m³ (0.05 ppm)	100 μg/m³ (0.053 ppm)
Sulfur Dioxide	Annual Mean	52 μg/m³ (0.02 ppm)	80 μg/m³ (0.03 ppm)
	24 hour	262 μg/m³ (0.10 ppm)	365 μg/m³ (0.14 ppm)
	3 hour	--	1,300 μg/m³ (0.50 ppm)[b]
	1 hour	1,300 μg/m³ (0.50 ppm)	--
Particulate Matter as PM_{10}	Annual	50 μg/m³	--
	24 hour	150 μg/m³	150 μg/m³
Particulate Matter as $PM_{2.5}$	Annual	--	15 μg/m³
	24 hour	--	35 μg/m³
Lead (Pb)	Calendar quarter/90-day average[c]	1.5 μg/m³	1.5 μg/m³

Note: μg/m³ = micrograms per cubic meter; ppm = parts per million; PM_{10} = Particulate Matter smaller than 10 microns; $PM_{2.5}$ = Particulate Matter smaller than 2.5 microns.
Sources: Administrative Rules of Montana (ARM) 17.8 and 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards
a Primary Standard unless otherwise noted
b Secondary Standard
c Calendar quarter for National; 90-day average for Montana

Air Quality Monitoring Data

Ambient air quality data have been collected in or near the analysis area at monitoring stations in Great Falls and Browning, Montana. Data from monitoring stations in Browning (approximately 35 miles west of the power line alignment) were included to provide a second source (that is, city location) of information. Data collected at the Great Falls sites include criteria pollutants PM_{10}, $PM_{2.5}$, SO_2, and CO. Data collected at the Browning sites include the criteria pollutant PM_{10}. Air quality data for criteria pollutants are in **Appendix K** of the March 2007 document**.**

PSD Classification
The analysis area and vicinity are designated Class II, as defined by the Federal Prevention of Significant Deterioration (PSD) provision of the Clean Air Act. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. Industrial emission sources proposing construction or modifications will demonstrate that the proposed emissions would not cause major deterioration of air quality in all areas. The standards for significant deterioration are more stringent for Class I areas than for Class II.

Federal/State Mandatory Class I areas located within 100 miles of the project area include Scapegoat Wilderness (50 miles west), Bob Marshall Wilderness (50 miles west), Glacier National Park (40 miles west), and Gates of the Mountains Wilderness (50 miles southwest).

Existing Sources
There are multiple air emission sources in the vicinity of the project area. Some of the permitted fixed facilities include petroleum refining plants (refineries), crude oil pumps and natural gas compressor stations, petroleum product terminals, concrete mix plants, asphalt mix plants, crematoriums, and other facilities. Permitted portable facilities include gravel crushers and associated processing equipment and asphalt plants. These facilities operate under specific permit limits for criteria pollutants such as PM_{10}, $PM_{2.5}$, SO_2, CO, and Pb. Other potential emission sources (for example, fugitive dust and smoke sources) include farming, field and forest burning, and dust from gravel roads.

Particulate Emissions
Potential sources of particulate (for example, PM_{10}, $PM_{2.5}$) emissions for the action alternatives are equipment used during the construction of the power line and equipment used to conduct maintenance and make repairs to the transmission line during the life of the project. Possible emissions during construction include fugitive dust from vehicles and equipment traveling on dirt roads and engine exhaust.

Gaseous and Photochemical Emissions
Potential sources of gaseous (for example, NO_2, SO_2, and CO) emissions for the proposed Project, including greenhouse gases, are equipment used during the construction of the power line and equipment used to conduct maintenance and make repairs to the transmission line during the life of the project. Possible emissions could be associated with engine exhaust from equipment traveling to the site and along access roads. These gaseous emissions from vehicles and equipment would include carbon dioxide (CO_2), a greenhouse gas (IPCC 2007). CO_2 would be released both directly from fuel combustion and indirectly as carbon monoxide (CO) that is converted to CO_2 after its release to the atmosphere.

Normal transmission line operations would produce a small amount of ozone from a photo-chemical reaction generated by corona activity. During damp or rainy weather, the ozone produced would be less than 1 part per billion which would be insignificant when compared to natural levels and their fluctuations (DOE 2001).

Air Quality Permitting
Industrial air quality permitting is part of the Montana State Implementation Plan process. DEQ uses air quality permit conditions to help ensure compliance with applicable Montana and National Ambient Air Quality Standards and PSD increments. Work conducted under the proposed Project would be subject to Administrative Rules of Montana (ARM) Title 17, Chapter 8 (Air Quality). Due to the nature of the project (that is, mobile equipment and short duration of construction), no specific permit requirements apply to gaseous emissions. However, construction would be required to comply with fugitive dust provisions under subchapter 3 of the rules, which require precautions to control airborne particulate emissions.

3.11.3 Environmental Impacts

Under all alternatives, no air quality permit or prevention of significant deterioration analysis would be needed.

3.11.3.1 Alternative 1 - No Action

Emissions

Under the No Action alternative, the power line would not be constructed, and emissions and air quality in the area would remain at current levels.

3.11.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Alternatives 2, 3, and 4 would result in an increase in activities that could adversely affect air quality during construction (short term) and during operation and maintenance of the transmission line (long term). For example, construction equipment (earthmoving equipment, cranes, or other equipment) and support vehicles (crew transportation, fueling, or other vehicles) would be used during the construction phase, and lighter equipment (for example, four-wheel-drive pickups) would be used during the operation and maintenance period. The construction phase is anticipated to last approximately 8 months. Operations and maintenance activities would last the life of the project, but impacts would be intermittent (for example, monthly and quarterly) and relatively minor compared to impacts during construction.

Emissions

Emissions from construction equipment and support vehicles would be transient and short term. The duration of the adverse impact would be a function of whether the source activity is associated with construction, or with operations and maintenance activities. The majority of the adverse impact would occur during the project construction phase when there is a relatively larger amount of equipment movement and vehicular traffic. Air quality impacts would include fugitive dust, gaseous emissions from engine operation, and small amounts of ozone produced photochemically by corona activity. Fugitive dust would be controlled through dust control measures such as water sprays, limiting the speed of construction equipment, and reseeding the disturbed areas at the end of the construction period. Gaseous emissions would be limited through construction management and scheduling. The levels of ozone produced through normal line operations would be insignificant.

Differences in the rate of emissions between alternatives would be a function of the amount of time project vehicles and equipment are used in the transmission line right-of-way. The amount of time equipment is used depends on several factors including, but not limited to, length of the transmission line for each alternative, overall topography and the presence of difficult or steep terrain, and the number of stream crossings. An alternative characterized by a longer alignment or difficult terrain would result in overall greater emissions. The differences in emissions would be minor and not substantially different between alternatives. Gaseous emissions from vehicles and equipment would represent a very small contribution to the ongoing accumulation of greenhouse gases in the atmosphere.

3.11.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.12 Audible Noise

Noise is defined as unwanted sound. It may be continuous (constant noise and decibel level), steady (constant noise with a fluctuating decibel level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (occurring at the same rate), or transient (occurring at different rate). Noise levels are quantified using units of decibels. The A-weighted scale, reported in A-weighted decibels (dBA), most effectively approximates the human ear's response to sounds.

Audible noise from transmission lines is primarily due to point source corona (crackling and hissing with small amounts of light). It routinely occurs when air is ionized around a gap, burr, irregularity, or some non-insulated component during the conductance of electricity through power lines. Periods of rain, fog, or heavy humidity amplify these corona effects due to the bridging capabilities of electricity and water. Additionally, corona is produced when transmission lines break down over time and their fastener components loosen resulting in an air gap. All corona-based noise sources would be point source locations due to the inconsistencies found along the line.

In addition to audible noise due directly to the transmission line and to other environmental factors, noise can be generated as a result of wind blowing across power lines and power poles when airflow is non-laminar or turbulent (Section 3.12.3).

3.12.1 Analysis Methods

Analysis Area

The analysis area for noise is the proposed and alternative transmission line alignments. Noise estimates were made at the edge of the EMF safety zone (52.5 feet from the centerline) and 100 feet to either side of the centerline.

Information Sources

The U.S. Department of Housing and Urban Development (HUD) noise level criteria that developments and industrial construction must adapt to are a 65 dBA average day/night noise level (L_{dn}) for exterior environments and 45 dBA L_{dn} for interior home environments (HUD 2001).

The DOE and BPA conducted research to determine the likelihood of receiving complaints related to transmission line audible noise. These noise values can be related to the level during rain that would be exceeded 50 percent of the time over 1 year (L_{50}) (BPA 1982). The foul weather L_{50} values are calculated at 100 feet from the centerline (BPA 1982).

The following probabilities of receiving complaints are based on their expected audible noise level:

- High, Numerous Complaints: over 60 dBA
- Moderate, Some Complaints: 52 to 60 dBA
- Low, No Complaints: less than 52 dBA

MATL used the BPA Corona and Field Effects Program (Version 3.0) to determine the decibel levels from the centerline for the H-frame and monopole structures (MATL 2006b).

3.12.2 Affected Environment

With the exception of the immediate Cut Bank area, the proposed Project alternatives are in a rural, predominantly agricultural area. Sources of background noise to rural residents and occasional visitors to the area include wind, agricultural activity, recreation (primarily hunting), and vehicles traveling the numerous county and state roadways and Interstate 15 in proximity to these alternatives. See **Table 3.12-1** for common noise sources and their noise levels.

TABLE 3.12-1
NOISE LEVELS OF COMMON SOURCES

Sound Source	Sound Pressure Level (dBA)
Air raid siren at 50 feet	120
Maximum levels in audience at rock concerts	110
On platform by passing subway train	100
On sidewalk by passing heavy truck or bus	90
On sidewalk by typical highway	80
On sidewalk by passing automobiles with mufflers	70
Typical urban area background/busy office	60
Typical suburban area background	50
Quiet suburban area at night	40
Typical rural area at night	30
Isolated broadcast studio	20
Audiometric (hearing testing) booth	10
Threshold of hearing (with undamaged hearing)	0

Source: Cowan 1994
dBA = A-weighted decibels.

Generic noise level data from the EPA and the National Transit Institute were used to estimate a typical sound level range for rural residences and agricultural cropland. Typical baseline noise levels in the Project study area likely range from approximately 30 dBA to 48 dBA (EPA 1978).

ARM 17.20.1607(2)(a)(i) states "for electric transmission facilities, the average annual noise levels, as expressed by dBA-L_{dn} would not exceed 50 decibels at the edge of the right-of-way in residential and subdivided areas." The affected landowner may waive this condition. The BPA design criterion for corona-generated audible noise (L_{50}, foul weather) is 50 +/-2 dBA at the edge of the right-of-way (BPA 1982).

Commercial and industrial activities (linear/point facilities) within the analysis area include communication sites (cell towers, microwave facilities), oil and gas development, surface mines (gravel pits), airstrips (public and private), railroads, pipelines and transmission lines, roadways, and military installations (MATL 2006b). Most residential areas (sensitive receptors) throughout the analysis area are approximately ¼ mile or more from the proposed transmission line centerline and alternative alignments. The closest residence is roughly 270 feet from the centerline. Alternative 4 passes through a subdivided, though undeveloped area.

3.12.3 Environmental Impacts

3.12.3.1 Alternative 1 – No Action

There would be no noise impacts related to selection of the No Action alternative.

3.12.3.2 Alternatives 2, 3 and 4 – Action Alternatives

Noise resulting from these alternatives would come from construction, corona effects, and wind.

Construction Impacts

Transmission line construction would require the short-term use of the following kinds of construction equipment: cranes, augers, compressors, air tampers, generators, haul trucks, bulldozers, excavators, concrete equipment, and other equipment. Construction activities would create both intermittent and continuous noises throughout the project at multiple pole locations along the chosen alignment. Intermittent noises would be created by passing trucks, loading and unloading operations, drilling, and other activities. Continuous noises would be created by generators, air tampers, compressors, and drilling operations.

The typical range of noise for earthmoving equipment at 50 feet is from 72 to 96 dBA. Typical ranges of noise for material handling equipment is from 75 to 88 dBA. Noise values 100 feet from the source are 66 to 90 dBA; noise values ¼ mile away are 44 to 68 dBA. Different makes and models of equipment, motor idling speeds, engine maintenance characteristics, and overall muffler performance would result in different dBA values.

The typical ruling span for transmission line support structures would be approximately 800 feet, and the structures would be constructed within the alignment (MATL 2006b). Approximately 10 to 12 transmission line structures would be erected per day. Therefore, any individual location near the transmission line alignment would be affected for approximately one half day during the construction process (VandenBos 2006).

During the construction process, heavy equipment grading, transport, and compacting activities may cause vibrations noticeable to residents within 100 feet. Under Alternative 2, near milepost 73, one residence is located within 20 feet of the 500-foot alignment edge or about 270 feet from the centerline. The Belgian Hill local routing option was developed for this section of Alternative 2 (Section 3.16) and would reduce potential impacts to this residence by moving the alignment about ¼ mile to the west and away from this residence. The peak vibration level would occur during construction activities. Other activities, such as large trucks and equipment motoring over potholes and rocks, would cause slight noticeable vibrations up to 100 feet.

Operational Impacts

Corona

Table 3.12-2 identifies the audible noise values calculated in MATL's permit application when simulating the 230-kV transmission line for both H-frame structures and monopole structures. Standard transmission line building constituents were used, including a rain rate (applicable to audible noise) of 0.14 inch per hour (MATL 2006b). BPA indicated that the rain data typically used in the program are from an average of rainfall throughout the northwest region (Sterns 2006).

Table 3.12-2 shows that for H-frame structures, audible noise levels of 46.23 dBA and 49.56 dBA would be expected at distances of 100 feet and 52.5 feet (edge of safety zone) from the centerline, respectively. These values would be below the recommended guidelines of 65 dBA exterior noise housing regulations developed by HUD. **Table 3.12-2** indicates that for monopole structures, audible noise levels of 47.13 dBA and 50.0 dBA would be expected at distances of 100 feet from the centerline, and at the edge of safety zone, respectively. These values would be below the recommended guidelines of 65 dBA exterior noise housing regulations developed by HUD. At the nearest residence, roughly 270 feet, noise levels would be below state standards for residential and subdivided areas.

Sound pressure level analysis conducted at the edge of the right-of-way based upon the known audible noise level at the edge of the safety zones for each type of pole calculated the following dBA noise levels:

- H-frame Double Pole: 56.89 dBA; and,
- Monopole: 55.03 dBA.

These values were based upon a total right-of-way width of 45 feet (22.5 feet from the centerline to the edge of the right-of-way). These values for both structures are above the right-of-way design criteria of 50 dBA at the edge of the right-of-way in residential and subdivided areas, as specified in ARM 17.20.1607(2)(a)(i), using the existing rainfall event criteria (0.14 inches of rain per hour) to establish the safety zone noise levels used in this calculation (MATL 2006b). The 50 dBA requirement may be waived by the landowner or a wide right-of-way could be obtained.

TABLE 3.12-2
AUDIBLE NOISE EFFECT

Pole Type	Distance from Centerline (feet)	Audible Noise (dBA) (L_{50})
H-frame Double Pole	100	46.23
	52.5	49.56
Monopole	100	47.13
	54	50.00
	30.18	52.48

Notes:

Estimates calculated using Corona and Field Effects Program (Kingery 1991), and based on conductor ground clearance of 21.2 feet (NESC specification). dBA (L_{50}) = decibels (A-weighted) during foul weather, indicated by L_{50}.

No data are available for noise generated by wind.

Wind

Noise can be generated as a result of wind blowing across power lines and power poles when airflow is non-laminar. Only limited research has been conducted to address wind-caused noise due to transmission line placement in urban and rural settings. For example, a wind velocity of approximately 46 miles per hour across a single conventional-style conductor cable resulted in a single-point octave band center frequency of 55 dBA at 100 hertz (Furukawa Review 2002).

Corona effects due to both single pole and H-frame structures are minor based on the actual distance to residential structures near the power lines and the rain data used for the calculations of the safety zone audible noise.

Noise generated based from wind effects of power lines would be minor based on gust-wind (46 mile per hour) noise generated across the transmission lines.

The single difference between the alternatives is based upon the distance from the edge of the right-of-way to the edge of property lines of sensitive receptors. The further away the power line is from the sensitive receptors the quieter the corona-generated, wind based, and construction noises would be.

3.12.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.13 Socioeconomics

3.13.1 Analysis Method

Analysis Area

The socioeconomic analysis area defined for the Project includes portions of Cascade, Chouteau, Glacier, Pondera, Teton, and Toole counties. This section provides the demographic, social, and economic profiles of each of these counties. These profiles would serve as a basis from which to estimate potential impacts to the socioeconomic condition of the region should the Project be implemented. This section also includes the baseline conditions for evaluating effects of the Project on minority and low income populations in accordance with Executive Order 12898: *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* (February 11, 1994).

Information Sources

The demographic profiles for each county are based on U.S. Census data collected in 2000. Population and growth estimates developed in 2005 by the U.S. Census Bureau are also referenced, although these data are not uniformly available across all counties and towns within the analysis area. As a result, these estimates are generally not used for quantitative analysis, but may be used in certain instances to provide a temporal characterization of a specific locality when appropriate. Additional demographic and economic statistics were compiled from various sources including, but not limited to, the Montana Department of Labor and Industry, Montana Department of Commerce, and the USDA.

Estimates of construction labor force and capital construction costs are based on available information from MATL and figures developed during construction of similar projects.

Information related to public services, including level of service and capacity, was obtained from documents provided by MATL to DEQ in the spring of 2006.

DEQ commissioned an independent report, the *Farming Cost Review* (HydroSolutions Inc. and Fehringer Agricultural Consulting, Inc. July 12, 2007), containing a detailed and critical review of three studies that estimate transmission line structure costs to a 'representative farmer' in the area of Conrad, Montana (**Appendix N**). The Farming Cost Review report estimated the annual costs to farmers of transmission structures in their crop fields.

<u>**Methods of Analysis**</u>

Direct, indirect, and cumulative impacts to socioeconomic resources were assessed based on reviews of similar projects in the state and other relevant energy industry policy documents and through interviews with individuals whose fields of expertise and experience provide insight relevant to this project. Such sources are referenced as appropriate. Conclusions regarding the impacts to local services that may occur during construction, operation, and maintenance of the project were developed by evaluating the number of employees and the duration of these activities relative to the availability of services and amenities that may be required.

3.13.2 Affected Environment

The discussion below presents information on demographics, economic activity, and local resources for each county in the analysis area.

3.13.2.1 Demographics

The Project analysis area is characterized by large expanses of open, sparsely populated agricultural land. Over 88 percent of agricultural land within the analysis area is cropland, while the remaining land is used for grazing or is under the Federal CRP (MATL 2006b). Like much of the upper Great Plains, market forces triggered in part by advances in farming technology, consolidation of large agricultural tracts into corporate production, and large tracts removed from production under the CRP have contributed to a decline in the populations of Pondera and Toole counties and general stagnation of growth in Teton County since the 1960s. The Montana Department of Labor and Industry (2005) reports that oil and gas account for about 11 percent of Toole County's total wages and even less in the other counties in the analysis area. These factors have recently combined to reduce demand for labor and demand for goods and services related to agricultural and energy production.

Most counties in the analysis area have seen declines in population or have seen their population hold steady. The population of Chouteau County has declined to less than half the number of people today than were there in the early 1900s. However, the 2005 estimated population of Chouteau County is about the same as the reported population in 1990 (U.S. Census Bureau 2005a). Meanwhile, growing tribal population on the Blackfeet Reservation, which makes up the largest population sector in Glacier County, has resulted in a growth rate in that county that has mirrored the state's growth pattern. The state's population grew by almost 13 percent between 1990 and 2000, while the population of Glacier County grew by 9.3 percent during that same period. Growth levels for both the state and Glacier County have tapered since then, to 3.7 percent and 2.3 percent, respectively from 2000 to 2005. Cascade County's population grew steadily, about 0.6 percent annually, throughout most of the 1900s, but tapered off toward the end of the century and is estimated to have decreased since the 2000 Federal census (U.S. Census Bureau 2000a).

Demographic data for each of the counties within the Project analysis area are shown below and summarized in **Tables 3.13-1** and **3.13-2**.

Cascade County

Cascade County encompasses the southern portion of the Project analysis area and is Montana's third most populous with 79,298 residents (U.S. Census Bureau 2000a). Cascade County covers approximately 2,698 square miles, resulting in an average population density of approximately 30 individuals per square mile. County population levels declined by approximately 2.7 percent between 1970 and 2005 based on estimates provided by the Montana Department of Commerce (2005).

The City of Great Falls is the largest population center (56,622 people based on the 2000 Federal census) in the county and is also the county seat. Other towns in the county include Belt, Black Eagle, Cascade, Fort Shaw, Monarch, Neihart, Simms, Stockett, Sun River, Ulm, and Vaughn. These towns range in size from approximately 70 people to almost 1,000 in Black Eagle, according to U.S. Census Bureau Data (2000a). Additional people also live at Malmstrom Air Force Base is in Cascade County east of Great Falls (Great Falls Development Authority 2005).

Average family size in the county is 2.97 individuals, and the average household size is 2.41 individuals. Most people are homeowners (64.9 percent), while the remainder rent housing. Less than 8 percent of housing units are unoccupied.

Chouteau County

Chouteau County encompasses 3,973 square miles. Based on the most recent population estimates of 5,463 individuals (Montana Department of Commerce 2005), the population density is approximately 1.4 persons per square mile. The 2005 population estimates, derived from tax records and birth and death statistics, suggest that the county has potentially lost up to 8.5 percent of its population between 2000 and 2005. This sharp decline balances with a similar increase in population between 1990 and 2000, but overall there has been a relatively steady decline since 1960. Communities in the county include the county seat of Fort Benton, Big Sandy, Box Elder, Carter, Geraldine, Iliad, Loma, and Shonkin. According to the 2000 Federal census, the average family in the county has 3.1 individuals and the average household size is 2.6 individuals. Approximately 69 percent of the county's residents are home owners while the remainder rent. The housing vacancy rate is fairly high at 19.8 percent.

TABLE 3.13-1
DEMOGRAPHIC PROFILES OF COUNTIES WITHIN THE PROJECT ANALYSIS AREA

	Cascade County		Teton County		Chouteau County		Pondera County		Toole County		Glacier County		Percent in Montana
	No.	Percent in County	No.	Percent in County	No.	Percent in County	No.	Percent in County	No.	Percent in County	No.	Percent in County	
Total Population	80,357 79,298 (2001)	--	6,445	--	5,970 5,575 (2004)	--	6,424	--	5,267	--	13,247 13,508 (2004)		
Gender													
Male	39,756	49.5	3,174	49.2	2,997	50.2	3,169	49.3	2,716	51.6	6,553	49.5	49.8
Female	40,601	50.5	3,271	50.8	2,973	49.8	3,255	50.7	2,551	48.4	6,694	50.5	50.2
Age													
15 or Younger	17,163	21.4	1,392	21.6	1,384	23.2	1,503	23.4	1,066	20.2	3,757	28.4	20.6
16 – 24	11,100	13.8	758	11.8	724	12.1	810	12.6	638	12.1	2,067	15.6	14.4
25 – 44	22,558	28.1	1,587	24.6	1,437	24.1	1,594	24.8	1,484	28.2	3,560	26.9	27.2
45 – 64	18,288	22.8	1,635	25.4	1,382	23.1	1,473	22.9	1,242	23.6	2,642	19.9	24.4
65+	11,248	14.0	1,073	16.6	1,043	17.5	1,044	16.3	837	15.9	1,221	9.2	13.4
Average Age	37.2	--	39.3	--	38.7	--	38.0	--	38.8	--	32.5		37.4

Notes:

Source: U.S. Census Bureau, 2005a
-- = Not applicable

TABLE 3.13-2
RACE AND ETHNICITY WITHIN COUNTIES IN THE PROJECT ANALYSIS AREA

Race or Ethnicity	Cascade County		Teton County		Chouteau County		Pondera County		Toole County		Glacier County		Percent in Montana
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
White	72,897	90.7	6,207	96.3	5,015	84.0	5,374	83.7	4,945	93.9	4,693	35.4	90.6
Black or African American	900	1.1	12	0.2	5	0.1	6	0.1	8	0.2	11	0.1	0.3
American Indian and Alaskan Native	3,394	4.2	98	1.5	873	14.6	929	14.5	168	3.2	8,186	61.8	6.2
Asian	652	0.8	6	0.1	14	0.2	9	0.1	16	0.3	9	0.1	0.5
Native Hawaiian and other Pacific Islander	67	0.1	0	0	6	0.1	3	0.1	1	0.1	7	0.1	0.1
Some other race	547	0.7	27	0.4	14	0.2	8	0.1	17	0.3	24	0.2	0.6
Two or more races	1,900	2.4	95	1.5	43	0.7	95	1.5	112	2.1	317	2.4	1.7
Hispanic or Latino	1,949	2.4	73	1.1	40	0.7	54	0.8	61	1.2	159	1.2	2.0

Note:

Percentages may not equal 100 because of rounding and potential duplicate counting for “some other race” and “two or more races.”

Glacier County

After Cascade County, Glacier County is the most populous county within the Project analysis area with an estimated 2005 population of 13,552. Land area is 2,995 square miles, resulting in an average density of 4.5 people per square mile. Unlike the other counties within the analysis area that have experienced a population reduction, Glacier County grew approximately 2.3 percent between 2000 and 2005 (Montana Department of Commerce 2005).

Principal communities include Babb, Browning, Cut Bank, Del Bonita, and Saint Mary. Cut Bank is the county seat and reported an estimated population of 3,155 in 2004 (U.S. Census Bureau 2005a). The Blackfeet Reservation accounts for the majority of the county's area and the majority of the county's population. U.S. Census data indicate that in 2000, the total on-reservation and off-reservation trust land Blackfeet population was estimated to be about 10,100 and the on-reservation population alone was 8,507 (64.2 percent of the census year 2000 population). If all of these individuals resided in Glacier County, they would account for 76 percent of all people in the county. The Blackfeet tribe also represents a growing population in the county, which is likely the driving force behind the county's growth (about 0.6 percent annually since 1970) (U.S. Census Bureau 2000b).

The average family size is 3.6 individuals and the average household size is 3 individuals. About 62 percent of the residents are homeowners; the remainder rent. About 18 percent of the county's housing inventory is vacant.

Pondera County

Pondera County encompasses approximately 1,625 square miles and had an estimated population of 6,087 people in 2005 (Montana Department of Commerce 2005), resulting in an average population density of about 3.7 people per square mile. The 2005 population estimate indicates that the population of the county has declined by 5.2 percent since 2000. Historic population records indicate an annual decline of 0.2 percent since 1960.

Principal communities in the county include Conrad, Heart Butte, and Valier. Conrad is the county seat.

The average family size in the county is 3.2 individuals and the average household has approximately 2.6 individuals. Most of the county's residents own their principal residence (70.5 percent), while the remainder are renters.

Teton County

Teton County encompasses an area of 2,272.6 square miles. The total population as of 2000 was 6,445 persons, yielding a population density of approximately 2.8 persons per square mile. County population levels have been generally stagnant since about 1980, and recent population estimates for 2005 (Montana Department of Commerce 2005) indicate a 3.2 percent decline since 2000. Choteau is the county seat and is home to approximately 28 percent of the county's residents. The remainder of the population is distributed throughout unincorporated county lands and small towns and communities, the largest of which is Fairfield with a 2004 estimated population of 641 (U.S. Census Bureau 2005a).

Average family size in Teton County is 3.1 individuals and the average household size is 2.5 individuals. Most people in the county own their home (75.4 percent) while the remainder rent. Approximately 12.8 percent of housing units are unoccupied.

Toole County

The total estimated population of Toole County in 2005 was 5,031 (Montana Department of Commerce 2005 and Montana Department of Labor and Industry 2005). Land area of the county is 1,911 square miles, yielding an average population density of 2.6 individuals per square mile. Communities include the county seat of Shelby, which is also the most populous town in the county with approximately 3,304 residents in 2004 (U.S. Census Bureau 2005a), and Kevin, Sunburst, and Sweetgrass.

The average family has 3.1 individuals, and the average household size is 2.5 individuals. Approximately 71.2 percent are homeowners. About 14.7 percent of the houses in the county are vacant.

3.13.2.2 Economic Activity

Economic activity in the analysis area ranges from heavy reliance on agriculture to growing development in the education, health, and social services sectors. In MATL's March 2006 response to DEQ comments, employment and labor trend data compiled from the U.S. Department of Labor, Bureau of Statistics were presented for each of the counties in the analysis area (MATL 2006b). These data were compiled for the last 5 years, documenting the total labor force available, total employment, total unemployment, and the resulting unemployment rate (**Table 3.13-3**). In general, unemployment rates have been fairly steady over the last 5 years, with three counties (Cascade, Teton, and Toole) seeing a small decline (0.5 percent or more) in total unemployment. Higher unemployment rates in Glacier County are attributable to the disproportionately higher unemployment rate on the Blackfeet Indian Reservation, which in 2005 was reported to be 69 percent of the available tribal workforce (Bureau of

Indian Affairs 2005). The unemployment rate for the county as a whole, which is the highest of the analysis area counties, is reported at 8 percent, though this has fluctuated over the last 5 years from a high of 8.2 percent to a low of 6.9 percent. Pondera and Chouteau counties saw a slight increase (less than 1 percent) in unemployment over the same period. (MATL 2006b).

TABLE 3.13-3
EMPLOYMENT AND DATA TRENDS BY COUNTY, 2000 – 2005a

Year	Labor Force	Employed	Unemployed	Unemployment Rate (%)
Cascade County				
2000	38,287	36,386	1,901	5.0
2001	38,419	36,719	1,700	4.4
2002	38,411	36,776	1,635	4.3
2003	38,558	36,992	1,636	4.2
2004	39,209	37,566	1,643	4.2
2005[b]	40,474	38,697	1,777	4.4
Chouteau County				
2000	2,799	2,698	101	3.6
2001	2,723	2,629	94	3.5
2002	2,474	2,387	87	3.5
2003	2,518	2,437	81	3.2
2004	2,633	2,454	88	3.3
2005 [b]	2,694	2,590	104	3.9
Glacier County				
2000	5,715	5,248	467	8.2
2001	5,775	5,348	427	7.4
2002	5,585	5,199	386	6.9
2003	5,750	5,315	435	7.6
2004	5,942	5,466	476	8.0
2005 [b]	6,105	5,614	491	8.0
Pondera County				
2000	2,976	2,836	140	4.7
2001	2,892	2,771	121	4.2
2002	2,745	2,630	124	4.5
2003	2,771	2,641	130	4.7
2004	2,715	2,568	147	5.4
2005 [b]	2,764	2,612	152	5.5
Teton County				
2000	2,974	2,846	128	4.3
2001	2,926	2,815	111	3.8
2002	2,906	2,796	110	3.8
2003	2,949	2,840	109	3.7
2004	3,001	2,885	116	3.9
2005[b]	3,047	2,931	116	3.8

TABLE 3.13-3 EMPLOYMENT AND DATA TRENDS BY COUNTY, 2000 – 2005a				
Year	**Labor Force**	**Employed**	**Unemployed**	**Unemployment Rate (%)**
Toole County				
2000	2,523	2,422	101	4.0
2001	2,429	2,346	83	3.4
2002	2,348	2,266	82	3.5
2003	2,538	2,453	85	3.3
2004	2,586	2,500	86	3.3
2005[b]	2,661	2,568	93	3.5

Notes:
a Reflects 2000 Census-based geography, new model controls, 2000 Census inputs.
b Average through Nov. 2005
Source: U.S. Department of Labor, Bureau of Labor Statistics, 2005.

Countywide earnings data by industry sector were available for 2001 through 2004 (**Tables 3.13-4** through **3.13-9**). In general, the data for each county indicated an increase in total wages across most sectors. However, Cascade County experienced a marked decrease (almost 50 percent) in total wages within the natural resources and mining sector (agriculture, forestry, and mining) between 2001 and 2004. The decrease is likely attributable to growth in other, more urban-related sectors such as the information and health, education, and social services sectors. Teton County experienced a substantial decline in wages associated with the manufacturing industry sector (40 percent) over the same time period but saw large increases in retail trade (83 percent) and in the professional, scientific, management, administrative, and waste management industry sectors (almost 400 percent). Elsewhere, wages in the natural resources and mining sectors generally held steady or increased. Large increases in wages in this sector were realized in Glacier County between 2002 and 2004 (approximately 91 percent), where oil and gas exploration, as a subsector of the mining industry, increased by 150 percent from 2001 to 2004 (Montana Department of Commerce 2006).

TABLE 3.13-4 INDUSTRY SECTOR EARNINGS TRENDS – CASCADE COUNTY		
Industry	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	2,815	-49.55
Construction	63,118	+21
Manufacturing	32,166	+0.3
Wholesale trade	51,191	+18
Retail trade	103,637	+6.7
Transportation and warehousing, and utilities	34,264	+4.1
Information	23,985	+23.7
Finance, insurance, real estate, and rental and leasing	89,744	+19.4
Professional, scientific, management, administrative, and waste management services	74,368	+17.5
Educational, health and social services	224,140	+16.7
Arts, entertainment, recreation, accommodation and food services	50,432	+16.8
Other services (except public administration)	23,672	+14.5
Public administration	67,345	+21

Source - US Department of Labor, Bureau of Labor Statistics 2005.

TABLE 3.13-5 INDUSTRY SECTOR EARNINGS TRENDS – TETON COUNTY		
Industry	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	1,263	+4.12
Construction	980	+68.38
Manufacturing	289	-40.17
Wholesale trade	4,459	+29.28
Retail trade	3,333	+83.23
Transportation and warehousing, and utilities	3,632	+21.55
Information	6,961	+15.38
Finance, insurance, real estate, and rental and leasing	2,698	+39.1
Professional, scientific, management, administrative, and waste management services	1,292	+396
Educational, health and social services	9,927	+22.4
Arts, entertainment, recreation, accommodation and food services	1,209	+3.6
Other services (except public administration)	483	-13.6
Public administration	3,242	+3

Source - US Department of Labor, Bureau of Labor Statistics 2005.

TABLE 3.13-6 INDUSTRY SECTOR EARNINGS TRENDS – CHOUTEAU COUNTY		
Industry	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	1,765	+23.0
Construction	433	+42.43
Manufacturing	444	-5.7
Wholesale trade	1,678	+71.4
Retail trade	2,837	+11.65
Transportation and warehousing, and utilities	793	+25.28
Information	N/A	N/A
Finance, insurance, real estate, and rental and leasing	864	-42.32
Professional, scientific, management, administrative, and waste management services	N/A	N/A
Educational, health and social services	9,192	+5.62
Arts, entertainment, recreation, accommodation and food services	1,182	+32.51
Other services (except public administration)	233	+29.44
Public administration	2,769	+12.84

Source - US Department of Labor, Bureau of Labor Statistics 2005.

N/A – Not Disclosed: Data do not meet Bureau of Labor Statistics or State agency disclosure standards

TABLE 3.13-7 INDUSTRY SECTOR EARNINGS TRENDS – PONDERA COUNTY		
INDUSTRY	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	748	-24.67
Construction	9,193	+14.88
Manufacturing	1,021	-23.7
Wholesale trade	3,117	+9.7
Retail trade	4,016	+15.43
Transportation and warehousing, and utilities	6,324	+9.03
Information	449	+39.44
Finance, insurance, real estate, and rental and leasing	1,908	+1.76
Professional, scientific, management, administrative, and waste management services	1,497	+6.4
Educational, health and social services	13,022	+4.48
Arts, entertainment, recreation, accommodation and food services	1,180	+21.65
Other services (except public administration)	523	-2.8
Public administration	847	+5.35

Source - US Department of Labor, Bureau of Labor Statistics 2005

TABLE 3.13-8
INDUSTRY SECTOR EARNINGS TRENDS – TOOLE COUNTY

INDUSTRY	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	4,287	+19.82
Construction	833	+33.28
Manufacturing	424	-6.2
Wholesale trade	2,759[a]	N/A
Retail trade	3,652	+33
Transportation and warehousing, and utilities	473	+1.94
Information	1,449	+54.3
Finance, insurance, real estate, and rental and leasing	2,087	+29.55
Professional, scientific, management, administrative, and waste management services	5,343	+27.8
Educational, health and social services	10,370	+20.34
Arts, entertainment, recreation, accommodation and food services	3,304	+47.3
Other services (except public administration)	373	-3.1
Public administration	8,130	+228.4

Source - US Department of Labor Bureau of Statistics 2005.
[a] 2002 Data, No Data Available for 2004
N/A– Not Available: comparison data do not meet Bureau of Labor Statistics or State agency disclosure standards

TABLE 3.13-9
INDUSTRY SECTOR EARNINGS TRENDS – GLACIER COUNTY

INDUSTRY	Total 2004 Wages by Sector (in thousands)	Trend between 2001-2004 (percent change)
Agriculture, forestry, fishing and hunting, and mining	4,939	+90.62a
Construction	2,726	-5.05
Manufacturing	583	-15.87a
Wholesale trade	3,056	+29.66
Retail trade	8,102	+22.39
Transportation and warehousing, and utilities	3,081	-6.8
Information	309	+6.19
Finance, insurance, real estate, and rental and leasing	2,158	+13.04
Professional, scientific, management, administrative, and waste management services	2,195	+21.2
Educational, health and social services	27,113	+28.52
Arts, entertainment, recreation, accommodation and food services	12,640	+1.93
Other services (except public administration)	1,311	-13.8
Public administration	36,200	+11.47

Source - US Department of Labor Bureau of Statistics 2005.
a 2002 Data, No Comparison Data Available for 2001

Per capita personal income has generally increased for all of the counties in the analysis area (U.S. Department of Commerce 2006). Per capita income is the average individual income from all sources, and is calculated by dividing total income by the total population. For counties dependent on agriculture, increases or decreases in per capita income are typically attributable to the quantity and value of crops or livestock produced. For example, per capita income increased between 2001 and 2004 as a result of bumper crops of winter wheat and barley, particularly in Chouteau and Toole counties (**Table 3.13-10**).

TABLE 3.13-10
PER CAPITA PERSONAL INCOME TRENDS

County	Per Capita Personal Income – 2004	Percent Change in Per Capita Personal Income, 2003 - 2004
Cascade	$29,231	+5.9
Chouteau	$27,303	+13.6
Glacier	$20,637	+7.6
Pondera	$23,709	+4
Teton	$26,158	+6.6
Toole	$28,100	+12.3

Notes:
Source: Sonoran Institute 2004.

Additional details regarding the social and economic activities in each of the counties in the analysis area are summarized for each county below.

Cascade County

The economy of Cascade County is heavily influenced by the commerce and trade activities centered in and around Great Falls, Montana's second largest city. This area provides the goods and services and other amenities drawn upon throughout the region. The largest private economic sector in the county is health care and social assistance, which accounts for nearly 24 percent of non-government employment. Another 14.2 percent of the labor force works in the retail trades. Malmstrom Air Force Base, just to the east of Great Falls, is home to several thousand military personnel and their families and employs about 4.9 percent of the county's population (approximately 3,000 people). According to the USDA, there were 1,037 farms in Cascade County in 2002, a slight drop (1.2 percent) since the 1997 agricultural census (USDA 2004).

Median household income in Cascade County in 2003 was $34,471, or 100.1 percent of the state's median household income (USDA Bureau of Labor Statistics 2005). Approximately 13.9 percent of the county's residents lived below the poverty level during 2003 (U.S. Census Bureau estimates 2005b).

Property tax revenues made up over 48 percent of all county revenues in fiscal year 2004-2005. Public safety was the largest segment draw on the county budget. For fiscal year 2004-2005, Cascade County appropriated $2,356,823 to its road fund, $39,451 to its rural fire fund, $165,088 to its emergency medical fund, and $6,811,144 to the public safety fund (MATL 2006b).

Chouteau County

The largest economic sector in Chouteau County is agriculture, accounting for almost 33 percent of the industries within the county and occupying over 90 percent of the county land area (USDA 2004). Still, the number of farms decreased by about 3.9 percent between 1997 and 2002 (USDA 2004). Education, health and social services combined constitute the next largest industry sector, followed by retail trades.

Chouteau County received more Federal farm subsidies than any other Montana county in 2003—over $33 million (Montana Department of Labor and Industry 2006). These subsidies reflect payments made for CRP lands, Loan Deficiency Payments, Crop Disaster Program, and the Livestock Compensation Program and reflected 20.6 to 32 percent of the reported per capita income in Chouteau County in 2003 (approximately $24,030). In 2004, the per capita income was $27,303, an increase of 23.6 percent from 2002 and 13.6 percent over 2003. Median household income in 2003 was $28,646, only 83.2 percent of the state average (USDA 2006). In 2003, 15 percent of the county population was estimated to be living in poverty (U.S. Census Bureau 2005b).

MATL provided DEQ with tables detailing county revenues and expenditures for the fiscal year ending June 2005 in its March 2006 submittal to the agency (MATL 2006b). In general, property tax made up nearly 50 percent of county revenues in fiscal year 2004-2005. Public works was the largest segment draw on the county budget. For fiscal year 2004-2005, Chouteau County appropriated $1,324,911 to its road fund.

Glacier County

Glacier County is home to the Blackfeet Indian Reservation and also encompasses the eastern portion of Glacier National Park. The presence of the park provides an important tourism draw to the area, which creates a higher degree of economic activity in the retail trade, accommodation and food services, and entertainment and recreation industry sectors. These sectors combined account for more than half the total private workforce, although government jobs, mostly tribal related, provide the greatest amount of employment (Montana Department of Labor and Industry 2005). Health care and social services are also a major industry sector (U.S. Census Bureau 2006), as is the oil and gas industry, which experienced a 150 percent increase in earnings from 2001 to 2004 (Montana Department of Commerce 2006). According to the USDA's 2002 census, 85.8 percent of the land in the county is in farms. The total number of farms decreased slightly from 493 in 1997 to 472 in 2002.

County per capita personal income in 2004 was $20,637, an increase of 13.4 percent from 2002 (U.S. Department of Commerce 2006). Median household income in 2003 was $27,117 which was only 78.7 percent of the state average (USDA 2006). According to U.S. Census Bureau estimates, in 2003 25.6 percent of Glacier County's population was living in poverty. The only other county in the state with a higher poverty rate was Roosevelt County (U.S. Census Bureau 2005b).

Property tax made up nearly 38 percent of county revenues in fiscal year 2004-2005. Largest segment draws on the county budget include public safety, public works, and general government expenditures; all tapping between 28 to 30 percent of revenue. For fiscal year 2004-2005, Glacier County appropriated $926,559 to its road department fund, $1,124 to the Cut Bank Fire Department fund, and $495,242 to the ambulance fund (MATL 2006b).

Pondera County

Economic data from 2004 indicate that within Pondera County the largest economic sector was education, health, and social services, which employed 302 individuals that year. A report on the economic impact of the health sector in Pondera County (Oklahoma State University 2005) indicated that the bulk of the health care workers (244) are employed by Pondera Medical Center. Retail trade was also a major sector, with approximately 280 employees (U.S. Census Bureau 2006). Agriculture was also a large industry in the county with 20.2 percent of individuals employed in that sector. Nearly 75,000 acres in Pondera County are irrigated cropland and 86.6 percent of the land is in farms (USDA 2004). Principal crops include winter wheat and barley.

In 2004, the county per capita personal income was $23,709, an 8.4 percent increase since 2002 (U.S. Department of Commerce 2006). Median household income was reported to be $29,362 in 2003, or 85.2 percent of the state average (USDA 2006). In 2003, 17.6 percent of county population was estimated to be living in poverty (U.S. Census Bureau 2005b).

Property tax made up nearly 50 percent of county revenues in fiscal year 2004-2005. Largest segment draws on the county budget include public works and general government expenditures. For fiscal year 2004-2005, Pondera County appropriated $925,355 to its road fund and $20,891 to its rural fire district fund (MATL 2006b).

Teton County

Based on the U.S. Census Bureau's 2004 county business patterns study, retail trade establishments employ the largest percentage of the workforce in the county, followed by health care and social assistances (U.S. Census Bureau 2006). However, these statistics do not take into account those establishments without employee identification numbers, which may include some farms. Of all the counties in the Project area, Teton County is the only one to see an increase in the number of farms between 1997 and 2002 (from 625 to 700, or 12.5 percent increase). This area of Montana is known for its high quality winter wheat and barley production. Much of the barley is grown under contract with Anheuser-Busch. Another prominent contractor in the area is General Mills (Chouteau Acantha 2004).

Per capita personal income in 2004 was $26,158. Median household income in 2003 was $30,844, or 89.5 percent of the state average (USDA 2006). During the same year, 13.7 percent of Teton County's population was living in poverty according to U.S. Census Bureau (2005b) estimates.

Taxes and assessments (including property tax) made up nearly 48 percent of county revenues in fiscal year ending 2004. Public safety was the largest segment draw on the county budget. For fiscal year 2004-2005, Teton County appropriated $787,037 to its road fund, $64,893 to its Fire Fee District, $15,000 to its rural fire fund, and $3,245 to the Choteau fire fund (MATL 2006b).

Toole County

The largest economic sector in Toole County was education, health, and social services. Retail trades was second, followed by accommodations and food service. Almost 90 percent of the county is farmland. Of the 405 farms in the county in 2002, 200 were oilseed and grain farms and 110 grew sugar beets, hay, and other types of crops. The remaining farms and ranches were primarily dedicated to beef cattle ranching and other animal production. Oil and gas extraction is also a major economic activity in the county, with about 11 percent of total private wages. The county is also home to Sweetgrass, the busiest port of entry on the Alaska-Canada Highway between eastern Washington and central North Dakota (Montana Department of Labor and Industry 2005).

Per capita personal income in 2004 was $28,100, an increase of 23 percent from 2002 (U.S. Department of Commerce 2006). Median household income in 2003 was $29,840 which was 86.6 percent of the state average (USDA 2006). According to the U.S. Census Bureau (2005b), an estimated 14.1 percent of the county population was living in poverty in 2003.

Taxes and assessments (including property tax) made up about 39 percent of Toole County revenues in fiscal year 2004-2005, however intergovernmental revenues (state/Federal) made up over 55 percent of county revenue that fiscal year. Largest segment draws on the county budget include public health and general government expenditures. For fiscal year 2004-2005, the county appropriated $910,275 to its road fund and $88,000 to its ambulance fund (MATL 2006b).

3.13.2.3 Local Resources

Local resources that were examined include emergency and medical services, law enforcement, and fire response. Resources such as housing and schools were not examined in detail because the relatively low number of employees expected through the duration of Project construction, and the relatively short duration of activities occurring in a given locale make it unlikely that these resources would incur any measurable direct impacts. Service and retail providers that would experience impacts as a result of the construction and operation of the proposed Project or alternatives include lodging, restaurants, and gas stations. The principal communities that likely would serve project workers include Great Falls (Cascade County), Conrad (Pondera County), Cut Bank (Glacier County), and Shelby (Toole County). Each of these towns has lodging and dining options as well as grocers and gas stations.

Cascade County

Emergency and Medical Services: Benefis Healthcare provides care to approximately 225,000 people in a service area covering 15 counties in north-central Montana. Benefis Healthcare offers a full range of medical services, including a Level II Trauma Center. Facilities include 502 beds at its two campuses. Benefis also operates the Williams-Ario Regional Emergency and Trauma Center in Great Falls. This facility provides 19 emergency examination rooms and an additional seven non-urgent care rooms. The emergency department is staffed with nine board-certified or -eligible physicians. The Fast track program has four family nurse practitioners who treat non-urgent patients.

Flight services are available through Mercy Flight, which operates both helicopters and fixed-wing aircraft. Mercy Flight crews respond to bring patients from isolated areas or accident scenes to the Regional Emergency Center.

Law Enforcement: The Cascade County Sheriff's Office covers all areas within the county, with the exception of Great Falls. The Sheriff's office has 34 officers. The City of Great Falls is covered by the City Police Department, with 82 officers and 65 patrol and support vehicles.

Fire Response: The Great Falls Fire Rescue consists of 65 uniformed firefighters, in addition to the Fire Chief, Assistant Chief, and several other staff. All suppression firefighters are certified EMTs, and 19 are also certified as paramedics. There are four stations with a total of six 1,250-gallon-per-minute fire engines, a water tender, a snorkel truck, a rescue vehicle, and hazardous materials response equipment. Additional fire services in Cascade County include:

- Sun River Fire Service Area
- Vaughn Volunteer Fire Department
- Black Eagle Volunteer Fire Department
- Malmstrom AFB Fire Department
- Gore Hill Volunteer Fire Department
- Cascade Volunteer Fire Department

Chouteau County

Emergency and Medical Services: The Missouri River Medical Center (MRMC) in Fort Benton provides a seven-bed acute care hospital, emergency room, laboratory, and radiology department. The MRMC Emergency room is available 24 hours a day, 7 days a week, and is staffed by a registered nurse with a physician on call. MRMC coordinates emergency services with Memorial Ambulance, Geraldine Ambulance, Benefis Healthcare, Mercy Flight, and Chouteau County.

Law Enforcement: The Chouteau County Sheriff's Office covers the towns of Big Sandy, Loma, Carter, Highwood, Square Butte, Geraldine, and all rural areas in Chouteau County. Fort Benton has its own city police department. The county sheriff's office has a force of nine full time officers and a reserve force of eight and is responsible for the investigation and prevention of crime, coroner duties, fire warden, civil process, bailiff, search and rescue, and emergency services response. The department has eight patrol cars and two suburbans (MATL 2006b).

Fire Response: There are eight volunteer fire departments in Chouteau County located in Fort Benton, Big Sandy, Geraldine, Highwood, Loma, Carter, Kness, and Elim. There are also five volunteer quick response units on call for emergency and fire situations, and three ambulance services in Fort Benton, Big Sandy, and Geraldine (MATL 2006b).

Glacier County

Emergency and Medical Services: Northern Rockies Medical Center in Cut Bank is a full service medical center with a 25-bed hospital, two fulltime physicians, one nurse practitioner, and several registered nurses. There are three ambulances in the county (MATL 2006b).

Law Enforcement: The Glacier County Sheriff's Office covers all areas in the county, though Cut Bank has its own police department as well. Glacier County Sheriff's Office has 12 officers and seven reserves, and has 12 patrol vehicles. The City of Cut Bank Police Department employs six officers and has five vehicles available for patrol.

Fire Response: Cut Bank Volunteer Fire Department serves the City of Cut Bank and eastern Glacier County. The department has 25 volunteer firefighters, two city trucks, three rural trucks, and a rescue truck. The Cut Bank department also provides equipment and training to the Del Bonita Volunteer Fire Company. There are three rural trucks at this location, and a variable number of volunteer firefighters. Other departments in the county include the Browning Volunteer Fire Department and the Babb Volunteer Fire Department (MATL 2006b).

Pondera County

Emergency and Medical Services: Pondera Medical Center, in Conrad, is a 20-bed acute care facility with a full range of services. There are five local physicians and five allied staff at the facility along with a variety of visiting specialists. Pondera Medical Center provides 24-hour emergency room coverage by a physician assistant and nurse practitioner, with physician backup. Pondera County Ambulance, staffed with emergency medical technicians, serves the Pondera County area with round-the-clock emergency services. The ambulance also provides transportation services for patients to other facilities (MATL 2006b).

Law Enforcement: The Pondera County Sheriff's Office covers all areas of the county with the exception of Conrad and reservation lands. The sheriff's office has eight fulltime officers and eight patrol vehicles. Conrad is covered by the City Police Department, with a staff of five and two vehicles available for patrol. The Bureau of Indian Affairs handles law enforcement on reservation lands in the western part of the county.

Fire Response: There are four fire departments in Pondera County. These are the Brady Volunteer Fire Department, the Conrad Volunteer Fire Department, the Dupuyer Volunteer Fire Department, and the Valier Volunteer Fire Department. They have a total of 79 volunteer firefighters and 16 trucks. There is also one department located in Heart Butte that falls under the Bureau of Indian Affairs.

Teton County

Emergency and Medical Services: Teton Medical Center is a 10-bed critical access hospital and 36-bed extended care facility located in Choteau. The hospital provides 24-hour emergency services, with two rooms staffed by physicians, physician assistants, and nurses (MATL 2006b).

Law Enforcement: Teton County Sheriff's Office covers the entire county. The office has a force of nine, including the sheriff and under sheriff, and has nine patrol vehicles.

Fire Response: There are five fire departments in Teton County – the Choteau Volunteer Fire Department, the Dutton Rural Fire Department, the Fairfield Rural Fire District, the Pendroy Volunteer Fire Company, and the Power Volunteer Fire Company (MATL 2006b).

Toole County

Emergency and Medical Services: Marias Medical Center in Shelby is a combined 20-bed acute care hospital with nursery, maternity rooms, intensive care and critical care units, and a 68-bed skilled nursing facility. The emergency room has a physician on call 24 hours a day, and a surgeon and anesthetist are available, as needed. The facility has 15 RNs on staff. Four ambulances serve the county, including one housed in Sunburst (35 miles north of Shelby). There is a helipad at the hospital, and transfers to fixed-wing aircraft can be made at the airport just north of Shelby.

Law Enforcement: Toole County Sheriff's Office covers the entire county, including Shelby. The office has a force of 12 including the sheriff, and has six patrol vehicles.

Fire Response: There are two volunteer fire departments in Toole County. The Shelby Volunteer Fire Department provides fire services for Shelby and southern Toole County and has 21 firefighters, three city trucks, and five rural trucks available. There is also a volunteer fire department in Sunburst that serves northern Toole County. The department has 21 firefighters, two local trucks, one city truck, one water tender, and five rural trucks.

3.13.3 Environmental Impacts

The socioeconomic impacts of Alternative 2 and the other action alternatives can be divided into (1) those that are an immediate result of project construction such as an influx of workers to the area to complete the project; (2) those related to operation of the proposed Project or alternatives, such as impediments to property owners' ability to make full and unimpeded economic use of their land and the addition of taxable property to state and county budgets; (3) those that would arise as a direct result of the presence of the proposed Project; and (4) those related to increased availability of power transmission options. Each of these types of effects is discussed in more detail below. Consequences more directly related to the changes that would occur to land use are discussed in more detail in Section 3.1.

3.13.3.1 Alternative 1 - No Action

Under the No Action alternative, economic and social activity in the area would continue as it has and follow currently expected trends. Neither the proposed Project nor any of the action alternatives would be constructed. Under this scenario, benefits to the counties in the analysis area from project-generated property taxes (**Table 3.13-18**), the Wholesale Electricity Tax, and any benefits from the increased utilization of local goods and services as a result of the project would not occur. The employment opportunities that would be created during construction of the project would also not occur. Wind generation projects are potentially expected to develop as a result of the construction of additional transmission capacity (also described in Section 3.13.3.2) would not be built in the immediate future; revenue to the counties from these projects would not materialize, nor would the associated temporary and permanent employment opportunities. Thus, the economic benefits of MATL and associated wind farms would not occur.

Under the No Action alternative, the social and economic situations of local landowners would continue as they have and follow currently expected trends. Costs that would occur from the MATL line to farmers and other landowners would not occur because these landowners would be able to use their land without incurring the inefficiencies caused by working around transmission structures. Conversely, local landowners would not receive a one-time easement payment for land they own in the transmission line right-of-way, nor would they receive any annual compensation from MATL for having to farm around those structures. Landowners would also not receive the recently approved 100% property tax break for land owned within 660 feet of the centerline of a new transmission line.

3.13.3.2 Alternative 2 – Proposed Project

Under the Proposed Project, the project owners would benefit from any future profits earned from transporting electricity on the line or bear costs from any future losses. Shareholders in the company would also profit from any returns on their investment (e.g. shareholders earning dividends and capital gains from stock options in the company) or bear costs from any future losses. It is likely that most shareholders in the company would not be from Montana. Wind power developers would also profit to the extent that the line would allow them to build wind farms. Montana landowners who receive payments from turbines on their land would stand to gain an additional source of annual income from those turbines as a result of the line being built. Landowners with the line on their property would incur costs from the structures on their land and benefits from compensation payments, and tax breaks.

Construction Phase: Approximately 55 employees would be needed to complete the Project within a 6-month timeframe (MATL 2006b). The local impact of construction activity would vary depending on whether the local labor pool is used or whether workers come from out of the region. An unknown number of those workers would potentially be locally hired, but some jobs may require skills that are unavailable in the local labor pool (MATL 2006b). Where local workers are hired, there would be a small but positive effect to local area personal income figures for the duration of construction and potentially a small reduction in unemployment in the analysis area's counties. According to MATL (2006b), about two-thirds of the hired construction workers would earn between $20 and $26 per hour and the project would provide in excess of 200,000 person-hours of construction employment. Assuming an average pre-tax hourly wage of $23, construction employment alone may conservatively generate $4.6 million in income over the construction time period of approximately 6 months. Earned wages from local workers would also be a source of income tax to state and Federal taxing authorities, although this revenue may simply represent a replacement of similar revenue amounts generated by jobs previously held by those same workers and other project contractors.

Workers would be dispersed along the chosen alignment, rather than all concentrated in one area at one time (Section 2.3). For example, some workers would concentrate on digging and setting poles, while other crews would follow at a later time to string line. Similarly, line installation would also be dispersed. Secondary, or induced positive impacts would be created by the increase in use of the local retail business and service industries by workers. However, given the few workers and dispersed nature of the construction activities associated with the proposed Project and action alternatives, it is likely that the secondary beneficial impacts in any given town along the alignment would be small and short term.

No direct impacts to the regional demographics are expected to occur as a result of the project since some of the workers are expected to already be residing in the area and others would be dispersed over the breadth of the Project area. The dispersed nature of the construction phase of the project also means that local goods and services such as lodging facilities, restaurants, and gas stations would not be over-utilized to the degree that additional employment or additional facilities would be required to maintain pre-Project levels of service. Interviews conducted by MATL representatives with other community service workers at hospitals and law enforcement agencies also indicated that these types of services would not be unduly taxed by the influx of workers to the region (MATL 2006b). In addition, construction costs of the line would ultimately be paid for by the energy shippers, not by Montana rate payers.

As described more fully in Section 3.1, the construction phase of the action alternatives would require limited access road development to reach otherwise inaccessible tower locations, overland driving to geographically accessible locations, and other activities related to structure placement. Temporary disruptions would occur to landowners, including brief inaccessibility to portions of their property in the right-of-way. Economic costs associated with such disruptions would be minimal due to the brief time required at each construction location.

Operation Phase: Portions of the proposed Project would be constructed on easements crossing irrigated and non-irrigated cropland and rangeland. Disruptions to farming practices would be expected to occur, including:

- Decreases in farming efficiency caused by pole placement in fields;
- Small, long-term decreases in farming acreage where the structures are located;
- Increases in farming costs and herbicide and pesticide spraying costs;
- Reduced coverage of aerial herbicide and pesticide resulting in increased weed pressure;
- Potential disruptions to DGPS-driven equipment; and
- The potential for reduced property values on farmland.

Because action alternatives are located in areas accessible by overland driving, few permanent access roads would be needed. However, where repeated compaction by heavy equipment occurs on fine-grained soils, previously productive cropland may require additional labor measures (such as tilling) to restore crop productivity to pre-construction levels.

Disruptions such as these would result in external costs associated to landowners and farm operators with the creation of non-productive farming areas; extra use of diesel, fertilizer, seed, pesticides and herbicides; modifications to DGPS networks infrastructure (that is, repeater installation/modification and tractor modifications); additional stress and increased flight time during aerial applications of fertilizer and pesticides due to the presence of tower and conductor obstructions; and real or perceived impacts to property values (MATL 2006b). Few recent studies are available that quantify the cost of these types of infringements to property owners with agreed-upon accuracy; however, a study conducted by Ontario Hydro in 1979 showed that the greatest financial effect of the towers comes as a result of the creation of a non-productive area, followed by time loss, crop damage, and material loss (Scott 1980). While the Ontario Hydro study attempted to quantify these losses, the values in the study are in terms of the averages between 1974 dollars for western Ontario and 1975 values for eastern Ontario. Therefore, it would be difficult to convert these monetary values to today's U.S. dollar value for the specific types of farm and ranchland uses in northern Montana. To support this assessment, DEQ obtained an independent analysis of costs for farming around transmission line structures (HydroSolutions and Fehringer 2007). The analysis estimated costs to a "representative farmer" in the Conrad, Montana, area (**Appendix N**).

MATL has committed to provide compensation for the impact to farmers by making pole payments for each structure and annual payments to offset the increased cost of farming around the structures. Some of these payments would go to all landowners, and not just farmers. These payments also provide a new, predictable, and consistent revenue stream to landowners.

Farmer Costs from Transmission Structures

The average annual cost to farmers per transmission structure shown in **Table 3.13-11** and **Table 3.13-12** was used to estimate total costs to Montana farmers from having to farm around transmission structures. Total costs were calculated by estimating the number of each type of structure that would be located along each alternative (e.g. H-frame at the edge of a field, monopole in the interior of a field, etc.) based on land uses. An 800-foot ruling span (distance between structures) was assumed. Then, for each alternative, the total number of each type of structure was multiplied by the corresponding cost figure from **Table 3.13-11** and **Table 3.13-12**. The total costs for each type of structure were then summed to estimate the total annual costs to farmers for each routing alternative. A range of costs was given for each alternative due to uncertainty over exact pole placement and these cost figures are estimates. Cost per pole is estimated as follows:

TABLE 3.13-11
COSTS OF DRYLAND FARMING AROUND POLE(s)

Structure	Pole Diam. (ft)	Field Location	Orientation to Field Edge	Farming Practice Annual Cost (per structure)	
				Spring Wheat-Fallow	Continuous Crop
Mono-pole	6.5	Long-Span Edge		$15.06	$15.86
Mono-pole	6.5	Long-span Interior		$107.98	$160.44
H-pole	3.0	Edge	Perpendicular	$37.13	$40.91
H-pole	3.0	Edge	Straddling Fence Line	$20.98	$22.38
H-pole	3.0	Edge	Parallel	$14.99	$15.76
H-pole	3.0	Interior		$120.57	$177.74

Notes:
Costs reflect 2007 prices.
H-Pole: 3-ft diameter each, 20-ft separation center to center.
Source: Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/21/07.

TABLE 3.13-12 COSTS OF IRRIGATED FARMING AROUND POLE(s)				
Structure	**Pole Diam. (ft)**	**Field Location**	**Orientation to Field Edge**	**Irrigated Cropping Annual Cost (per structure)**
Mono-pole	6.5	Long-Span Edge		$18.69
Mono-pole	6.5	Long-span Interior		$266.61
H-pole	3.0	Edge	Perpendicular	$41.81
H-pole	3.0	Edge	Straddling Fence Line	$23.34
H-pole	3.0	Edge	Parallel	$18.51
H-pole	3.0	Interior		$290.41

Notes:
Cost reflect 2007 prices.
H-Frame: 3-ft diameter each, 20-ft separation center to center.
Source: Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/21/07.

Gross costs to farmers are the costs of farming around transmission structures. Gross costs do not include compensation from the Project owner back to the farmer/landowner. Individual farmer costs would vary with each farm and might be different than the average costs estimated here. In order to evaluate the long-term costs over the potential life of the transmission line, the agencies estimated costs over a 50-year period based on the calculated annual costs. Estimated total annual gross costs and estimated total gross costs over the next 50 years to farmers for each alternative are listed in **Table 3.13-13**. Discount rates (future costs or benefits at today's equivalent value) over time are ignored in order to err on the side of farmers. Alternative 3 is the most expensive to farmers, and Alternative 4 is the least expensive.

TABLE 3.13-13 ESTIMATED ANNUAL AND 50 YEAR GROSS COSTS TO FARMERS FROM MATL (ROUNDED TO THE NEAREST $1,000)		
Route	**Annual Gross Cost to Farmers**	**50-Year Gross Cost to Farmers**
Alternative 2	$82,000 to $86,000	$4,083,000 to $4,310,000
Alternative 3	$108,000 to $109,000	$5,399,000 to $5,446,000
Alternative 4	$57,000 to $59,000	$2,839,000 to $2,935,000

Note: For Alternative 2, single pole structures would be used on 53 miles of cropland (including CRP) crossed on a diagonal; H-frame structures would be used on the remaining cultivated land. For Alternative 3, H-frame structures were assumed for the entire route. For Alternative 4, single pole structures were assumed on all cropland including CRP.

Mitigation/Compensation to Farmers and Other Landowners

Although farmers would bear costs as a result of the proposed Project, they would also be compensated by both property tax relief and MATL payments. To arrive at the estimated net costs to farmers, the estimated annual payment (**Table 3.13-14**) would be subtracted from the annual gross cost to farmers (**Table 3.13-13)**. It is important to note that easement payments and per pole payments would go to all landowners, not just farmers. Property tax relief would only go to the owners of class 3 farmland. The four types of compensation to farmers and other landowners would include:

1) A one-time right-of-way payment from MATL for an easement on their property,
2) An annual payment per pole from MATL just for having the pole on a landowner's property,
3) An annual payment per pole of $9.38 (Fernandez 2007) from MATL for extra costs incurred to farm around transmission structures (to farmers only), and
4) An elimination of property taxes for class 3 farmland (Glossary) within 660 feet of the centerline of a new transmission line.

The total annual payments to farmers and other landowners under Alternatives 2, 3, and 4 (not including the one-time easement payment) are given in **Table 3.13-14**.

TABLE 3.13-14
ESTIMATED TOTAL ANNUAL PAYMENTS
(ROUNDED TO THE NEAREST $1,000)

	Payment per Pole Total	Annual Extra Farming Cost Payment	Tax Break	TOTAL
Alternative 2	$46,000	$8,000	$40,000	$95,000
Alternative 3	$72,000	$12,000	$40,000	$124,000
Alternative 4	$39,000	$6,000	$40,000	$85,000

Subtracting the two annual payments from MATL and the property tax break from the annual costs to farmers, the annual net monetary effect and 50-year effect to all landowners is positive for all three Alternatives (not taking into account the one-time easement payment). These net effects are given in **Table 3.13-15**.

TABLE 3.13-15 ESTIMATED ANNUAL NET EFFECT ON FARMERS (ROUNDED TO THE NEAREST $1,000)				
	Annual Cost to Farmers	**Annual Compensation to Farmers**	**Net Annual Effect to Farmers**	**Net Effect to Farmers over 50 years** (excluding one-time easement payment)
Alternative 2	$82,000 to $86,000	$85,000	$9,000 to $13,000	$450,000 to $650,000
Alternative 3	$108,000 to $109,000	$124,000	$15,000 to $16,000	$750,000 to $800,000
Alternative 4	$57,000 to $59,000	$85,000	$26,000 to $28,000	$1,300,000 to $1,400,000

In addition, landowners in Montana who granted easements for the project would receive one-time easement payments totaling: $402,000 total for Alternative 2, $393,000 for Alternative 3, and $417,000 for Alternative 4. These easement payments were estimated by the agencies based on information from MATL, estimated lengths of the transmission line alignments, and land use data.

The four types of landowner compensation are discussed below in more detail:

1) One-time easement payments to farmers
MATL would pay landowners a one-time easement payment of $375 per acre for rangeland, $650 per acre for dryland agricultural, and $1,200 per acre for irrigated agricultural land (Fernandez 2007). The easement payments are meant to compensate the landowners for MATL's use of the landowner's property. Forest land and riparian land would be compensated the same as rangeland and other types of land would be paid an easement corresponding to fair market value, depending on the area (e.g. Great Falls would have a higher value than Conrad). For the purposes of net costs to landowners, **Table 3.13-16** gives the total acreage for each type of land for Alternatives 2, 3 and 4 for farmers and ranchers only. The acreage is estimated by multiplying the 45-foot-wide easement by the total mileage for each land use category. This table also gives the total one-time easement payments to Montana landowners from MATL for each route.

TABLE 3.13-16 ACRES AND EASEMENT PAYMENT				
	Acres of Rangeland	**Acres of Dryland Ag Land**	**Acres of Irrigated Ag land**	**Total One-Time Easement Payment**
Alternative 2	179	501	8	$402,000
Alternative 3	123	501	18	$393,000
Alternative 4	259	476	9	$417,000

2) Annual Payment per pole from MATL to Farmers
MATL would pay landowners an annual payment per pole for having a pole on their land (Fernandez 2007). For dryland agricultural land and rangeland with poles placed on the edges of fields, the annual payment would be $20. For any of these types of poles with a guy wire, the payment would be $30 per year. The $20 and $30 figures are assumed for poles on rangeland as well. For poles on irrigated agricultural land and/or those that are in the interior of a field (including the interior of a dryland field), MATL would pay landowners $50 per year for poles without guy wires and $60 per year for poles with guy wires. For all two-pole, H-frame structures, the numbers above would be multiplied by two. MATL would adjust these per pole payments for inflation every 5 years.

Alternative 3 would have only H-frames or two poles per structure, resulting in a significantly higher overall annual per pole payment to Montana landowners. Alternative 4 would be all monopoles in farm fields, and thus would have the lowest overall annual per pole payment of the three routes. Alternative 2 is estimated to have 350 monopole structures and 265 H-frame structures in farmland, resulting in the second highest overall annual payment of the three options.

Multiplying the 'per pole' payments by the estimated total number of each category of pole for each of the alternatives, total annual payments for poles are estimated to be about $46,000 for Alternative 2, $72,000 for Alternative 3, and $39,000 for Alternative 4.

3) MATL compensation to Farmers for additional costs
MATL would pay farmers an annual flat fee for additional farming costs from transmission structures based on a formula developed by DeVuyst et al. (2006). That study estimated that farmers would bear an additional cost of $9.38 per pole per year. This number was multiplied by the number of poles per structure on each of the three MATL routes times the number of structures per route. It is important to note that for Alternative 4, only monopole structures would occur on farmland, whereas for Alternative 3, H-frames would occur on all farmland. It is assumed that those landowners with poles on rangeland would be compensated the $9.38 as well. **Table 3.13-17** summarizes the final expected total compensation to farmers per route based on the study.

TABLE 3.13-17
PAYMENT TO FARMERS ANNUALLY TO COMPENSATE FOR FARMER LOSSES

	Number of Monopoles	Number of H-Frames	Total annual payment (rounded to nearest $100)
Alternative 2	350	265	$8,300
Alternative 3	0	630	$11,800
Alternative 4	587	0	$5,500

4) Exemption of Property Taxes in House Bill 3:
Section 8 of House Bill 3 from the April 2007 Special Legislative Session provides for a property tax exemption for class 3 agricultural land and class 10 timberland within 660 feet of the center of the right-of-way of an electric transmission line with a capacity of 30 megavoltamperes or greater, constructed after January 1, 2007. The Montana Department of Revenue (DOR) estimates that the effect of the property tax exemption for land adjacent to the right-of-way of MATL would be a lowering of future tax revenues to the State general fund of $7,169 in both FY 2010 and FY 2011. The university state special revenue would be reduced by $452 in both FY 2010 and FY 2011. Local government and school revenues would decrease by $31,870 in both FY 2010 and FY 2011 (DOR 2007). It is assumed that this tax break would continue indefinitely. The estimated total of these decreases is about $40,000 per year, which is $40,000 less in property taxes that landowners along MATL would otherwise pay each year (DOR 2007).

Effects on Property Values

Property values depend on many factors. A review of recent studies indicates that property values could decrease slightly, might not change, or may increase with the presence of a transmission line (EPRI 2003). Some reduction in property values due to the presence of the transmission line could occur as a consequence of the visual effects of the towers, perceived health risks associated with high voltage, and effects on farming efficiency. Property devaluation would likely be more evident on properties immediately adjacent to the line, particularly those where residences are close, or the land is farmed. However, most of the MATL line is on remote ranch and cropland. For these properties, changes in value due to perceived impacts would likely be negligible (EPRI 2003) or at least partially offset by negotiated compensation.

There is an increasing body of literature concerning the effects of transmission lines on property values. The review mentioned in the previous paragraph, *Transmission Lines and Property Values: State of the Science*, by EPRI (November 2003), found that some transmission lines caused small decreases in property values, some caused no effect, and some lines caused a small increase in property values. These studies included surveys, opinion-based studies and quantitative studies that were either market-data comparisons or econometric approaches. Most of these studies were conducted from 1991-2003. The main conclusions (on page 4-1) of the study were:

1) There is evidence that transmission lines have the potential to decrease nearby property values, but this decrease is usually small (6.3% or lower);
2) Lots adjacent to the right-of-way often benefit; lots next to adjacent lots often have value reduction;

3) Higher-end properties are more likely to experience a reduction in selling price than lower-end properties;
4) The degree of opposition to an upgrade project may affect the size and duration of the sales price effects;
5) Setback distance, right-of-way landscaping, shielding of visual and aural effects, and integration of the right-of-way into the neighborhood can significantly reduce or eliminate the impact of transmission structures on sales price;
6) Although appreciation of property does not appear to be affected, proximity to a transmission line can sometimes result in increased selling times for adjacent properties;
7) Sales-price effects are more complex than they have been portrayed in many studies;
8) Effects of a transmission line on sales prices of properties diminish over time and all but disappear in five years.

An older review consisting of appraiser studies found varying results as well. This study was entitled *The Effects of Overhead Transmission Lines on Property Values, A review and Analysis of the Literature*, by Cynthia Kroll and Thomas Priestly, Edison Electric Institute Siting and Environmental Planning Task Force (1992). It found that property values may be but are not always affected by transmission lines. About half the studies the review looked at found no effects from transmission lines on property values for residential and agricultural property. Some studies found a small negative effect on agricultural land and a few found larger adverse effects (2 to 20 percent lower values). Only some agricultural property owners thought that their property was worth less overall because of the lines. It was stated in this review that the appraisal technique used for the review did not provide statistically reliable results.

Other Benefits and Costs from MATL to the Local Area

Employment: MATL proposes to use experienced operations and maintenance (O&M) contractors, possibly obtained from other regionally-located utility companies, for ongoing maintenance of the transmission line once it is constructed. This may provide additional employment opportunities. The number of employees that could be hired is unknown at this time; however, the estimated wages are expected to be in the $25 per hour range (Pfister 2007). A small number of new residents working on the MATL project might move into the study area as a result of the transmission line.

Tax Revenue: In Montana, property tax is the primary source of funding for local governments. A recent change in Montana tax law (2007 Legislative Session) allows certain new transmission lines that carry renewable energy to be taxed at a lower rate than the standard 12% property tax rate. According to MATL, the proposed transmission line would qualify for this tax break. The Project would be centrally assessed (as a single unit) at 3 % rather than 12%. The revenue would be apportioned to different districts based on mileage of line within each district.

Property taxes assessed on the Project would be based on the value of the line. Applicable mill levies would also be applied to the property taxes paid within each district. The approximate amount of property taxes potentially available to each county within the analysis area was calculated based on an estimated transmission line value of $363,284 per mile and the approximate mileage of the proposed alignment and alternatives (Mullen 2006).

As shown in **Table 3.13-18,** the line may generate tax revenue ranging from $28,122 in Chouteau County to $259,742 in Pondera County. Since MATL crosses county lines, it would be assessed as a unit rather than as separate individual components. The total value is then allocated to taxing jurisdictions based on the portion of the line in each jurisdiction. As long as the line is used and maintained, its value would be based on capitalized future revenue rather than depreciated costs, and tax revenue and the benefits available to each county are expected to be relatively constant over time (Dodds 2006).

In addition to property taxes, the Project would also be subject to the Wholesale Energy Transaction (WET) Tax, which is imposed by the State of Montana at a rate of $0.00015 per kilowatt hour (kWh). Estimating total amounts that would be generated by the WET Tax is beyond the scope of this study. Revenue generated from this source is directed to the state's general fund, which is distributed to projects (primarily school districts) throughout the state (Dodds 2006).

Increased Availability of Power Transmission Options: Although the expected permitted firm capacity of the Project has been sold, it is likely that some non-firm capacity would be available for other energy transactions. The operation of the MATL line would provide an additional avenue for transferring energy between the western U.S., including Montana, and Canada. Currently, without this or other future transmission lines, power transmitted between Montana and Alberta, must go through Idaho, Washington, and British Columbia. Energy shippers transferring power between Montana and Alberta incur additional transmission tariffs that would not be incurred if the MATL line were available to them.

Increased energy transactions between buyers and sellers of electricity as a result of MATL along with more efficient paths of conveyance could increase the competition between suppliers and potentially result in lower rates to customers. On the other hand Alberta prices tend to be higher most of the time than the Mid-Columbia Hub (Mid-C) prices, and Mid-C prices are usually higher than the prices that Montanans pay. (Mid-C electricity prices are measured in Washington State, and like the stock market, measure the hourly prices of electricity in the Northwest U.S. region). This could mean that some Montana-generated electricity might be exported to Alberta over MATL if Albertans can obtain cheaper electricity from the U.S. at certain times of the year. If the wind farms are constructed and electricity is exported from Montana to Alberta, it is not likely to substantially affect Montana consumer rates. Because the amount of transmission capacity the MATL line would open up between Montana and Alberta would be relatively small compared to the total amount of interconnection capacity Montana currently has with other states, it is likely that increases in competition and changes in electricity prices would be limited or non-existent as a result of the proposed line.

3.13.3.3 Alternatives 3 and 4 – MATL B and Agency Alternative

The socioeconomic impacts described above are essentially equal for all of the alternatives with the exception of differences in the estimated property tax revenue available to each affected county depending on the mileage of the line that would ultimately be constructed within each county's jurisdiction (**Table 3.13-18**). Also, net farmer benefits and landowner compensation would be slightly different for each Alternative.

TABLE 3.13-18 TAX BENEFIT ESTIMATES FROM MATL WITH 3% TAX RATE							
	Alignment Length (Miles)	Value $/Mi.	Estimated Value in County	Class 9 Tax Rate: 3%	Taxable Value	Avg. Rural Mill Levy	Property Tax
Cascade							
Alternative 2	12.76	$363,284	$4,635,504	0.03	$139,065	0.50412	$70,105
Alternative 3	12.31	$363,284	$4,472,026	0.03	$134,161	0.50412	$67,633
Alternative 4	19.81	$363,284	$7,196,656	0.03	$215,900	0.50412	$108,840
Chouteau							
Alternative 2	5.87	$363,284	$2,132,477	0.03	$63,974	0.43959	$28,122
Alternative 3	10.21	$363,284	$3,709,130	0.03	$111,274	0.43959	$48,915
Alternative 4	0	$363,284	$0	0.03	$0	0.43959	$0
Glacier							
Alternative 2	40.41	$363,284	$14,680,306	0.03	$440,409	0.53745	$236,698
Alternative 3	37.34	$363,284	$13,565,025	0.03	$406,950	0.53745	$218,715
Alternative 4	40.56	$363,284	$14,680,306	0.03	$440,409	0.53745	$236,698
Pondera							
Alternative 2	45.69	$363,284	$16,598,446	0.03	$497,953	0.52162	$259,742
Alternative 3	44.44	$363,284	$16,144,341	0.03	$484,330	0.52162	$252,636
Alternative 4	52.01	$363,284	$18,894,401	0.03	$566,832	0.52162	$295,671
Teton							
Alternative 2	25.16	$363,284	$9,140,255	0.03	$274,208	0.4991	$136,857
Alternative 3	17.32	$363,284	$6,292,079	0.03	$188,762	0.4991	$94,211
Alternative 4	27.26	$363,284	$9,903,122	0.03	$297,094	0.4991	$148,280
Total							
Alternative 2							**$731,525**
Alternative 3							**$682,112**
Alternative 4							**$789,488**

Notes:

Sources: Mullen 2006

Montana Department of Revenue 2004

3.13.3.4 Environmental Justice

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994), directs each Federal agency to:

> "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effect of its programs, policies, and activities on minority and low-income populations."

The Presidential Memorandum that accompanied EO 12898 emphasized the importance of using existing laws, including NEPA, to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions." CEQ, which oversees the Federal government's compliance with EO 12898 and NEPA, has subsequently developed guidelines to assist Federal agencies in incorporating the goals of EO 12898 into the NEPA process. This guidance, published in 1997, was intended to "assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed" (CEQ 1997). DOE has also published recommendations for complying with the EO as part of the NEPA process (DOE 2004).

Affected Environment

Pursuant to EO 12898, this section identifies possible minority or low-income populations that might be subject to disproportionately high and adverse environmental impacts or health effects from the proposed MATL Project.

Minority Populations. The CEQ guidelines define "minority" as individual(s) who are members of the following population groups: "American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic" (CEQ 1997). The guidelines identify these groups as a "minority population" when either "(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis" (CEQ 1997).

To identify minority populations for this analysis, DOE compared the populations of ethnic minority groups in the study area (as defined for this EIS) with percentages tabulated for the state of Montana and the whole United States. As indicated in **Table 3.13-2**, there are only very small percentages of Asian or Pacific Islander, Black, or Hispanic residents in the study area and the state of Montana. Therefore, this analysis focuses only on two populations: (1) all minority groups combined and (2) American

Indian populations. The following text discusses the total minority and American Indian populations within the study area using census tract[6] data from the 2000 U.S. Census, which is the most recent year for which complete data are available at the census tract level. **Figure 3.13-1** shows the census tracts in the region surrounding the proposed Project, and **Figure 1.1-1** shows the study area as defined in this EIS. **Table 3.13-19** lists the total minority and American Indian population percentages for the eight census tracts located at least partially within the study area.

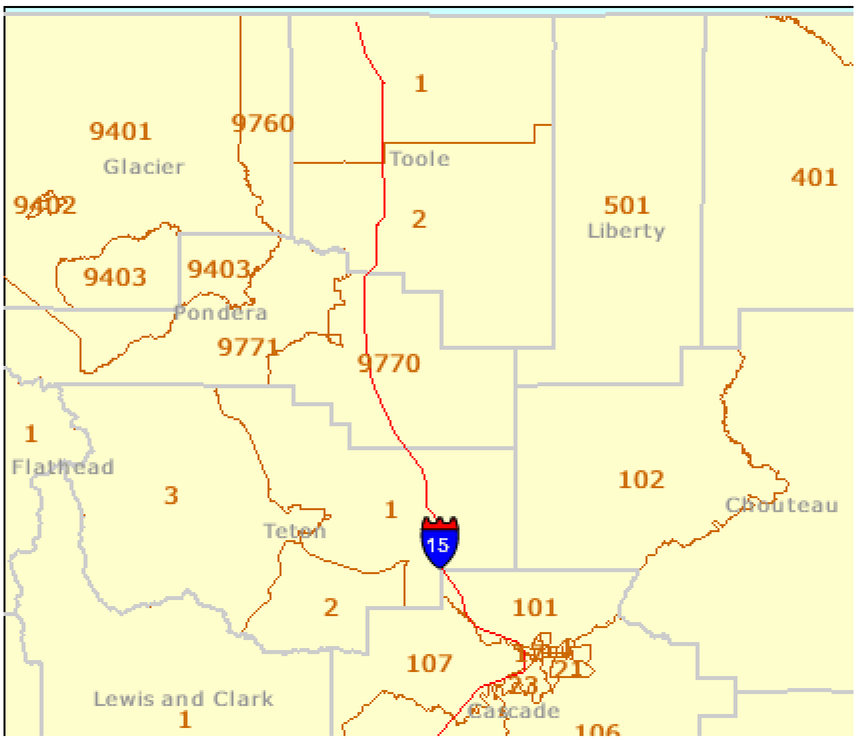


Figure 3.13-1 Census tracts in the region surrounding the proposed Project (Area shown is approximately 130 miles across and does not include the full western extent of CT 9771 in Pondera County; **Figure 1.1-1** shows the Project study area and the location of the three action alternatives.)

[6]As defined by the Census Bureau, census tracts are small, relatively permanent statistical subdivisions of a county. Tracts are delineated by a local committee of census data users for the purpose of presenting data. Census tract boundaries normally follow visible features, but may follow governmental unit boundaries and other non-visible features in some instances; they always nest within counties. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions, census tracts average about 4,000 inhabitants (U.S. Census Bureau 2007a).

As indicated in **Table 3.13-19**, the census tracts located within the study area have much lower total minority population percentages than the United States as a whole, and all but one have smaller percentages of minority populations than the state of Montana. One census tract in the study area (Census Tract 9760 in Glacier County) has an American Indian population that is more than 16 times higher (10.9 percentage points greater) than that tabulated for the United States in the 2000 census, but is only about twice as high (5.6 percentage points greater) as the statewide percentage of American Indians. Glacier County as a whole has a very high American Indian percentage (61.0 percent of the county's population classified themselves as American Indian in the 2000 Census) due to the presence of the Blackfeet Indian Reservation, which is located west of the town of Cut Bank, outside the study area for this EIS. For purposes of incorporating environmental justice considerations into this analysis, the minority population percentage and American Indian percentage in the study area do not appear to be "meaningfully greater" than that in the state of Montana or the United States. The largest concentration of American Indians near the study area, the Blackfeet Indian Reservation in Glacier County, begins just to the west of the study area, and has headquarters over 30 miles away in Browning. The Project is not expected to have disproportionately adverse effects on any of the resources used by area Tribes (see discussion below).

TABLE 3.13-19
RACIAL AND ETHNIC COMPOSITION (BY PERCENTAGE) IN 2000
OF CENSUS TRACTS (CT) WITHIN THE STUDY AREA

Location	Number of residents	White	Total minority	American Indian
CT 101 in Cascade County	3,818	90.5	9.5	4.4
CT 102 in Chouteau County	2,221	97.8	2.2	0.4
CT 9760 in Glacier County	3,996	84.2	15.8	11.6
CT 9770 in Pondera County	4,069	95.5	4.5	2.1
CT 9771 in Pondera County	1,464	94.1	5.9	2.9
CT 1 in Teton County	1,966	95.2	4.8	1.0
CT 1 in Toole County	1,393	94.8	5.2	2.0
CT 2 in Toole County	3,874	92.7	7.3	3.5
State of Montana	902,195	89.5	10.5	6.0
United States	281,421,906	69.1	30.9	0.7

Source: U.S. Census Bureau 2007b

Low-Income Populations. CEQ guidance defines "low-income" using statistical poverty thresholds from the Bureau of Census Current Population Reports, Series P-60 on Income and Poverty, by household. In identifying low-income populations, a population may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effects.

To identify possible low-income populations, DOE used CEQ's definition of low-income households, and compared the percentages of households below the poverty level (i.e., incomes less than or equal to the official 2000 poverty threshold of $17,463 for a family of four) in the eight study area census tracts with percentages tabulated for the state of Montana and the whole United States in the 2000 Census.

Table 3.13-20 lists the low-income population percentages (as indicated by the percentage of households below the poverty level) for the eight census tracts located at least partially within the study area.

TABLE 3.13-20
LOW-INCOME COMPOSITION (BY PERCENTAGE) IN 2000
FOR CENSUS TRACTS WITHIN THE STUDY AREA

Location	Number of households	Percentage of households below the poverty level
CT 101 in Cascade County	1,464	12.9
CT 102 in Chouteau County	893	13.5
CT 9760 in Glacier County	1,578	11.8
CT 9770 in Pondera County	1,646	13.2
CT 9771 in Pondera County	541	20.9
CT 1 in Teton County	741	14.0
CT 1 in Toole County	509	13.8
CT 2 in Toole County	1,453	10.3
State of Montana	358,667	14.0
United States	105,480,101	11.8

Source: U.S. Census Bureau 2007c

As indicated in **Table 3.13-20**, most of the census tracts within the study area have low-income population percentages similar to the state and national averages. However, Census Tract 9771 in Pondera County has a percentage of low-income households (20.9 percent) that is about one-and-one-half times the state percentage of low-income households (6.9 percentage points greater) and more than one-and-three-fourths times the national percentage (9.1 percentage points greater). This is a geographically expansive and sparsely settled census tract. Additional detail on income distribution within the census tract is not available. However, the preponderance of census-reported poverty in this census tract may be attributable to the presence of several Hutterite colonies, the closest of which is the New Miami Colony that is about 9 miles west of Alternative 2 and 7.5 miles west of Alternative 3 (outside the study area for this EIS). Personal and household income data reported for families living in the communal setting of a Hutterite colony may not be consistent with the true household economic situation. Due to the small total size and highly dispersed nature of the population of this census tract, as well as the distance of the Hutterite colonies from the study area for this EIS, this census tract does not appear to be a "low income" population within the meaning of EO 12898.

Environmental Impacts

As discussed above, DOE identified one small "minority" concentration (the American Indians in Census Tract 9760 in Glacier County) and one small "low-income" concentration (Census Tract 9771 in Pondera County) in the study area census tracts. Although these do not appear to be "minority" or "low income" populations pursuant to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, this section examines the potential for the proposed Project to result in disproportionately high and adverse impacts to any minority population (specifically American Indians) and low-income households in the study area.

Methodology: To determine whether there would be disproportionately high and adverse human health or environmental effects of the proposed Project on minority and low-income populations, DOE considered the following (DOE 2004):

- For each alternative, are there any significant adverse impacts to minority and low income populations that would appreciably exceed impacts to the general population or other appropriate comparison group, considering all potential impacts (e.g., health effects, air quality, water quality, cultural resources, cumulative impacts)?

- Would minority and low-income populations have different ways than the general population of being affected by an alternative, such as unique exposure pathways or rates of exposure (e.g., from subsistence fishing), special sensitivities (e.g., to air pollution because of less access to health care and poorer control of asthma), or different uses of natural resources (e.g., for cultural, religious, or economic practices)?

Alternative 1, the no-action alternative, would not result in any adverse impacts that would be experienced disproportionately by minority or low-income populations.

Under the action alternatives, the main environmental impacts potentially affecting residents within the study area would be in the form of changes to the visual setting from the presence of the transmission line and supporting towers. As discussed in Section 3.15.3, each of the alternative alignments would have visual impacts on residents within the study area. However, because these impacts to residents would be distributed along the alternative alignments (as indicated by the locations of houses on **Figures 3.15-1** through **3.15-3**) and not concentrated in Census Tract 9760 in Glacier County or in Census Tract 9771 in Pondera County, the proposed Project's visual impacts would not represent a disproportionately high and adverse effect on American Indian or low-income residents in these locations. Analysis in this EIS found that other potential environmental hazards, including EMF exposure, air emissions, and noise, would not significantly affect the surrounding population, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

As discussed in Section 3.8.3.2, the action alternatives would not negatively affect wildlife populations that could serve as a food source for minority or low-income populations in the area. DOE is not aware of any other special circumstance that would disproportionately impact American Indian or low-income residents.

The proposed Project is within the traditional territories of several Native American tribes, and Census Tract 9760 is just outside the eastern boundary of the Blackfeet Indian Reservation. As discussed in Section 3.14.3, Blackfeet Tribal representatives have stressed the need to evaluate the proposed Project's potential to impact Traditional Cultural Properties (i.e., those sacred sites that have traditional spiritual values for the tribe). Mitigation measures described in Section 3.14.3 (e.g., inclusion of tribal monitors during cultural surveys, establishment of a Memorandum of Understanding [MOU] that includes the Blackfeet's Tribal Historic Preservation Office [THPO]) would help prevent disproportionately adverse effects to Tribal Traditional Cultural Properties.

On the basis of the foregoing analysis, DOE concludes that no disproportionately high and adverse impacts would be expected for minority or low-income populations.

3.14 Paleontological and Cultural Resources

3.14.1 Analysis Methods

Paleontological and cultural resources provide valuable information about the behavior of past plant, animal, and human populations and their environments. Paleontological resources are fossilized plant and animal remains that are rare and have scientific research value. Cultural resources include archaeological sites, historic sites, architectural properties, traditional cultural properties, districts, landscapes, structures, features, or objects resulting from human activity. Both resources are nonrenewable and irreplaceable, and Montana state law requires that inventory for and evaluation of these resources occur before they are impacted by ground disturbing activities or removed from state ownership.

Federal regulations that were considered for this analysis include the National Historic Preservation Act of 1966, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, the American Indian Religious Freedom Act of 1977, the Native American Graves Protection and Repatriation Act of 1990, and Executive Orders relevant to cultural resources. State legislation considered includes the Montana Antiquities Act and the Montana Human Remains and Burial Site Protection Act.

Known prehistoric cultural resource sites (thousands of years old) and historic sites (at least 50 years old) have been documented in the project area. The number and variety of sites increases through time due to population increases and the effects of immigration. Existing sources of information were consulted in order to analyze paleontological and cultural resources, as described below.

<u>**Information Resources**</u>

The Montana Antiquities Database maintained by the Montana State Historic Preservation Office (SHPO) in Helena was the primary source for information about specific cultural resource sites and paleontological localities in the project study area. The Cultural Resources Information System (CRIS) contains summary information about previously recorded resources by site type and township, range, and quarter section. The Cultural Resources Annotated Bibliography System (CRABS) contains listings of previous resource inventories by township, range, and section. A search for sites listed in the National Register of Historic Places (NRHP) was conducted through SHPO and on-line through the National Park Service, as appropriate.

A variety of literature references including Frison (1991, 2001), Greiser (1984, 1994), Hanna (2003), Malone and Roeder (1976), Montana State Engineer's Office (1964), Montana Water Resources Board (1969), Schwantes (1996), Toole (1959), and Walker and Sprague (1998) were used in preparation of sections of this EIS related to paleontology, prehistory, and history. Information from Class I and Class III cultural resources inventories (Ferguson 2007; Petersen and Ferguson 2006) was also incorporated.

Analysis Area

The analysis area for paleontological and cultural resources is at least 480 square miles with a research area extending 2 miles to either side of the proposed and alternative alignments (figures showing these alignments are provided in Chapter 2).

In the Great Falls area, the lacustrine basins and related features are interspersed with areas of nearly level to steep soils on terraces, fans, and benches mixed with strongly sloping to steep soils on dissected sedimentary bedrock plains and hills. From just north of the Cascade County line to the Canadian border, the analysis area crosses the undulating to strongly rolling topography of the Glaciated Missouri Plateau section of the Great Plains physiographic province. This part of the area is also interspersed with nearly level soils in lacustrine basins surrounded by strongly sloping soils on terraces, fans, and benches. The lush grasslands once found in the area during much of the prehistoric past provided sufficient food for large herds of bison, antelope, and deer, with elk found in or near forested areas closer to the mountains or in the river breaks. These animals were not only food sources, but also provided materials for clothing, tools, and shelter. Grizzly and black bear were likely common and there was a wide variety of game birds and migratory water fowl. Other plant resources would provide roots, bulbs, fruits, berries, greens, and leaves for eating, making teas, and for medicinal purposes. Stone material left behind by glaciers or exposed by erosional episodes were used for hide anchors on tipis, piled for use as cairns or alignments for animal drive lines, and worked into stone tools.

Cultivation of much of the analysis area for more than the past century has impacted many of the shallow prehistoric cultural resource sites such as tipi rings or campsites in areas of little soil development. Intact prehistoric sites can be anticipated in areas of deep soils either on terrace or bench surfaces or in drainages where redeposited soils would protect them. Historic homestead, farm, or ranch buildings or foundations and related features or structures might be more visible in the agricultural areas.

3.14.2 Affected Environment

Paleontological Sites

A fossil is defined as the remains, trace, or imprint of a plant or animal that has been preserved in a geologic context. These fossils are grouped into categories including: trace, plant, invertebrate, fish, amphibian, reptile, dinosaur, bird, mammal, and vertebrate. A trace fossil (ichnofossil) is a track, trail, burrow, or tube formed by the activity of an animal. Coprolites, or fossilized dung, are also trace fossils. Fossilized plants occur as physical remains (petrified wood) or imprints (leaf impressions). Stromatolites (laminated algal mounds) and Cyanobacteria (blue-green algae) are included in the plant category. Invertebrates are animals without backbones that inhabit marine, freshwater, and terrestrial environments, and are also found in the study area.

The geologic formation with the highest probability of containing fossils in the study area is the Two Medicine Formation. The only other formations with low to moderate probability of containing fossils include the Eagle, Kootenai, and Virgelle. The remaining formations or geologic types within the Study Area have little or no potential to contain fossils. Areas within the Two Medicine, Eagle, Kootenai, and Virgelle formations with potential to contain fossils primarily occur on steep exposed slopes above major river channels north from the Conrad area. In general, the distribution of fossils has not been determined at other locations within the Study Area since most of the Cretaceous rocks are covered by 1 to 15 feet of glacial deposits, and no paleontological fieldwork is reported. However, the likelihood of encountering new fossil types of significance to the scientific community is thought to be low because of the low amount of disturbance to deeper layers.

Cultural Sites

In some parts of the analysis area the nomadic, hunting and gathering lifeway persisted until European contact, while many Native American groups throughout the western United States generally became sedentary, settling in permanent or semi-permanent dwellings. By Late Prehistoric times the native populations were often settled into seasonal camps or villages, with those living on and near the Plains becoming specialized nomadic bison hunters. Known prehistoric site types in the analysis area include: tipi rings, buffalo jumps, open camps, lithic scatters, and cairn sites. Other site types that might be anticipated are house pits, cache pits, caves, rockshelters, kill or processing sites for other herd animals, lithic material quarries, pictographs, petroglyphs, medicine wheels, vision quest sites, and human burials.

Known historic site types in the analysis area likely include: exploration and overland migration sites, such as trails (likely Native American in origin), river fords, wagon roads, encampments, or geologic/geographic landmarks; inscriptions, including pictographs, petroglyphs, or tree carvings; transportation sites, such as late nineteenth-early twentieth century roads, railroad engineered features (bridges, trestles, ballast, track, and ties) and construction camps; isolated trappers cabins; homesteading, ranching, and farming sites, such as residences (including foundations), outlying buildings and structures, cultural landscape elements (including fences, field/pasture patterns, stock ponds and dams, stock trails, and river fords), irrigation structures, and artifact scatters; mining and mine related sites; and abandoned town sites, including foundations and trash dumps.

Summary of Previously Recorded Data

A Class I review of previously recorded cultural resources and previous cultural resource inventories for the MATL proposed transmission line analysis area indicates that there are known prehistoric and historic cultural resources in or near the Proposed Action and the Alternative 3 (Petersen and Ferguson 2006). An additional Class I search for previously recorded cultural resources in sections containing Alternative 4 segments was conducted in November 2006. All Class I information is summarized in **Table 3.14-1**. The searches are computerized searches of records maintained by the SHPO using township, range, and section legal descriptions. The resulting data indicate the presence or absence of cultural resources in a section but not necessarily on the route of a specific alternative.

In total, ten sites, one prehistoric and nine historic, are eligible for the NRHP on the basis of consensus determination between the SHPO and a lead Federal or state agency. Cascade County contains the eligible Rainbow Dam Road 24CA416, which is located in sections containing Alternatives 2, 3, and 4. Another Cascade County site is 24CA1040, an eligible historic transmission line, crossed by Alternative 4. Site 24PN24 is an eligible tipi ring site along both Alternative 2 and Alternative 3 in Pondera County. Sites 24PN109 and 24PN111 are historic irrigation systems located in Pondera County intersecting Alternatives 2 and 3. Two eligible sites located in Pondera County are an historic railroad (24PN114), along Alternatives 2 and 3, and an historic oil refinery (24PN117), along Alternative 3. Sites 24GL191 and 24PN114 are portions of the Great Northern Railway; now part of the Burlington Northern-Santa Fe, located in Glacier and Pondera counties along Alternatives 2, 3, and 4. While the exact route of the Lewis and Clark National Historic Trail through the analysis area has not been identified, it is known that it followed the Marias River and is a resource of concern. Finally, two irrigation systems in Pondera County (24PN87 and 24PN88) are eligible historic sites.

TABLE 3.14-1 RESULTS OF CLASS I INVENTORY			
Site Type	**Consensus Determination of Eligibility**	**No Determination or Unknown Eligibility**	**Not Eligible (Determined by SHPO)**
Alternative 2 **Prehistoric Sites**			
Tipi Ring Sites	**24PN24**	**24TT1008 24PN21 24PN5 24GL55**	**24PN112**
Buffalo Jumps	**--**	**24GL348 24GL587**	**--**
Cairn Sites	**--**	**24GL1032**	**--**
Historic Sites			
Historic Road/Trail	**24CA416**	**24CA645 24PN83**	**--**
Railroads	**24GL191/24PN114**	**--**	**--**
Railroad/Stage routes		**24PN34**	**--**
Bridges	**--**	**24PN46**	**--**
Homesteads/ Farmsteads/ Residences	**--**	**24PN119**	**--**
Irrigation Systems	**24PN88, 24PN109, 24PN111**	**--**	**--**
Alternative 3 **Prehistoric Sites**			
Tipi Ring Sites	**24PN24**	**24PN21 24GL55**	**--**
Buffalo Jumps	**--**	**24GL348 24GL587**	**--**
Cairn Sites	**--**	**24GL1032**	**--**
Historic Sites			
Historic Road/Trail	**24CA416**	**--**	**--**
Railroads	**24GL191/24PN114**	**--**	**--**
Bridges	**--**	**24PN46**	**--**
Homesteads/ Farmsteads/ Residences	**--**	**24PN82**	**24PN115 24PN116**
Irrigation Systems	**24PN87, 24PN109, 24PN111**	**--**	**--**
Historic Oil Refinery	**24PN117**	**--**	**--**
Unknown Historic	**--**	**24TT1006 24PN20**	**--**

TABLE 3.14-1 RESULTS OF CLASS I INVENTORY			
Site Type	**Consensus Determination of Eligibility**	**No Determination or Unknown Eligibility**	**Not Eligible (Determined by SHPO)**
Alternative 4 - Segments **Prehistoric Sites**			
Tipi Ring Sites	--	**24CA194 24CA195 24CA196 24TT1008 24PN773 24PN61**	--
Lithic Scatter	--	**24CA192 24CA193**	--
Camp Site	--	**24CA445 24CA494**	--
Historic Sites			
Historic Road/Trail	**24CA416**	**24PN83**	--
Railroads	**24GL191**	--	--
Homesteads/ Farmsteads/ Residences	--	**24CA190 24CA191 24CA199 24PN91 24PN95**	--
Irrigation Systems	**24PN88**	**24PN551**	--
Historic Trash Dump	--	**24PN62**	--
Mining	--	**24CA976**	--
Historic Transmission Line	**24CA1040**	--	--

Note:
-- No reported site

Subcontracted personnel conducted an intensive pedestrian or Class III cultural resources inventory between May and November 2006 along much of Alternative 2 (Ferguson 2007). This inventory was conducted along undisturbed segments of Alternative 2. The intensive pedestrian cultural resource inventory was undertaken in areas of native grasslands, bases and edges of bluffs, stream terraces, and all Federal lands regardless of prior disturbance. The inventory covered a 500-foot-wide corridor centered on the proposed transmission line and a 100-foot-wide corridor along undeveloped access roads. The inventory process included analysis of visual effects on individual sites and cultural landscapes within one mile of the proposed centerline. Sites were recorded and evaluated for NRHP-eligibility according to SHPO standards. Any tribal consultation was to be undertaken by the lead Federal agency. All Class III information is summarized in **Table 3.14-2**.

TABLE 3.14-2
RESULTS OF CLASS III INVENTORY, ALTERNATIVE 2

Site Type	NRHP-Eligible	Unevaluated/Unresolved NRHP-Eligibility	Not Eligible (Consultant Recommendation)
Prehistoric Sites			
Tipi Ring Sites	24PN24[1]	24GL1120 24GL1121 24GL1125 24GL1126 24GL1127 24GL1132 24PN148 24PN150 24PN152 24PN153 24PN154 24PN156 24PN158 24PN159 24TT574 24TT575 24TT576 24TT577 24TT578 24CA1053	24PN112[3]
Buffalo Jump	--	24GL587	--
Multi-component sites	24PN5/24PN147[2]	--	--
	--	--	--
Historic Sites			
Historic Road/Trail	--	--	--
Railroads	24GL191[1]/24PN114[1]	--	--
Railroad/Stage Route	--	24PN34	--
Bridge	--	--	--
Homesteads/ Farmsteads/ Residences/ Structures	24PN149[2]	24GL1119	24GL1133[2] 24GL1134[2] 24GL1136[2] 24PN157[2]
Irrigation Systems	24PN83[1] 24PN88[1] 24PN109[1] 24PN111[1]	--	--
Historic Oil Camp	--	--	24GL1135[2]
Historic Trash Dump	--	--	24PN151[2]
Historic graffiti	--	--	24PN155[2]

Notes:
1 – Previous Consensus Determination
2 – Consultant Recommendation
3 – Site subjected to mitigative measures, no longer exists

A total of 10 previously recorded cultural resource sites are located within, or are crossed by, the 500 foot inventory corridor. Four of the previously recorded sites are prehistoric, one of which (24PN24) has been determined NRHP-eligible, one (24PN5/24PN147) is recommended eligible, the eligibility of one (24GL587) is unresolved, and one (24PN112) was destroyed following recording and testing as mitigative measures. Of the six previously recorded historic sites, four irrigation canals (24PN83, 24PN88, 24PN109, and 24PN111) and portions of the Great Northern Railway (24GL191/24PN114) have been determined NRHP-eligible; the eligibility of one, an historic travel route (24PN34), is unresolved. The Class III inventory also located 30 previously unrecorded cultural resource sites in the inventory corridor. The 21 prehistoric sites have not been evaluated for NRHP eligibility. Of the nine historic sites, one homestead (24PN149) is recommended NRHP-eligible, while seven of the remaining eight are recommended not eligible and the eighth is unevaluated.

3.14.3 Environmental Impacts

Paleontological Resources

As part of MATL's mitigation program, pre-construction reconnaissance would be conducted in areas where potential paleontological or fossil discovery exists. If found, fossil data would be recorded by trained professionals (with landowner permission). Under these conditions, the project may result in the beneficial impact of unknown or little studied fossils being discovered (MATL 2006).

Direct effects to paleontological resources from development projects such as the MATL proposed transmission line, include earthmoving or ground clearing activities, blasting of bedrock for tower foundations or access roads, boring for geotechnical surveys or placement of guy wires, and pedestrian or vehicular traffic. Indirect effects of projects such as the MATL transmission line include access to areas that were formerly not accessible. Access can lead to intentional damage to paleontological resources, such as unauthorized collecting, theft, and defacement, and result in the loss of information and destruction of the resource. An unanticipated discoveries plan that addresses discovery of paleontological resources in high probability areas during construction should be developed prior to project implementation.

Cultural Resources

Previous cultural resource inventories and/or recording of properties in the broader study area resulted in no properties listed in the NRHP being located on any of the alternative alignments. A segment of one NRHP-listed property, the Mullan Road (24CA89), is reportedly located in a section adjacent to the southern end of Alternatives 2 and 3 on the Benton Lake National Wildlife Refuge. This cultural resource site has never been located on the ground and formally recorded. It is recommended that if either alternative is selected the area be thoroughly reviewed for intact portions of the property.

Nine cultural resource sites located along one or more of the alternative alignments are listed as NRHP-eligible by consensus determination in the SHPO CRIS system. One multi-component prehistoric site (24PN5/24PN147) is located along and near Alternative 2. One prehistoric tipi ring site (24PN24) is located along Alternatives 2 and 3. One historic road/trail (24CA416) and an historic railroad route (24GL191/24PN114), still in use, are crossed by Alternatives 2, 3, and 4. Historic irrigation systems (24PN109 and 24PN111) are crossed by Alternatives 2 and 3, while historic irrigation systems (24PN83 and 24PN88) are crossed by Alternatives 3 and 4.

The recommended treatment of either NRHP-listed or eligible cultural resource properties is avoidance, if at all possible, and protection. Many of the known, NRHP-eligible cultural resource sites within or crossed by the various alternatives are either limited in size or are linear sites. Direct impact to these sites can likely be avoided by adjusting the location of individual structures and roads.

Locations of Traditional Cultural Properties or potential locations identified by knowledgeable tribal members should be avoided. Traditional Cultural Properties or sacred sites are places that have traditional spiritual values for Montana Native people (Indian tribes or Indian religious practitioners) that are reverently dedicated to a person or object or event or activity and are secured against violation or infringement or interference.

In order to protect and preserve Indian religious practices, Executive Order 13007 and other laws and Executive orders of the U.S. Government place specific requirements on each executive branch agency with statutory or administrative responsibility for the management of Federal lands. Those agencies must, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners; avoid adversely affecting the physical integrity of sacred sites; and, where appropriate, maintain the confidentiality of sacred sites.

In the MFSA application, MATL stated that during a meeting Blackfeet Tribal representatives stressed the need to evaluate the proposed Project’s potential to impact traditional landscape and land use values. Inclusion of tribal monitors during cultural surveys and/or review of cultural resource findings by THPO personnel were suggested to assist in appropriate treatment of prehistoric findings. In addition, MATL is addressing Tribal issues with an appropriate level of cultural survey established through MOUs (MATL 2006).

During the summer of 2007, ethnographers and consultants representing the Blackfeet Tribe reviewed the Class I and class III cultural resource inventory reports and conducted field visits of four prehistoric sites. The Blackfeet consultants found the sites containing stone alignments, tipi rings, rock piles or cairns, and bison remains of particular relevance. As they visited the sites they found ceremonial [mineral] paint sources, traditionally utilized plants, traditionally utilized animals and their habitats (e.g., eagle nests, horned toads), rocks and fossils, and old graves not previously recorded by the cultural resource crews. The Blackfeet consultants consider the study area holy not only because of a connection with a culture hero, but also because the cultural resources located throughout the area, all of which are considered significant, are integral to Blackfeet culture and identity and to the future education of their children. Their recommendation is that all identified prehistoric cultural resources be avoided (Zedeño et al 2007).

Cultural resource properties and Traditional Cultural Properties where the NRHP eligibility is unknown, has not been determined, or is unresolved can either be avoided, if possible, or subjected to sufficient investigation to determine or resolve eligibility. In their report, the Blackfeet consultants recommended recording and mapping of possible stone effigies at sites 24PN150 and 24PN24 and they recommended excavation and documentation of any feature to be disturbed at sites that cannot be avoided. They further recommended that Blackfeet elders and monitors be hired and present during any excavations and any recovered artifacts be curated with the Blackfeet Tribe (Zedeño et al 2007).

If Alternatives 2, 3 or 4 are selected, then unevaluated cultural resource properties and Traditional Cultural Properties along the route should be individually evaluated in terms of Project effect. In addition, an intensive cultural resource inventory of areas not previously inventoried to Montana SHPO standards is necessary to comply with regulations in the Montana Antiquities Act, as amended (1995). Portions of a selected alternative along or within one-half mile of rivers, flowing streams, lakes, springs, or seeps should be considered high probability areas especially for prehistoric cultural resource sites and Traditional Cultural Properties. Such areas may also be more likely to contain historic sites, although intact homesteads may be more broadly distributed based on the system of patenting land in the late nineteenth and early twentieth centuries. Certain topographic features, such as those conducive to buffalo jump sites or high points for observation, should also be considered likely areas to contain prehistoric sites and Traditional Cultural Properties.

Areas least likely to contain cultural resource sites or NRHP-eligible sites are those areas far from reliable water and those areas where food or tool making resources would not occur. While areas subjected to plowing for farming may be less likely to contain intact cultural resource sites, plowed areas of well- developed soil may still contain intact prehistoric cultural resources.

Direct effects to cultural resource sites from development projects such as the MATL proposed transmission line include earthmoving or ground clearing activities and pedestrian or vehicular traffic. There is the potential for visual impacts to above-ground resources, such as historic buildings or houses. Indirect effects of projects such as the MATL proposed transmission line include soil erosion from earthmoving activities and access to areas that were formerly not accessible. Access can lead to intentional damage to cultural resource sites such as looting and vandalism, including unauthorized relic collecting, theft, and defacement, and result in the loss of information and destruction of the resource. An unanticipated discoveries plan that addresses discovery of artifacts or cultural resource sites during construction should be developed prior to project implementation.

3.14.3.1 Alternative 1 – No Action

Under the No Action Alternative, the proposed Project would not be constructed. Thus there would be no impacts to cultural resources or any Traditional Cultural Properties.

3.14.3.2 Alternative 2 – Proposed Action

The Class 1 cultural resource searches resulted in the identification of six previously recorded sites considered eligible for the NRHP in sections along Alternative 2. These sites include the Rainbow Dam Road, the Burlington Northern-Santa Fe Railroad, one other historic railroad, a large tipi ring site, and two historic irrigation systems. There are 12 sites where NRHP-eligibility has not been determined, is unknown, or is unresolved. This group includes four tipi ring sites, two buffalo jump sites, a prehistoric site consisting of stone cairns, two historic roads or trails, a railroad, a bridge, and a homestead. There is one previously recorded tipi ring site that was determined not eligible for the NRHP.

The Class III inventory, which was only conducted along undisturbed segments of Alterative 2, resulted in the relocation of seven previously recorded cultural resources sites considered NRHP-eligible. These include a large tipi ring site, multi-component prehistoric site, the Burlington Northern-Santa Fe Railroad, and four historic irrigation systems. A newly recorded historic homestead is recommended NRHP-eligible. There are 21 sites where NRHP-eligibility has not been determined, is unknown, or is unresolved. This group includes 20 tipi ring sites, one buffalo jump site, one historic railroad or stage route, and a homestead. There is one previously recorded tipi ring site that was tested and destroyed and is no longer considered eligible for the NRHP. There are seven historic sites recommended not eligible for the NRHP.

3.14.3.3 Alternative 3 – MATL B

The Class 1 cultural resource searches resulted in the identification of seven previously recorded sites considered eligible for the NRHP in sections along Alternative 3. These sites include the Rainbow Dam Road, the Burlington Northern-Santa Fe Railroad, one other historic railroad, a large tipi ring site, an historic oil refinery, and two historic irrigation systems. There are nine sites where NRHP-eligibility has not been determined, is unknown, or is unresolved. This group includes two tipi ring sites, two buffalo jump sites, a prehistoric site consisting of stone cairns, an historic bridge, a homestead, and two sites only described as historic. There are two previously recorded homestead or residence sites that were determined not eligible for the NRHP.

3.14.3.4 Alternative 4 – Agency Alternative

The Class 1 cultural resource searches resulted in the identification of four previously recorded sites considered eligible for the NRHP in sections along Alternative 4. These sites include the Rainbow Dam Road, an historic transmission line, an historic irrigation system, and the Burlington Northern-Santa Fe Railroad. There are 19 sites where NRHP-eligibility has not been determined, is unknown, or is unresolved. This group includes six tipi ring sites, two lithic scatter sites, two prehistoric camp sites, an historic road or trail, five homesteads, one historic irrigation systems, one historic trash dump, and one historic mining site.

Two NRHP-eligible sites, 24CA416 the Rainbow Dam Road and 24CA1040 an historic transmission line just north of the Missouri River, are located in sections along Alternative 4. The sections crossed by Alternative 4 contain three of the tipi ring sites, the two lithic scatter sites, the two prehistoric camp sites, three of the homesteads, and the historic mining site in the category of undetermined, unknown, or unresolved NRHP eligibility.

One section along Alternative 4 contains one tipi ring site of undetermined NRHP eligibility. Several sections along Alternative 4 contain two of the tipi ring sites, two of the homesteads, the historic irrigation system, and the one historic trash dump in the category of undetermined, unknown, or unresolved NRHP eligibility.

Two sections along Alternative 4 contain the historic road or trail and the historic irrigation systems both of undetermined NRHP eligibility. Two additional sections along Alternative 4 contain the NRHP-eligible Site 24GL191, the Great Northern Railway – now part of the Burlington Northern-Santa Fe.

3.15 Visuals

3.15.1 Analysis Methods

Analysis Area

The visual resource analysis was developed using a resource analysis area 3 miles on either side of the proposed transmission line alternatives for reasons discussed in Section 3.15.3.

Information Sources

Visual resources refer to the natural and man-made features in the resource analysis area and include cultural and historic landmarks, landforms of particular beauty or significance, water surfaces, and vegetation. Together, these features form the overall impression that a viewer receives of an area or its landscape character.

Data and information for this section were compiled and refined from a variety of sources and verified by ground reconnaissance by Montana Alberta Tie, Ltd. during July and August 2005. Additional ground reconnaissance was conducted during May 2006 by DEQ and Tetra Tech. Additionally, aerial photographs were used to validate, change, or add to existing CAMA residential location information. Some of this information was originally compiled by AMEC Earth and Environmental for the MFSA application (MATL 2006b) and confirmed for use in this analysis.

Visual environmental impacts were analyzed in part by using computer generated photographic simulations. Technical information about these photographic simulations is provided in **Appendix L**.

3.15.2 Affected Environment

Landscape Character

The Project area is located in the Northwestern Glaciated Plains ecoregion (Nesser and others 1997) and is characterized by level to gently rolling glaciated plains crossed by alluvial corridors of the Marias and Teton rivers and their tributaries. Both dryland cultivation and irrigated cropland are common throughout the Project area (Montana Environmental Quality Council 1972). This agricultural land base gives the landscape its characteristic and dominant patterns of linear strips and blocks of dryland cultivation and circular and rectangular shapes associated with irrigated fields. Field colors that change seasonally among greens, yellows, and browns accentuate these strong landscape patterns. Scattered parcels of rangeland and native grassland found in steeper coulees and rough terrain throughout the Project area provide additional color and texture in the viewed landscape.

Alluvial floodplains of the Marias and Teton rivers provide more topographic relief and diverse vegetation than surrounding uplands and plains. Mature cottonwood stands, riparian undergrowth of willows, boxelder, and chokecherry, eroded rock formations on valley walls, and meandering river channels contribute to a higher scenic quality in these floodplain corridors. In addition to these alluvial corridors and rivers, area lakes such as Benton and Hay lakes and Black Horse Lake, which is ephemeral, provide another type of water feature in the Project area. Scattered prairie potholes and wetlands dominated by trees, shrubs, emergents (cattails, bulrush), mosses, or lichens are also found in the Project area.

The cultivated and rural landscape provides the dominant cultural setting for the Project area. Rural farms and ranches dot the landscape, increasing in density where irrigation is present. Developed commercial and residential settings are found at small communities like Power, Dutton, and Brady, and the larger communities of Cut Bank and Conrad. Great Falls, at the southern edge of the Project area, is the only urban setting. Visual linear elements, including Interstate 15, state and local roads, railroads, and transmission lines crisscross the region, providing transportation and energy links for residents and commercial use. Other cultural modifications include the scattered oil and gas fields in the northern portion of the Project area and radio towers near Cut Bank and Great Falls. Dryland and irrigated cultivation are visually dominant throughout the Project area. Although cultural modifications and industrial development are present and visible in typical views, these modifications are typically subordinate to the predominant agricultural landscape.

Views are typically expansive throughout the entire Project area, extending across rolling uplands and plains to the Rocky Mountain Front and island ranges such as the Sweet Grass Hills and Highwood Mountains. Only in the alluvial valleys of the Teton and Marias rivers, their tributaries, and in steep coulees with some degree of topographic relief do views become more enclosed and limited.

Landscape Rating Units and Scenic Quality

The analysis area has been subdivided into landscape units for rating purposes (MATL 2006b). The rating areas (provided below) were delineated on a basis of: (1) similar physiographic characteristics; (2) similar visual patterns, texture, color, variety, and other features; and (3) areas that have similar impacts from man-made modifications. The landscape ratings and scenic quality assessments are based on a visual quality analysis methodology based on BLM methodology (BLM 1984).

The scenic quality of each of the landscape units is provided at the end of each unit description. Scenic quality is a measure of the visual appeal of a tract of land or scenic quality rating unit. Scenic quality rating units can be assigned an A (outstanding), B (above average), or C (common) rating based on the apparent scenic quality, which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (BLM 1984). No Class A areas are present. Those areas classified as Class B are shown on **Figures 3.15-1, 3.15-2,** and **3.15-3**.

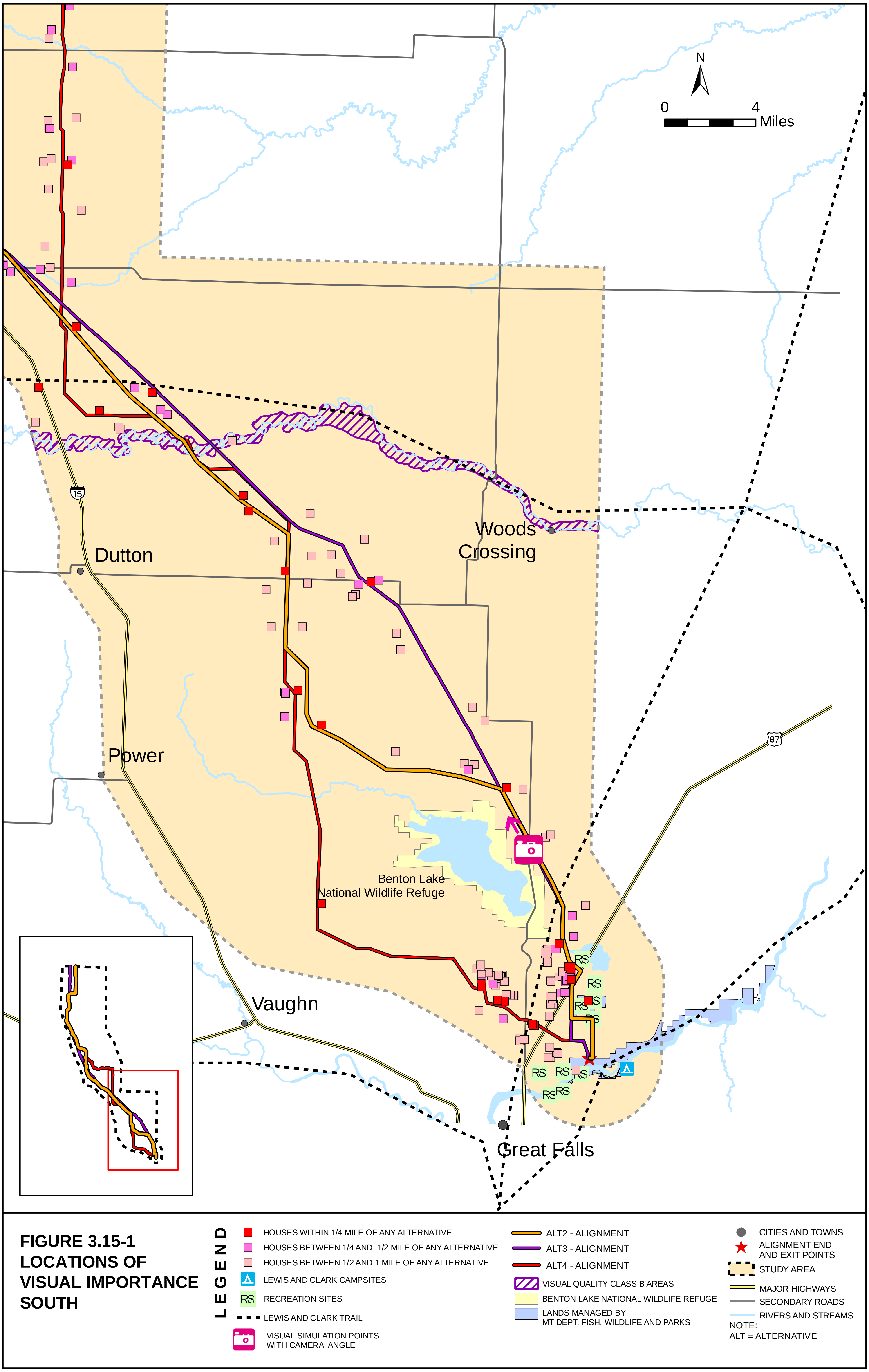
Alluvial Corridors
This unit constitutes narrow strips of land following coulees, creeks, and major rivers crossing the visual analysis area. The unit is moderately diverse in terrain, vegetation, and water features. Corridors along coulees and creeks in the analysis area are designated as Class C because their landform and vegetation are fairly common in the analysis area. The Marias River corridor and the Teton River corridor are designated as Class B due to floodplains, diverse vegetation patterns, river meanders, and topographic relief present in the setting.

Wetland Areas
Wetlands found in the visual analysis area include:

- permanently flooded lakes and reservoirs, and intermittent lakes;
- wetlands found along creek channels and coulees and in association with prairie potholes; and
- wetlands that have natural or artificial channels and periodically or continuously flowing water such as the permanently flooded river channel bottoms associated with the Marias and Teton rivers.

Figure 3.6-1, 3.6-2, and 3.6-3 show the locations of all mapped wetlands within the MATL Project study area. Most wetlands provide diverse vegetation and have low landform diversity and are designated as Class C. The wetlands associated with the Marias and Teton Rivers are designated as Class B because they contain a combination of diverse vegetation and a water feature.

Rims, Ridges, and Buttes
Several rims, ridges, and buttes occur in the Project study area. Prominent features include Lookout Butte, Abbott Ridge and Trunk Butte south of Cut Bank, West Knob and East Knob north of the Teton River in Chouteau County, Teton Ridge, and the Sun River/Missouri River Rim in the southern Project study area. These features are designated Class C because they offer less vegetation diversity than the Class B areas shown on **Figures 3.15-1**, **3.15-2**, and **3.15-3** and little visual variety.



GIS map by Ed Madej -TTEMI-HE Fig3_15-1_MATL_visual_mpacts_south_part_012007.mxd

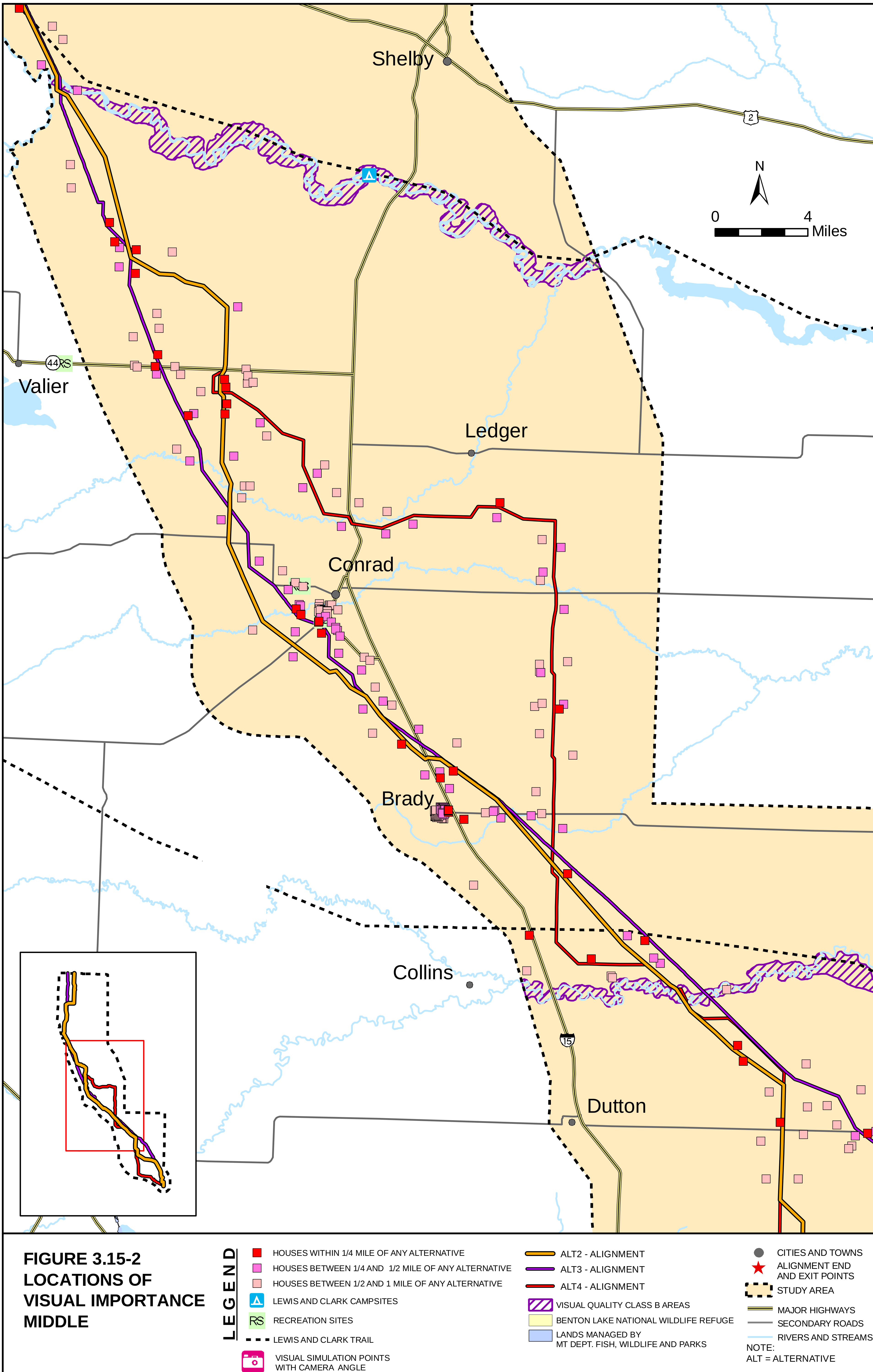


FIGURE 3.15-2 LOCATIONS OF VISUAL IMPORTANCE MIDDLE

GIS map by Ed Madej -TTEMI-HE Fig3_15-2_MATL_visual_impacts_middle_part_012007.mxd

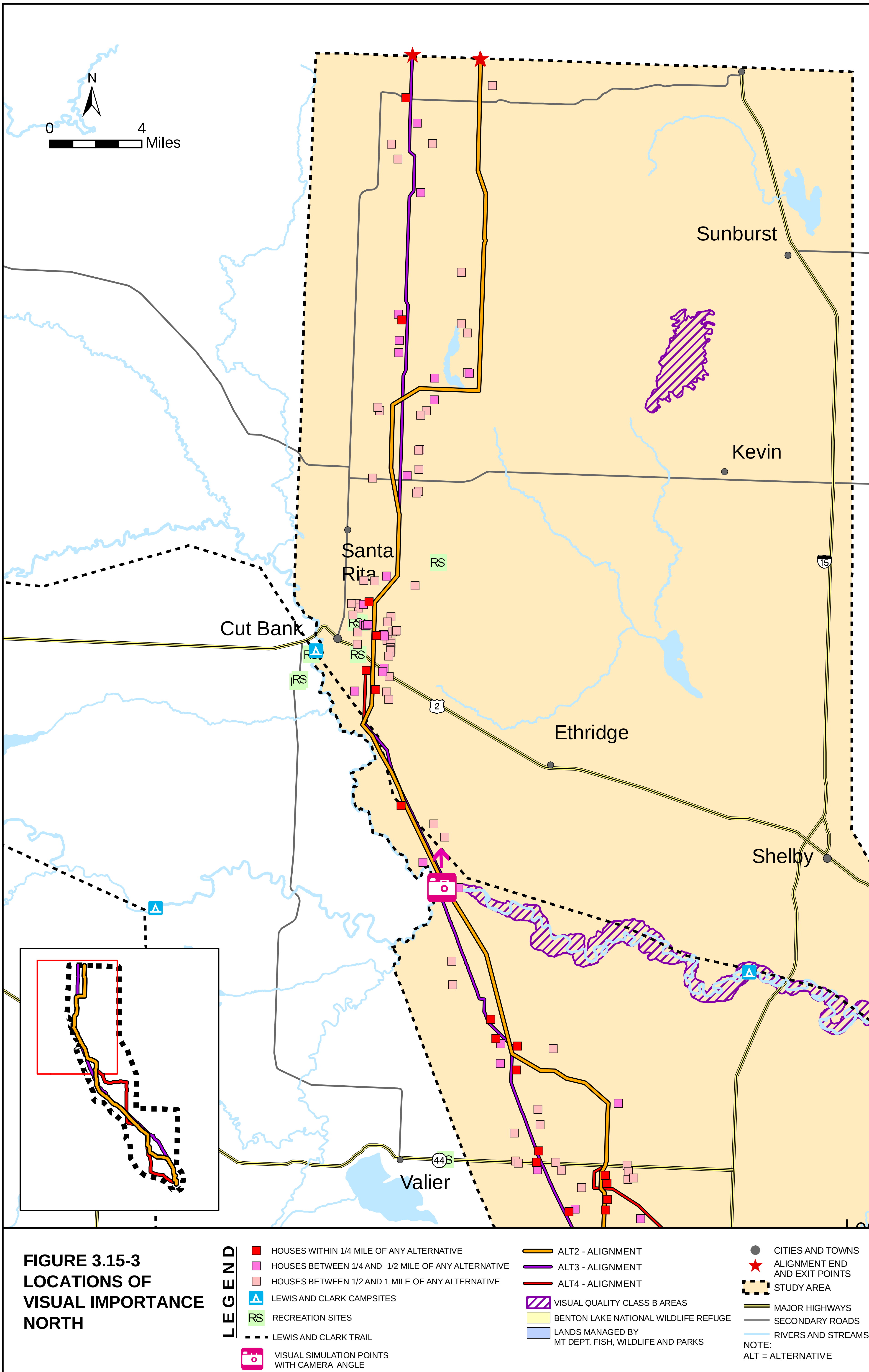


FIGURE 3.15-3
LOCATIONS OF VISUAL IMPORTANCE NORTH

Uplands and benchlands
Uplands and benchlands comprise the majority of the Project study area. Benchlands are characterized by gently sloping terrain, expansive views, and cropland use. They occur predominantly in the center of the Project study area between the Marias River and Pondera Coulee and in the northern part of the study area associated with Kevin Rim. Rolling uplands with a fairly uniform landscape of gently sloping wheat fields and grassland constitute the remainder of the Project study area. These landscapes are designated Class C because their landforms, vegetation, and cultural modifications are common to the analysis area.

Existing Inventories

Federal and state land managers and local/county officials have not developed maps that establish an inventory of scenic attractiveness, distance zones or concern levels, scenic classes, and visual absorption capability for any portion of the Project study area.

Travel Routes

Travel routes include the primary and secondary roads shown in **Figures 3.15-1**, **3.15-2**, and **3.15-3**.

3.15.3 Environmental Impacts

Distance Zones and Visual Influence Zones

Distance zones were established based on thresholds for visual perception of form, texture, color, and line (BLM 1984). These visual criteria change as distance from a viewpoint increases. Detailed elements on the landscape tend to become less obvious and detailed at longer viewing distances. Elements of form and line become more dominant than color and texture at longer viewing distances. Four distance zones were established:

- Immediate Foreground (0 to 0.25 mile) — The immediate foreground is the dominant view threshold. Details are easily perceived and obvious. Changes may dominate the landscape.
- Foreground (0.25 to 0.5 mile) — The foreground is the viewed area in which details are perceived and obvious, though less so than the immediate foreground.
- Middleground (0.5 to 1 mile) — The middleground is the zone where details of foliage and fine textures are less perceptible. Vegetation begins to appear as patterns. Form and line are more dominant visual elements.

- Background (1 to 3 miles) — The background is the portion of the landscape where texture is weak and landform becomes the most dominant element.

Impact Types and Levels

Most visual impacts are direct and long term. The major impact concern assessed by the visual resources study is the potential for a decline in aesthetic quality. Visual impact types evaluated include the following:

- Effects on scenic quality
- Effects on views from residential, commercial, institutional, and other visually sensitive land uses (existing and planned)
- Effects on views from travel routes
- Effects on views from established, designated or planned park or recreation areas
- Visual contrast resulting from different structure types and/or materials, and construction of new access trails

Determination of potential impacts and levels was based on assessing: (1) physical contrasts or landscape changes that would result from the project and (2) the degree of visibility that the project would have from each sensitive land use or scenic area (key observation points) (DOE 1986). Visibility levels for key observation points were determined by assessing viewer sensitivity, distance from the proposed Project, and duration of views. The impact levels for areas with a current non urban area land use are described below. **Table 3.15-1** provides a summary of the impact levels for various observation points.

Major Impact – A high level of impact would result if the construction and operation of the transmission line would potentially cause substantial adverse change to viewers at residential and designated recreation sites or result in substantial and noticeable landscape alteration in areas of above average or outstanding visual quality. Generally, structures within the immediate foreground and foreground (½ mile) of residences, immediate foreground of recreation sites, or within areas of Class B scenic quality would result in a major impact. Structures within the immediate foreground or foreground of primary use travel corridors would result in a major impact.

Minor Impact – A minor level of impact would result if the construction and operation of the transmission line would potentially result in a noticeable landscape alteration in areas of average visual quality to viewers at residences, designated recreation sites (including the Lewis and Clark trail corridor), or along travel corridors. Generally, structures within the foreground (¼ to ½ miles) of recreation sites and within the middleground (½ to 1 mile) of residences would result in a minor impact. Structures within the middleground of primary use travel corridors would result in a minor impact.

Very Minor Impact – A very minor impact is the result of a small degree of landscape alteration in areas of average or common visual quality. Views of the transmission line within the middleground and background of recreation sites, within the background of primary use travel corridors, within the background of residences, or within middleground and background of secondary use travel corridors would result in a very minor impact.

Residences, recreation sites, travel corridors, and areas with Class B scenic quality within 1 mile of Alternatives 2 through 4 are shown in **Figures 3.15-1** through **3.15-3**. The remainder of the natural landscape in the Project study area – including uplands, benchlands, rims, ridges, buttes, and wetlands – has generally lower landscape and viewer sensitivity.

TABLE 3.15-1
VISUAL IMPACT LEVELS FROM VARIOUS OBSERVATION POINTS[a]

Observation Points[a]	Immediate Foreground (0 – ¼ mile)	Foreground (¼– ½ mile)	Middleground (½ - 1 mile)	Background (> 1 mile)
Residential	Major	Major	Minor	Very Minor
Recreation	Major	Minor	Very Minor	Very Minor
Travel – Primary Roads	Major	Major	Minor	Very Minor
Travel – Secondary Roads	Minor	Minor	Very Minor	Very Minor

Notes:
[a] A transmission line going through a Class B scenic quality area would be a major impact.

3.15.3.1 Alternative 1 – No Action

There would be no additional visual impacts under the No Action alternative.

3.15.3.2 Alternatives 2, 3, and 4 – Action Alternatives

Table 3.15-2 summarizes the proximity of various observation points to the alternatives. These observation points include area residences, recreational sites, and Class B scenic areas that fall within the immediate foreground, foreground, and middleground of each alternative centerline. In addition, the miles of major highways that fall within the immediate foreground, foreground, and middleground of each alternative centerline are provided. **Figures 3.15-1, 3.15-2**, and **3.15-3** provide a visual overview of the data provided in **Table 3.15-2**.

TABLE 3.15-2 COMPARISON OF DISTANCE ZONES FROM VARIOUS OBSERVATION POINTS[a] Action Alternatives 2, 3, and 4												
Alternative [b]	**Number of Residences (Points)**			**Recreation – General**[c] **(Point)**			**Recreation - L & C Trail (Lineal Mileage)**			**Travel Corridor**[d] **(Lineal Mileage)**		
Miles	0 to 1/4	1/4 to 1/2	1/2 to 1	0 to 1/4	1/4 to ½	1/2 to 1	0 to 1/4	1/4 to 1/2	1/2 to 1	0 to 1/4	1/4 to 1/2	1/2 to 1
Alternative 2	20	51	111	1	2	NA[e]	7.94	3.39	NA	3.3	2.8	6.3
Alternative 3	25	65	139	0	3	NA	7.72	2.3	NA	3.7	3.9	8.2
Alternative 4	20	45	111	0	0	NA	6.51	2.85	NA	2.7	2.3	5.3

Notes:
[a] Local routing options are not included in this table. Their impacts are discussed in Section 3.16.3.
[b] All action alternatives would cross the Marias River and Teton River, which are Class B scenic areas.
[c] Does not include the conservation easement located north of the Missouri River at Great Falls switch yard (Lewis and Clark Greenway Conservation Easement).
[d] Interstate 15 and U.S. Highways 2 and 87
[e] NA = Not available

Residential Areas – Long Term

Residences are located within the immediate foreground and foreground of the centerline of each action alternative. As **Table 3.15-2** indicates, Alternative 4 would have the least number of residences (65) within ½ mile. Alternative 2 would have the second least (71). Alternative 3 would have the highest number of residences within ½ miles (90). As a result, the overall long-term impact for residences that would be classified as a major impact would be the highest for Alternative 3 and the lowest for Alternative 4. The long-term impact for residences that would be classified as minor (within ½ to 1 mile of an alternative centerline) would be highest for Alternative 3 (124 residences) and lowest for Alternative 2 (91 residences) (DOE 1986). No residential clusters are located within the immediate foreground or foreground of any of the alternatives.

Recreation Areas – Long Term

All three action alternatives would cross the Lewis and Clark National Historic Trail and the Teton and Marias river corridors. All action alternatives would also be within the foreground of the Missouri River Corridor and several developed recreation areas near Great Falls including Giant Springs State Park, the Lewis and Clark Interpretive Center, and the Lewis and Clark Heritage Greenway. Alternative 2 crosses the south and west edges of the Great Falls Shooting Sports Complex located north of Great Falls; Alternative 3 crosses to the west of the complex. Both Alternatives 2 and 3 cross within the foreground of Benton Lake National Wildlife Refuge. The Lewis and Clark National Historic Trail is paralleled and crossed by all alternatives between the Marias River and Cut Bank (Class B scenery). Other recreation areas considered, but not within the foreground, include wildlife production areas, research natural areas, and other sporting venues/complexes (for example, golf courses, race tracks, rodeo arenas, city parks) located along alignment alternatives near Cut Bank, Conrad, and Great Falls. Although the proposed transmission line would be within the foreground of several recreational areas in the Great Falls area, the proposed transmission line would be an additional line in a setting with many transmission lines and a substation. The visual effect of an additional line would be incremental.

As shown in **Table 3.15-2**, Alternative 4 would not have any recreational sites within ½ mile of the alignment. Alternatives 2 and 3 would each have three recreation sites within ½ mile; however, one site (Morony entrance to the Great Falls Shooting Sports Complex) would be less than ¼ mile from Alternative 2 only. Under the matrix used for this assessment, a transmission line within ¼ mile of a recreational site is classified as a major impact but because surrounding scenery is not an important contributor to the recreation experience at the Shooting Sports Complex, the impact would likely be minor (DOE 1986).

Travel Routes – Long Term

Major travel routes that were considered include: Interstate 15 and U.S. Highways 2 and 87. Each of these highways would be crossed by each action alternative. The action alternatives differ slightly in the lineal miles of proposed alignment that would be within ½ mile of these major travel routes. Alternative 2 would have 11.3 miles within ½ mile, Alternative 3 would also have 11.3 miles within ½ mile, and Alternative 4 would have 9.4 miles (**Table 3.15-2)**. A transmission line within ½ mile of a major travel route is classified as a major impact because it would result in highly visible contrast with the surrounding landscape (BLM 1984).

A computer generated visual simulation was developed showing the proposed line looking northwest from Montana State Highway 44, also known as Bootlegger Trail (**Figure 3.15-4**). Though not a high volume road (major travel route), this viewpoint on Bootlegger Trail is typical of views from secondary roads. Because monopoles would be used on approximately 53 miles of diagonal alignment that would cross cultivated land, the computer generated view incorporates monopole structures (**Figure 3.15-5)**. Many road crossings would have monopole structures but some would incorporate H-frame structures. While monopole structures would typically be about 25 feet taller than H-frame structures, the ruling span length would be similar for both structure types (**Figure 2.3-5**). The monopole visual impact levels would be comparable to H-frame visual impact levels.

Visual impacts on all major travel routes would be comparable for all action alternatives with major impact levels for the immediate foreground and foreground viewing areas (DOE 1986). The MATL 230-kV transmission line would cross secondary roads seven times under Alternative 2, seven times under Alternative 3, and six times under Alternative 4. Visual impacts on all secondary road crossings would be minor.

Landscape Alteration – Long Term

The visual contrast of the proposed transmission line would be based on varying levels of potential landform and vegetation alteration that would result from construction. Landform contrast would result where access roads and pads for structure erection are constructed in hilly or steep terrain. Hillside benching, exposure of subsoil, and erosion scars from project construction in steeper terrain could modify existing topography and soils, resulting in visual contrast that is long term. These effects are more likely to occur on steeper slopes near the crossings of the Marias and Teton rivers, compared to surrounding uplands and plains. However, the transmission line structures would be located so that no roads need to be constructed over the edge of cliffs along the Marias River. Some road building is anticipated on the south side of the Teton River. **Figure 3.15-6** shows a computer generated visual simulation of an H-frame power line crossing the Marias River. Based on the crossing of rivers corridors with Class B scenic quality, the potential impact for all action alternatives would be major (DOE 1986).

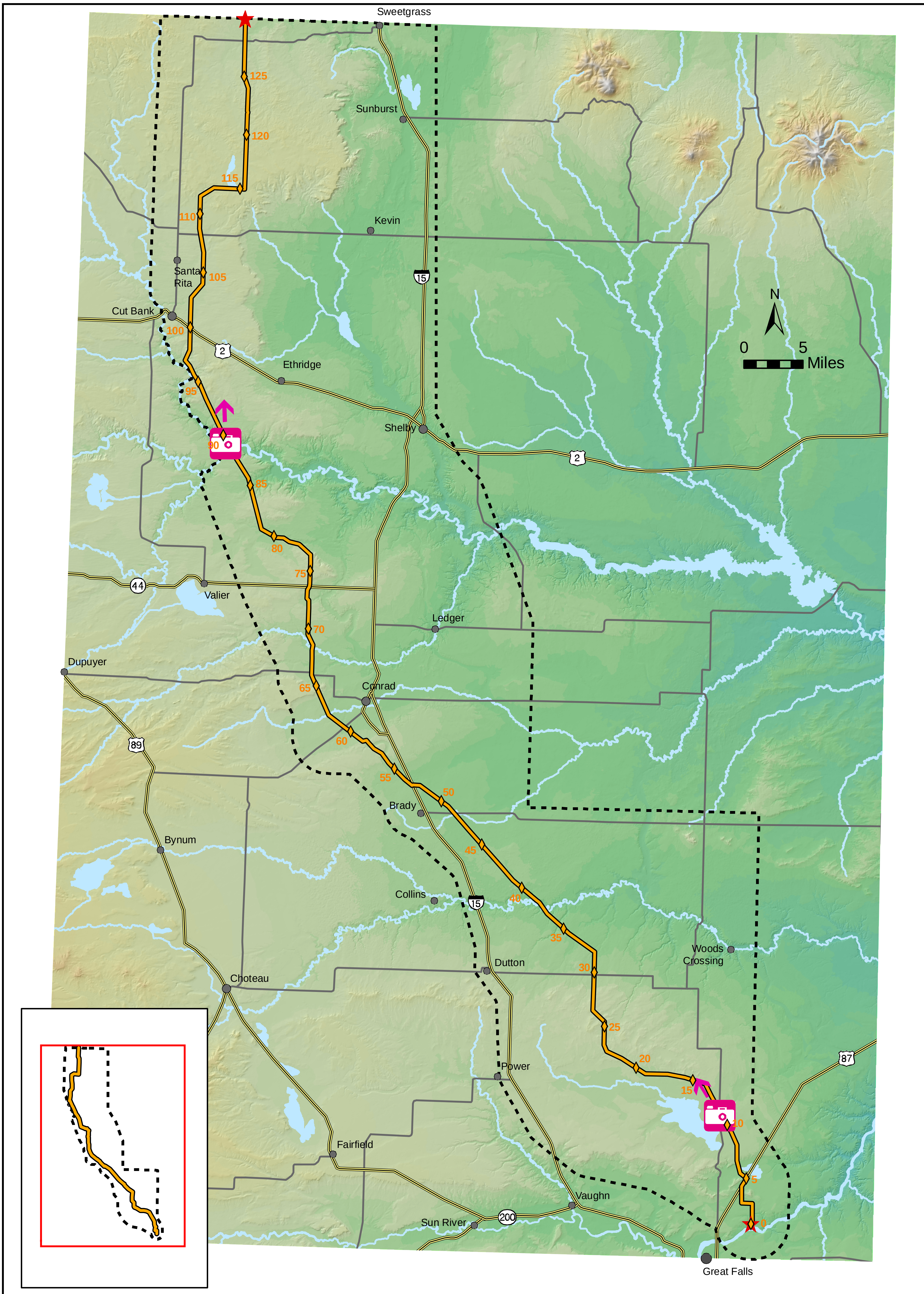


FIGURE 3.15-4
VISUAL SIMULATION
LOCATIONS

GIS map by Ed Madej -TTEMI-HE Fig3_15-4_MATL_Visual_Simulation_Locations_012007.mxd

FIGURE 3.15-5
PROPOSED MATL POWERLINE
BOOTLEGGER TRAIL - Visual Simulation of Monopole Construction
(Lat/Long: 47.679944, -111.283055 - 05/31/06 10:00 a.m.)

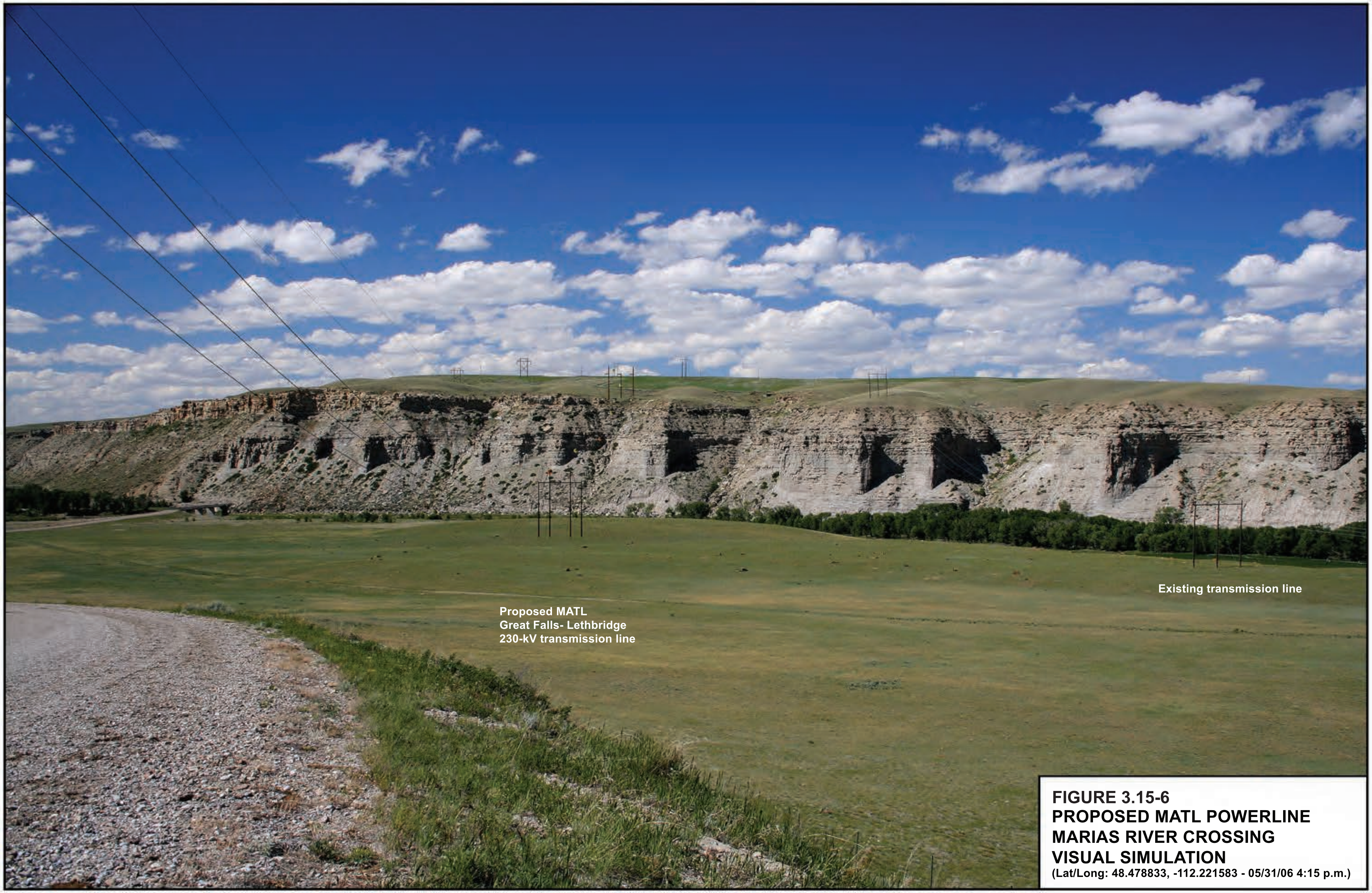


FIGURE 3.15-6
PROPOSED MATL POWERLINE
MARIAS RIVER CROSSING
VISUAL SIMULATION
(Lat/Long: 48.478833, -112.221583 - 05/31/06 4:15 p.m.)

Successful implementation of reclamation and revegetation efforts and the avoidance of dense riparian vegetation at the proposed river crossings would decrease the impact to minor levels (DOE 1986).

Vegetation contrast is a function of existing cover type (riparian forest, grassland, or agricultural cropland) and the amount of clearing needed for line construction and maintenance. Higher levels of vegetation contrast would result where woody riparian growth is removed from the right-of-way, structure sites, and access roads. This effect can be long term where mature trees, windbreaks, and other woody vegetation are trimmed or removed for line operation over the life of the project.

Visual Impacts — Short Term

In agricultural cropland, vegetation would be removed for one growing season as structures are erected and construction traffic uses access roads. This effect would likely be short term for all action alternatives as crops would be restored in the following year.

Visual Resource Mitigations

To minimize adverse environmental impacts to visual resources from Alternative 2 and address local visuals issues in specific places, DEQ identified several potential mitigation realignments that are described in **Appendix A** of the March 2007 document. The agency's preliminary analysis of the environmental impacts is in that appendix.

3.15.3.3 Local Routing Options

Analysis of the impacts of the local routing options is in Section 3.16.

3.16 Local Routing Options

Issues raised during the public comment period on the March 2007 document are summarized in Chapter 1 and formal responses to these comments are provided in Volume 2 of this document. Throughout the review process, the agencies worked with landowners to refine Alternative 2 and developed 11 local routing options addressing local concerns. Several of these routing options could also be applied to some parts of Alternative 4. **Figure 2.6-1** provides the general locations for the 11 local routing options that were developed primarily to address landowner concerns related to costs and impacts to farming, impacts to other land uses, impacts to visual resources, and impacts to wildlife. The local routing options also address the required finding under MFSA that the facility minimize adverse environmental impacts considering the state of available technology and the nature and economics of the various alternatives (75-20-301(1)(c), MCA).

The 11 local routing options are described in Section 2.6. Not all three potential routing options in the Diamond Valley area could be selected because they address similar portions of the Alternative 2 and 4 alignments. Local routing options could be adopted as part of either Alternative 2 or 4 in the following areas: Diamond Valley, Teton River Crossing, a portion of the Belgian Hill road, and South of Cut Bank. The agencies invite readers to comment on the environmental advantages and disadvantages as well as costs associated with the local routing options, especially in the Diamond Valley area. The agencies would consider these comments and, if appropriate, revise Section 3.18.

3.16.1 Analysis Methods

Potential impacts to all resources were analyzed for the 11 local routing options. For many resource areas, the impacts associated with local routing options and the portions of Alternatives 2 or 4 they could replace would be very similar. The resource areas most affected by the local routing options are land use and visuals, which are the primary reasons that the routing options were developed. Each local routing option is considered only in relation to the comparable portion of Alternative 2 or 4 it could replace.

Analysis Area

The analysis areas for the local routing options are the immediate areas where they are located.

Information Sources

Information sources used to analyze the local routing options came from field and air photo review and discussions with interested landowners. This information was supplemented by data from the MFSA application, as necessary.

3.16.2 Affected Environment

The affected resource environments for the local routing options are discussed in the applicable resource area sections of Chapter 3. For most resource areas, the affected environment is very similar, if not identical, to the affected environment described in the main resource area sections. The 11 local routing options are all located within the same Project study area.

3.16.3 Environmental Impacts

Section 2.6 summarizes the major differences in location between each local routing option and the corresponding segment of Alternatives 2 or 4. This impacts analysis focuses on the issues identified in comments on the March 2007 document: potential land use effects and costs associated with farming around structures. These costs are compared to the additional cost of line construction for a routing option. The following section discusses these differences and similarities, and the construction costs are summarized in **Table 3.16-1**.

Several resource areas have very similar impacts between the local routing options and corresponding portions of either Alternative 2 or 4. Unless specifically mentioned, potential effects to these resource areas are not discussed further: geology and soils, engineering and hazardous materials, water resources, wetlands and floodplains, fish resources, threatened and endangered species and candidates for listing, noise, and air quality. Overall, the local routing options would not result in socioeconomic impacts substantially different than those described in Section 3.13.3. However, at the local level several of the proposed options could reduce costs of farming around new structures, and, in some cases, these reduced farming costs would likely outweigh the additional cost of line construction as indicated in **Table 3.13-15**.

All local routing options avoid residences sufficiently so that the State standard for electric fields of 1 kV/m and the State standard for noise of 50 dBA at the edge of the right-of-way in residential and subdivided areas would be met. In addition, the newly recommended magnetic field standard of 1.4 mG would also be met at these residences.

TABLE 3.16-1

DIFFERENCES BETWEEN LOCAL ROUTING OPTIONS AND ALTERNATIVE 2[a]

No.	Local Routing Options	Crossing Cropland		Construction Cost[d]	Residences up to ¼ mile from Local Routing Option	Residences ¼ to ½ miles from Local Routing Option	Other Issues
		Diagonal[b] Miles Approximate	Parallel & Perpendicular[c] Miles Approximate				
1	Diamond Valley South	0.3 (4.22)	5.54 (1.07)	$2,422,470 ($1,961,895)	0 (2)	2 (0)	
2	Diamond Valley Middle	0.84 (4.22)	5.86 (1.07)	$2,249,515 ($1,961,895)	0 (2)	3 (0)	
3	Diamond Valley North	0.4 (4.22)	6.25 (1.07)	$2,302,500 ($1,961,895)	0 (2)	1 (0)	One grain bin may have to be moved
4	Teton River Crossing	0.17 (0.63)	0.11 (0)	$266,825 ($237,980)	0 (0)	0 (0)	Avoids an infrequent flooded area and uses field edges.
5	Southeast of Conrad	1.08 (2.23)	0 (0)	$886,205 (927,675)	1 (1)	1 (2)	
6	West of Conrad	0 (1.35)	1.3 (0)	$575,260 ($464,255)	0 (0)	2 (0)	
7	Northwest of Conrad	0.25 (1.3)	1.21 (1.13)	$859,400 ($835,350)	0 (0)	2 (1)	
8	Belgian Hill (Alt 2)	0.3 (0.26)	1.63 (1.55)	$731,660 ($721,525)	2 (4)	2 (0)	
	Belgian Hill (Alt 4)	0.25 (0.5)	0.8 (1.4)	$239,500 ($335,300)	1 (1)	1 (1)	

TABLE 3.16-1 (Cont.)

DIFFERENCES BETWEEN LOCAL ROUTING OPTIONS AND ALTERNATIVE 2[a]

No.	Local Routing Options	Crossing Cropland		Construction Cost[d]	Residences up to ¼ mile from Local Routing Option	Residences ¼ to ½ miles from Local Routing Option	Other Issues
		Diagonal[b] Miles Approximate	Parallel & Perpendicular[c] Miles Approximate				
9	Bullhead Coulee South	0.56 (0.62)	0.4 (0)	$505,690 ($422,555)	0 (0)	1 (1)	Over 500 feet from planned wind turbine
10	Bullhead Coulee North	1.16 (1.52)	0.48 (0)	$522,555 ($525,630)	0 (0)	0 (0)	
11	South of Cut Bank	0 (0)	0 (0.67)	$654,505 ($677,985)	1 (1)	3 (3)	

Notes:
[a] In this table where two numbers are listed, the first is for the local routing option, followed by a number in parentheses for the Alternative 2 comparative length, cost, or count.
[b] Diagonal to due north, south, east, or west.
[c] Parallel to north and south (+-5 due north or south). Perpendicular to north and south (+-5 due east or west).
[d] Based on $239,500 per mile for H-frames and $326,500 per mile for monopoles. Cost of angle structures were not included in these figures.
[e] Alternative 4 could include some of the Local Routing Options listed above but would use only a portion of the Belgian Hill Local Routing Option. If the Belgian Hill Local Routing Option is used with Alternative 2, it would be 1.93 miles long compared to 1.05 miles if used with Alternative 4.

3.16.3.1 Diamond Valley Area

As indicated in **Figure 2.6-2**, the Diamond Valley South routing option would avoid diagonal crossing of farmland and residences by at least ¼ mile. In the northeast corner of Section 7, T24N, R2E where this routing option diagonally crosses a field, the guyed angle structures would be located in range and pasture lands. Diamond Valley South would have two residences between ¼ and ½ mile from the centerline. The corresponding segment of Alternative 2 would have two residences between 0 and ¼ mile. It would be about 2 miles longer than Alternative 2 and would cost about $460,575 more to construct.

The Diamond Valley North routing option (**Figure 2.6-2**) also would avoid diagonal crossing of farmland and residences by at least ¼ mile. Diamond Valley North would have one residence between ¼ and ½ mile from the centerline. The corresponding segment of Alternative 2 would have two residences between 0 and ¼ mile. The Diamond Valley North realignment would cross the existing NWE 115-kV line twice, creating potentially non-sprayable areas in fields where the two lines are in close proximity and create an acute angle. This realignment would be located near a single grain bin that might have to be moved if too close to the transmission line. If the grain bin is not moved, the centerline might need to be adjusted to the west sufficiently to allow grain augers to be used safely and to meet NESC requirements. The Diamond Valley North realignment would be approximately 1.3 miles longer than Alternative 2 and would cost $340,605 more to construct plus potential costs to move the grain bin.

The Diamond Valley Middle routing option would follow field boundaries to reduce diagonal crossing of cultivated land compared to Alternative 2 (**Figure 2.6-2**). This option would have three residences between ¼ and ½ mile from the centerline whereas, the corresponding section of Alternative 2 would have two residences less than ¼ mile away. Diamond Valley Middle is an applicant-suggested routing option. This routing option would potentially result in several areas in fields where it would have angular approaches to the existing NWE 115-kV line (primarily Section 25 T25N, R1E) and make farming operations difficult. It would be about 1.4 miles longer than Alternative 2 and would cost $287,620 more to construct.

The three Diamond Valley local routing options all have equal likelihood of encountering cultural resource sites. These areas are considered moderate to low probability areas for cultural resources.

3.16.3.2 Teton River Crossing Area

The Teton River has a meandering channel near the river crossing, and a broad floodplain. The routing option (**Figure 2.6-3**) would allow one structure on the north side of the river to be on a slightly more elevated terrace that would avoid an area in the right-of-way for Alternatives 2 and 4 that is reported to have flooded in 1964. It would also locate structures at the edge of fields to reduce interference with farming.

The proximity to residences would be the same for this realignment as Alternative 2, with no occupied residences nearby. Depending on final design, some additional clearing of tall growing riparian vegetation would be required on the south bank of the Teton River. Because the Teton River Crossing realignment would require more angled structures and be about a quarter mile longer than Alternative 2, it would cost at least $28,845 more to construct.

3.16.3.3 Southeast of Conrad

The Southeast of Conrad routing option would result in lower estimated farming costs because more rangeland and a reclaimed gravel pit would be used (**Figure 2.6-4**). The local routing option is about a tenth of a mile longer than the same segment of Alternative 2. The construction costs for the Southeast of Conrad realignment would be approximately $41,470 less than the costs for Alternative 2 because more H-frame structures would be used. The Southeast of Conrad realignment would have one residence between ¼ and ½ mile from the centerline whereas; Alternative 2 would have two residences between ¼ and ½ mile from the centerline. The number of residences within ¼ mile of the line, would be the same for the Southeast of Conrad realignment and the corresponding section of Alternative 2.

This routing option southeast of Conrad would cross more uncultivated, native range lands, compared to the Alternative 2 segment it would replace, and would have a greater chance of encountering cultural resource sites if this option was selected.

3.16.3.4 West of Conrad

The West of Conrad routing option would decrease potential mid-field interference with aerial crop dusting compared to the Alternative 2 alignment, but would cause more edge-of-field interferences along the southern east-west and west segments (**Figure 2.6-5**). The West of Conrad realignment would have two residences between ¼ and ½ mile from the centerline whereas; the corresponding section of Alternative 2 would have no residences between ¼ and ½ mile from the centerline. The local routing option is approximately a half mile longer than the same segment of Alternative 2. This routing option would likely result in cost savings (reduced farming costs) to farmers due to structure locations along the edges of fields. Cost of construction for this realignment would be about $111,005 more than Alternative 2.

3.16.3.5 Northwest of Conrad

The Northwest of Conrad routing option (**Figure 2.6-6**) would decrease the amount of cultivated land crossed diagonally compared to Alternative 2, thereby decreasing estimated costs to farm around structures. The local routing option is approximately a tenth of a mile longer than the same segment of Alternative 2 and would have an additional cost of $24,050. The approximate increased construction cost would not exceed the estimated cost savings to landowners. The Northwest of Conrad routing option realignment would have two residences between ¼ and ½ mile from the centerline whereas; Alternative 2 would have only residence between ¼ and ½ mile from the centerline. The number of residences within ¼ mile of the centerline would be the same for the Northeast of Conrad realignment and the corresponding section of Alternative 2.

This routing option may encounter several tepee rings, which can be spanned. It would cross more uncultivated, and native range lands, compared to the Alternative 2 segment it would replace, and would have a greater chance of encountering cultural resource sites.

3.16.3.6 Belgian Hill Road Area

The Belgian Hill route options are shown in **Figure 2.6-7**. The routing options could be used with Alternative 2 or the northern portion could be used with Alternative 4. Comments received on the March 2007 document and subsequent field review indicate that the old Belgian Hill reroute used with Alternative 2 would cross approximately ½ mile of cultivation on the diagonal and would also traverse a side-roll irrigated field. The revised Belgian Hill routing option would reduce estimated farming costs by slightly reducing the length of diagonal crossing of cultivated fields by about ¼ mile and would help avoid the crossing of the side-roll irrigated field. However, it would cross the same side roll irrigated field as Alternative 2 but at a location roughly 1,250 feet further west. The local routing option is approximately a tenth of a mile longer than the same segment of Alternative 2 and would have an additional cost of $10,135. It is approximately 0.4 miles shorter than Alternative 4 and would have cost savings of $130,600 over Alternative 4. The Belgian Hill routing option would be located between ¼ and ½ mile of four residences. As with Alternative 2, this routing option would still cross a field with a side roll irrigation system.

The Belgian Hill local routing option would reduce the potential for wind caused noise impacts to four residences close to Alternative 2 and be about 1,250 feet closer to two residences than Alternative 4.

The Belgian Hill local routing option alignment would have two residences between ¼ and ½ mile from the centerline whereas, the corresponding section of Alternative 2 would have no residences between ¼ and ½ mile from the centerline. However, the number of residences within ¼ mile of the line would be two for the Belgian Hill realignment and four for the corresponding section of Alternative 2. The Alternative 4 alignment would be the farthest away from the residences.

3.16.3.7 Bullhead Coulee Area

Under Alternative 2, a landowner could lose the opportunity of receiving annual payments from having a wind turbine located on his land since the proposed line location would be within 500 feet of a planned turbine. The turbine is part of wind farm that has not signed agreements with MATL but plans to interconnect with another transmission line in the area. The Bullhead Coulee South routing option (**Figure 2.6-8**) would allow placement of a wind turbine south of the line. Expected annual revenue from the turbine over the life of the line is estimated to exceed the additional cost of line construction. The affected landowner who suggested the reroute recognizes that the line would cross some additional CRP land on his property. This reroute would entail additional angle structures and would involve routing the line off a high bench, through fields, and back up to the bench. The local routing option is approximately a third of a mile longer than the same segment of Alternative 2 and would have an additional cost of $83,135. The potential for erosion would increase slightly, but proposed and required mitigating measures should adequately address such impacts. The proximity of residences to the Bullhead Coulee South realignment would not differ from Alternatives 2 or 4.

The Bullhead Coulee North routing option (**Figure 2.6-8**) could reduce farming costs by placing more structures on field edges. The local routing option is approximately 0.1 mile longer than the same segment of Alternative 2 but would cost about $3,075 less than Alternative 2 because more H-frame structures would be used. This local routing option visual and noise impacts would be the same as Alternative 2.

3.16.3.8 South of Cut Bank

This segment was designated as part of the tentative preferred alternative in the March 2007 document and has general local acceptance. This approximately 2.4-mile-long realignment would be approximately 0.1 mile longer than the same segment of Alternative 2 and be located ¼ mile west of the Alternative 2 alignment. This realignment would better follow property boundaries and section lines. It avoids a midfield location in a CRP field reducing potential for interference with farming. This local routing option visual and noise impacts would be the same as Alternative 2. The South of Cut Bank realignment would have a slightly higher cost to construct.

3.17 Electrical Transmission System Operation and Reliability

This section describes the affected transmission system as it is currently configured and managed, and how reliability could be affected by the Project. This analysis was based, in part, on the results of a system feasibility study (ABB Consulting 2005) and the NorthWestern Energy MATL System Impact Study (**Appendix I** to the MATL application). Additional data and information for this section were compiled and refined from several sources including the MATL application for certification (MATL 2006b) and information contributed by DEQ's economist (Blend 2007).

Prior to issuing a Presidential permit, DOE would prepare a separate reliability determination. At the time this document is published, information on which to base the DOE decision is preliminary.

3.17.1 Existing Transmission System

The North American transmission grid moves electricity from power-generating facilities to customers using a transmission system coordinated by the North American Electric Reliability Council (NERC) (**Figure 1.1-2**). NERC's mission is to ensure that the bulk electric system in North America is reliable, adequate, and secure. NERC's primary role is to set standards for the reliable operation of the bulk electric system and monitor and enforce compliance with reliability standards (NERC 2007). NERC is composed of eight regional reliability councils formed in response to national concern regarding the reliability of the interconnected bulk power systems, the ability to operate these systems without widespread failures in electric service, and the need to foster the preservation of reliability through a formal organization (NERC 2007).

Montana is located primarily within the western grid under the authority of the Western Electricity Coordinating Council (WECC). The WECC region is the largest and most diverse of the regional councils. WECC's service territory extends from Canada to Mexico and includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 western states in between (**Figure 1.1-2**). The WECC mission is to support efficient competitive power markets, assure open and non-discriminatory transmission access among members, and provide a forum for resolving transmission access disputes (WECC 2007). There is currently no direct power transmission connection between Alberta and Montana (**Figure 1.1-2**).

Transmission Capacity

Owners of transmission lines sell rights to use lines on a long-term firm basis, a long-term non-firm basis, or a short-term basis. "Firm" transmission service is a contractually established priority right to transmit a given amount of energy for a given period of time. "Non-firm" service is typically reserved and scheduled on an as-available basis and is subject to curtailment or interruption. An agreement must be in place between a shipper and an owner of a line before any power can be transmitted over the western grid. Under WECC requirements, the owner of a line must determine whether the line has available capacity before an agreement can be entered into. The available transmission capacity is calculated by subtracting contracted uses from the total rated line flow capacity. The transmission path can be described as congested if (1) no rights to use it are for sale, (2) it is fully scheduled and no firm space is available, or (3) the path is fully loaded to its flow capacity (DEQ 2004).

Electricity moving across the western grid does not necessarily follow contracted paths. Rather it flows along the paths of least resistance. Therefore, before a new transmission line is added to a grid, operators of the grid conduct studies to ensure that new power does not overload other lines and substations on the grid. In the case of the proposed MATL line, these studies are overseen by WECC. In August 2007, WECC released the results of its study and granted the MATL line an accepted rating of +/- 300 MW (**Appendix M** - Letter from WECC/BPA, Brian Silverstein, about MATL Phase 3 Status, dated August 28, 2007). Negotiations between MATL and NorthWestern Energy for MATL to connect to NorthWestern Energy's line are still underway (Williams 2007d).

Montana's Electricity Generation and Transmission System

Except for several rural electric cooperatives and Montana Dakota Utilities customers, Montana's residential and commercial customers receive most of their contracted electricity from generation facilities located in Montana (DEQ 2004).

Most of Montana's electric generation is owned by private utilities or by the Federal government through the U.S. Army Corps of Engineers or the Bureau of Reclamation. The Bonneville Power Administration (BPA) and Western Area Power Administration (WAPA) market hydropower from Federal dams in Montana. PPL Montana is the largest supplier of Montana-consumed energy, owning both hydroelectric and coal-fired generation. PPL Montana's hydroelectric generation facilities are regulated by the Federal Energy Regulatory Commission (FERC).

Montana has just over 5,000 MW of electrical generation capacity within its borders, most of it coal-fired and hydroelectric power. From 1999 to 2003, Montana's electric generating plants produced an average output of about 3,000 average megawatts (aMW) (DEQ 2004). During that same time period, just over half of Montana generation was consumed in-state, while approximately 1,400 aMW were delivered out of the state (DEQ 2004).

Wholesale prices of electricity are set by contract negotiations between transmission suppliers and electricity suppliers. Wholesale prices in Montana are usually bounded by prices at the Mid-Columbia hub located near the Columbia River in Washington State. Usually, the wholesale price for electricity goes no higher than the Mid-Columbia price minus transmission costs into Montana (Blend 2007). NorthWestern Energy (NWE), Montana's largest private transmission and distribution utility, is the only major Montana transmission utility in-state on the Western Grid and is responsible for determining the default power supply for a majority of consumers in Montana. The default source will be approved by the Public Service Commission (Blend 2007).

NWE uses around 600 to 650 aMW of electricity to serve its customers, with a peak usage of over 1,000 MW. BPA and WAPA provide transmission service to electric cooperatives that deliver electricity to many of the smaller Montana customers on the western grid not served by NWE. Other wholesale suppliers provide electricity over transmission lines owned by NWE to a number of large commercial and industrial customers. NWE is regulated by the Montana Public Service Commission, FERC, and WECC rules, while BPA and WAPA and electric cooperatives will meet Federal regulatory and WECC requirements.

Alberta's Electricity Generation and Transmission System

Alberta has experienced the fastest growing electricity demand in Canada over the past 5 years (Independent Power Producers Society of Alberta 2006). Since 1999, the demand for power in Alberta has grown by 21 percent, which compares to the average growth of demand in North America of 12 percent over the same time period (Independent Power Producers Society of Alberta 2006). To meet this demand, approximately 3,800 MW of new generation have been added to Alberta's grid in the past 7 years (Independent Power Producers Society of Alberta 2006). This includes new coal units (450 MW), new wind and alternative fuel projects (300 MW), and 3,000 MW of new gas-fired generation. As of late 2006, Alberta had 11,557 MW of supply capacity, compared with almost 9,600 MW of peak demand (Alberta Department of Energy 2006). An additional 4,800 MW of power generation has been announced by industry for future development in Alberta (Alberta Department of Energy 2006).

Coal-fired generation makes up just over 50 percent of Alberta's generating capacity and gas almost 40 percent, with hydro, wind, and alternative fuel making up the remaining 10 percent (Alberta Department of Energy 2006).

The electric transmission system in Alberta is owned, built, and maintained by private investors (Alberta Department of Energy 2006), except for some municipally owned utilities. Alberta has nearly 30 suppliers offering new electricity products and services to Alberta's wholesale, commercial, and residential customers. Alberta also has electric cooperatives. Wholesale prices are set by the laws of supply and demand in Alberta and fluctuate daily in response to consumer demand (Alberta Government Services 2006). Alberta's hourly wholesale electricity market is managed by the Alberta Electric System Operator (AESO), an independent system operator that facilitates Alberta's competitive wholesale electricity market and is accountable for the administration and regulation of load settlement function (AESO 2007). Consumers may choose their own electricity supplier or remain under default supply arrangements determined by AESO, which are periodically adjusted to reflect actual wholesale power costs (Alberta Government Services 2006). The costs and expansion plans of Alberta's transmission and distribution lines are regulated by the Alberta Energy and Utilities Board.

Alberta has been a net importer of electricity 5 out of the last 6 years, but electricity regularly flows in and out of the province (Alberta Department of Energy 2006). Alberta is not currently directly connected to Montana but has 800 MW of transmission connections with British Columbia and 150 MW with Saskatchewan (**Figure 1.1-2**).

3.17.2 System Reliability Constraints and Influences

Power transmission systems must include many sources of generation and pathways to be reliable sources of electricity. The MATL transmission line may improve reliability on Montana's transmission system due to (1) better generation resource sharing and (2) different electric routing options. Different transmission system operators (jurisdictions) have different load factors and different mixes of generation. One example of this is peak loads occurring at different times of the day or seasons of the year for different jurisdictions. The fact that every jurisdiction does not experience peak demand and supply at exactly the same time of day/month allows the potential sharing of resources, which could lead to improved reliability (Williams 2006). Tie lines such as MATL can respond to these different load and generation characteristics.

A stand alone jurisdiction would need more generators standing by on an as-needed basis to cover planned and unplanned outages of generating units, than would be required for the same level of reliability if that jurisdiction was interconnected to other jurisdictions. The probability that multiple adjacent jurisdictions would experience a large loss of generation at the same time is very low, so adjacent jurisdictions can get the benefits of higher generation reliability by sharing generation resources. Sharing these resources costs each jurisdiction less than what it would cost to own the resource entirely and not share (Williams 2006).

MATL might also allow more alternative options for power routing within Montana. If a particular line was removed from service due to either an unexpected event or scheduled maintenance, the MATL tie line could be used to supply power from the north giving transmission operators in Montana one more option to use in case of a removed line. This routing would depend upon loading on the line. Alberta's independent system operators might be able to use MATL in a similar fashion for their service area.

Potential Impacts to System Reliability

Potential impacts to system reliability from the Project have been evaluated by NorthWestern Energy in its System Impact Study (NWE 2006) and by the potentially affected transmission system owners and agencies via the WECC Path Rating Process (WECC 2007). Summaries of these studies are provided in Appendix M. MATL has committed to mitigate the reliability impacts identified in NorthWestern's system impact study and has committed to a process for mitigating the impacts identified in the WECC Path Rating process (Williams 2007e).

Potential Impacts to Reliability Based on Information Provided by NWE and MATL's Plan to Mitigate those Impacts

Negotiations between MATL and NorthWestern Energy to interconnect the MATL line to the Great Falls 230 –kV switch yard continue. The potential impacts to reliability have been identified by NWE in a system impact study (MATL System Impact Study Stand-Alone & Co-Existing, Third Revision, September 26, 2006), a copy of which is provided in Appendix M. A summary of those potential impacts and MATL's plan to mitigate, or otherwise address them, is provided below:

Potential Reliability Impacts Identified by NWE

- The unused capability of the Great falls 230kV Switchyard without any system or network upgrades is 0 MW.

- The overload of the Great Falls 230/100 kV autotransformers must be mitigated. With the autotransformer upgrades, the MATL line will be able to connect its 230 kV line to the GF 230 kV Switchyard without further mitigation in the switchyard based on the information provided and analyzed in this study. The mitigation required must be coordinated with senior queue mitigation requirements.

- MATL needs to consider the voltage set points of the switched shunts to prevent high voltages during all conditions (N-0, N-1 and N-2). The high voltages at the new Marias and MATL 230 kV buses are present for the other contingency conditions too.

MATL Mitigation Plan and Comments

- MATL will mitigate the switchyard autotransformer constraint as described in the next section. In the event that further mitigation is required to move power out of the Great Falls 230kV Switchyard from the MATL project, then MATL's shippers will be responsible for such mitigation.

- MATL will pay the cost of replacing the two existing 230/100 kV 100 MVA autotransformers with two 230/100 kV 200 MVA autotransformers. The commitment to upgrade the two autotransformers to 200 MVA capacity does take into account and coordinates with senior queue mitigation requirements.

- MATL commits to work with NWE, in its role as Control Area Operator of the Montana portion of the MATL project, in establishing the voltage set points of the switched shunts at the Marias substation. MATL also commits to work with the Alberta Electric System Operator, in its role as Control Area Operator of the Alberta portion of the MATL project, in establishing the voltage set points of the switched shunts at the MATL 120S substation.

Potential Impacts to System Reliability Based on WECC Path Rating Study

The WECC organization granted Phase III status for the MATL project with an Accepted Rating of +/- 300 MW on August 28, 2007. This Phase III status requires that MATL work with impacted transmission owners and agencies to develop remedial action schemes (RAS) and other forms of operational mitigation to address potential impacts on system reliability. MATL will initiate this work in 2008.

3.18 Information Regarding Findings for MFSA Certification

DEQ would approve a transmission line facility as proposed or as modified or an alternative to the proposed facility if it finds and determines:

- the need for the facility;
- the nature of probable environmental impacts;
- that the facility minimizes adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives;
- what part, if any, would be located underground;
- the facility is consistent with regional plans for expansion of the appropriate grid of the utility systems serving the state and interconnected utility systems;
- the facility would serve the interests of utility system economy and reliability;
- that the location of the proposed facility conforms to applicable state and local laws;
- that the facility would serve the public interest, convenience, and necessity;
- that DEQ has issued all necessary decisions, opinions, orders, certifications, and permits; and
- 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 (75-20-301[1], MCA).

Information pertaining to these determinations is summarized in this section.

3.18.1 Need

In order to determine that there is a need for the proposed electric transmission line, the Department must make one of the findings enumerated in ARM 17.20.1606. Pursuant to subsection (1)(a) of that administrative rule, insufficient power transfer capacity at adequate voltage levels under normal operating conditions may form a basis of need if the department finds that the transfer capacity of the proposed facility will be required within two years of the date the proposed facility is to be placed in service.

MATL held an Open Season between February 3 and April 15, 2005, during which companies could submit bids for transmission rights on the proposed 600 MW transmission line. MATL received 13 bids from four different companies, accepting bids totaling 420 MWs. The U.S. Federal Energy Regulatory Commission has determined that the bidding process used by MATL was nondiscriminatory, fair and transparent. MATL held an additional Open Season between June 9 and 30, 2006. MATL received 37 bids from four different companies for a capacity totaling more than 2000 MWs. MATL accepted bids from four companies totaling 300 MWs in each direction (**Table 4.1-2**).

3.18.2 Nature of Probable Environmental Impacts

Probable impacts to land use, geology, soils, safety, hazardous material management, electric and magnetic fields, water, wetlands, vegetation, wildlife, fish, special status species, air quality, noise, socioeconomics, paleontological resources, cultural resources, transportation, utilities, visual resources, and the existing transmission system from the proposed Project and alternatives are described in Sections 3.1 through 3.17 and summarized in **Table 3.18-1**. This table summarizes impacts from Alternative 2 as proposed by the applicant along with Alternatives 3 and 4. It does not include mitigation measures; such as potential alignment changes described for land use and visuals. Applicant proposed measures to reduce impacts discussed in Chapter 3 would be applied to Alternative 2 if selected as the preferred alternative. Cumulative impacts are described in Chapter 4.

3.18.3 Facility Minimizes Adverse Environmental Impact

Section 75-20-301 (1)(c), MCA requires a finding that the facility as proposed or modified or an alternative to the facility must minimize adverse environmental impact considering the state of available technology and the nature and economics of the various alternatives. ARM 17.20.1607 outlines additional requirements before this finding can be made.

Project costs and costs of mitigation are presented in **Table 4.20-1**. The estimated annual net effect from the project on farmers is indicated in **Table 3.13-15** along with the net effect over 50 years.

Table 3.18-1 summarizes probable impacts for each alternative. Resource specific impacts are described in Chapter 3. Cumulative impacts are described in Chapter 4. Monetary values of these impacts, except for estimated costs to farmers, cannot reasonably be quantified. Many potential adverse environmental impacts are minimized through measures proposed by the applicant and the application of environmental specifications (**Appendix F**). A plan for monitoring the facility is described in environmental specifications for the project in **Appendix F** and further detailed in ARM 17.20.1901.

The proposed line and alternatives would not cross any of the following areas: wilderness areas, national primitive areas, national wildlife refuges, state wildlife management areas and 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 greater than 5,000 acres in size managed by federal or state agencies to retain their roadless character, and specially managed buffer areas surrounding national wilderness areas and national primitive areas. The line would cross isolated areas with rugged topography on slopes greater than 30 percent. Vegetation may be destroyed during the construction process and soil exposed to erosion on these steep slopes. MATL has proposed a plan to control erosion during project construction and would be required to implement a storm water pollution prevention plan under Montana water quality statutes. DEQ would require a bond to ensure that areas disturbed during construction are reclaimed and revegetated.

If approved, DEQ would require that the project meet standards for noise and electric field strength in residential and subdivided areas unless affected landowners waive these requirements. The project would be required to meet minimum standards set forth in the National Electric Safety Code and Federal Aviation Administration requirements for marking the line.

Reasonable alternative locations for the project have been considered throughout the review process and will be considered in the final decision making process.

Before making its minimum impact determination DEQ is soliciting additional public comments on impacts, balancing the preferred location criteria listed on page 2-2 of this document, project design and line location.

3.18.4 Locating Transmission Lines Underground

No part of the transmission line would be built underground. Underground 230-kV lines would cost between 2 and 15 times the amount required to build an overhead line (Georgia Transmission Corporation 2006; Verbund 2006). Thus, the cost to build underground may be slightly more than $1 million per mile (Energy Central News 2007), compared with MATL's estimate of about $293,500 per mile using H-frame structures. This would be cost prohibitive and would stop the project.

Digging trenches to bury the lines would result in greater construction disturbance to the land and would require greater time to install. Above ground access vaults would need to be constructed as well as above ground structures at line termination points. Buildings on the alignment would be restricted. Vegetation would likely have to be restricted to avoid reducing soil moisture that is needed to cool the transmission line. Problems with underground systems would also be more difficult to locate and repair.

3.18.5 Facility is Consistent with Regional Plans for Expansion of the Appropriate Grid of the Utility Systems Serving the State and Interconnected Utility Systems

The transmission line would allow new generators to connect to regional grids and provide a direct connection between Alberta and Montana grid systems. There is no single formal published plan for expansion of the regional grid. WECC oversees the Regional Planning Process. A Regional Planning Review Group was formed and on January 23, 2007 the WECC Planning Coordination Committee notified MATL that the Regional Planning Project Review had been completed. WECC has approved a path rating of +/- 300 MW. Negotiations for interconnection to NWE's transmission system are ongoing.

3.18.6 Facility Would Serve the Interests of Utility System Economy and Reliability

WECC has approved a path rating of +/- 300 MW. MATL and NWE have been conducting interconnection studies (**Appendix M**) and discussions of issues related to interconnection with NWE's transmission system at the Great Falls 230 kV switchyard are ongoing.

3.18.7 Location of the Proposed Facility Conforms to Applicable State and Local Laws

The location of the facility would conform to applicable state and local laws and regulations either as a permitting or license condition, or in compliance with project-specific environmental specifications (**Appendix F**).

3.18.8 Facility Would Serve the Public Interest, Convenience, and Necessity

The proposed transmission line would be built to meet the need for additional transfer capacity and transmission access for new wind power generators. Benefits to the applicant would be the monetary profit from operating the transmission line. Benefits to the state include local tax revenues to counties in which the line is located, state tax revenues from the line, a short-term boost to local economies from construction, future electricity generation, and the possible opening of spot electricity market within which Montana utilities can buy and sell electricity. The grid may also operate more efficiently.

Economic impacts due to the proposed transmission line would be minimal at a state level. Construction benefits would be short term. Line maintenance employment benefits and tax benefits would be long term but likely small at both a county and state level except for Pondera County which could earn up to $240,000 per year in tax revenue. Farmers would experience greater costs from loss of farming acreage and difficulty farming due to the poles. Some of these costs would be mitigated by payments from MATL. Other environmental impacts (costs) are summarized in **Table 3.18-1**.

Benefits to the state of the wind farms include jobs, state taxes and county taxes. Costs include environmental impacts associated with wind farm development and operation. Benefits and impacts of wind farm development are described in Chapter 4.

The proposed facility is unlikely to have adverse affects on public health, welfare and safety because the line would conform to the requirements of the National Electric Safety Code and DEQ standards for electric field strength in residential or subdivided areas and at road crossings. Sensitive receptors such as residences, schools, and hospitals will be located at distances sufficient that even the most restrictive suggested standards for magnetic fields would be met under normal operating conditions. Structure designs would be used that discourage pole climbing by members of the public. Lastly, the project would be constructed in a manner that minimizes adverse impacts to soil, water, and aquatic resources.

The Montana DEQ is waiting for additional comments on the benefits and costs of MATL, and will make a final determination on public interest, convenience, and necessity after comments on this document are analyzed.

3.18.9 Public and Private Lands

The use of public lands for location of the facility was evaluated, and public lands were incorporated into alternatives whenever their use was as economically practicable as the use of private lands (75-20-301(1)(h), MCA). Table 3.1-5 lists the public land crossed by each alternative.

3.18.10 DEQ Issuance of Necessary Decisions, Opinions, Orders, Certifications, and Permits

As appropriate, the department would issue all necessary environmental permits at the time the decision is made on whether or not to grant a certificate for the facility. MATL has not applied for air or water quality permits.

TABLE 3.18-1 SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS AND COSTS BY ACTION ALTERNATIVE				
Resource Area/ Resource Attribute	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Summary of Impacts**
Land Use – General Impacts	Potential impacts compared to other alternatives depend on length of alignment in general, and length on cropland.	Potential impacts compared to other alternatives depend on length of alignment in general, and length on cropland.	Potential impact compared to other alternatives depend on length of alignment in general, and length on cropland.	Loss of production due to structures & roads, increased risk of weed introduction and spread, risk of equipment damage from hitting a structure, increased time to farm around poles, and some GPS-guided equipment may be affected. Cropland crossings also increase the risk of crop duster accidents.
Land Use – General Impacts	Similar for all alternatives	Similar for all alternatives	Similar for all alternatives	During construction, facility construction traffic may conflict with movement of farm equipment on roads.
Land Use- Total Amount of Land Crossed	129.9 miles	121.6 miles	139.6 miles	Alt 3 would disturb the least amount of land. Alt 4 would disturb the most.
Land Use – Total Cropland crossed	93.3 miles	97.7 miles	87.9 miles	Alt 4 crosses the least cropland. Alt 3 crosses the most cropland.
Land Use – Total Cropland Crossed Diagonally	52.9 miles	70.4 miles	27.1 miles	Alt 4 crosses the least cropland diagonally / Alt 3 crosses the most diagonally.
Land Use – Guaranteed Use of Monopoles On Cropland	Yes, for 53 miles	No	Yes	Alt 4 requires the use of monopoles for crossing all cropland, Alt 2 would use monopoles for 53 miles of cropland crossed diagonally. Alt 3 would not use monopoles unless at the discretion of MATL.
Land Use –Special Management Areas Crossed	11.2 miles	6.4 miles	11.2 miles	Alt 3 would cross the least amount of special management areas. Alt 4 would avoid most used portion of the Great Falls Shooting Sports Complex
Land Use – Conservation Easements Crossed	23.6 miles	18.1 miles	32.5 miles	Alt 3 would cross the least amount of conservation easements. Alt 4 would cross the most.

TABLE 3.18-1 (Continued)
SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE

Resource Area/ Resource Attribute	Alternative 2	Alternative 3	Alternative 4	Summary of Impacts
Land Use – Proximity to Residences	1 residence within about 270 feet of the centerline. 20 residences less than ¼ mile from the centerline.	25 residences less than ¼ mile from the centerline.	20 residences less than ¼ mile from the centerline.	Alts 2 and 4 have the fewest residences less than ¼ mile from the centerline. Alt 2 has the closest residence to the centerline.
Land Use – Length of 500-foot-wide Alignment Buffer Zone Within 100 feet of a Pipeline.	7.0 miles	23.7 miles	5.7 miles	Alt 4 has the least amount of the 500-foot alignment buffer zone near pipelines. Alt 3 contains the greatest length of alignment near pipelines.
Land Use – Impacts to Roads and Road Use	Increased traffic on roads during construction resulting in occasional conflicts with farm machinery.	Same as Alt 2	Same as Alt 2	All alternatives have similar impact
Geology – Miles on Soil and Geologic Resources Prone to Mass Movement	9 miles	3 miles	20 miles	Alt 3 would have the least risk of causing mass movement that could result in pole instability. Alt 4 presents the greatest risk.
Soils – Miles on Unstable Soils	10 miles	12 miles	24 miles	Alt 2 would have the least risk of soil erosion. Alt 4 presents the greatest risk. Soil erosion impacts can be mitigated under all alternatives.
Engineering	No adverse impact to structural reliability is anticipated.	Same as Alt 2	Same as Alt 2	All facilities are proposed to be constructed in compliance with accepted engineering standards.
Hazardous Materials	No impact to resources from hazardous materials is anticipated.	Same as Alt 2	Same as Alt 2	MATL proposes to manage and transport hazardous materials and wastes in accordance with State and Federal requirements.
EMF – Exposure Levels	Low impact	Same as Alt 2	Same as Alt 2	Exposure levels would not exceed state standards for electric fields.

TABLE 3.18-1 (Continued) SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE				
Resource Area/ Resource Attribute	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Summary of Impacts**
EMF – Radio or TV Interference	Low impact	Same as Alt 2	Same as Alt 2	No alternative is expected to interfere with stationary radio or TV reception. Potential interference with mobile AM reception of weak signals.
EMF – DGPS Interference	Potential for interference with radio-based differential connection signal from corona, gap discharges, scintillation, and to a lesser degree, limited shielding of GPS satellite signal.	Same as Alt 2	Same as Alt 2	Agencies would require mitigation for interference with GPs signals.
Water – General Impacts	Potential impact compared to other alternatives depends on number of river crossings	Potential impact compared to other alternatives depends on number of river crossings	Potential impact compared to other alternatives depends on number of river crossings	Minor short-term adverse impacts to surface water quality could occur by temporarily increasing sources of sediment from the time of construction to reclamation completion. This impact would be mitigated if water and riparian areas are undisturbed or measures to reduce sediment transport are installed.
Water – Potential Number of Perennial Stream or River Crossings	10	6	17	Alt 3 poses the lowest risk and Alt 4 poses the highest risk of contributing sediment to streams and lakes based on number of stream crossings. Multiple crossings would be addressed during on-site inspections.
Water – Potential Number of Lake Crossings	4	6	2	
Wetlands - General	Potential impact compared to other alternatives depends on acres of wetlands not spanned.	Potential impact compared to other alternatives depends on acres of wetlands not spanned.	Potential impact compared to other alternatives depends on acres of wetlands not spanned.	Spanning of most wetlands is expected. Construction disturbance could result in a change in wetland plant community if wetland hydrology is altered. This impact would not occur if wetlands were undisturbed during construction and maintenance.

TABLE 3.18-1 (Continued) SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE				
Resource Area/ Resource Attribute	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Summary of Impacts**
Wetlands – Total Wetlands and Potential Wetlands Crossed	67.6 acres	62.3 acres	76.4 acres	Spanning of most wetlands is expected. Alt 3 crosses the least amount of ground that contains wetlands and potential wetlands. Alt 4 crosses the greatest amount of wetlands and potential wetlands.
Vegetation - General	Potential impact compared to other alternatives is dependent on acres of disturbed native vegetation	Potential impact compared to other alternatives is dependent on acres of disturbed native vegetation	Potential impact compared to other alternatives is dependent on acres of disturbed native vegetation	Temporary loss of vegetation and increased risk of weed emergence and dispersion in disturbed areas until reclaimed.
Vegetation – Potential loss during construction	38 acres	41 acres	48 acres	Alt 2 would disturb the least amount of native vegetation; Alt 4 would disturb the largest acreage.
Wildlife - General	Impacts greatest for birds and animals with low mobility.	Same as Alt 2	Same as Alt 2	Short-term impacts include loss of individuals during construction or direct disturbance of species during critical periods in their life-cycles. Long-term impacts include habitat alterations and collisions. Impacts would be similar for all alternatives.
Wildlife- Crosses Mule Deer Habitat	19 miles	10 miles	28 miles	Minor to no impact to mule deer population relative to the size of the existing habitat and individual mobility.

TABLE 3.18-1 (Continued)
SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE

Resource Area/ Resource Attribute	Alternative 2	Alternative 3	Alternative 4	Summary of Impacts
Wildlife – Birds	Collisions with transmission line could result in bird loss. Portion of the line located near wetland and the Benton Lake National Wildlife Refuge would experience bird collisions.	Because the line length and location are similar to the existing 115-kV line in Alt 1 (within 1% difference) and both pass near wetlands and the Benton Lake National Wildlife Refuge, impacts to wildlife would be similar to Alt 2.	Close proximity to Benton Lake National Wildlife Refuge is avoided. Collision risk exists in other areas.	Bird collision potential is similar for all alternatives. Marking of line would reduce but not eliminate collisions.
Fish – Expected Impacts to Water Quality	10 perennial river crossings	6 perennial river crossings	17 perennial river crossings	Low impact is expected but Alt 3 poses the lowest risk of affecting fish habitat by contributing sediment to streams based on the number of stream crossings.
Special Status Species - Vegetation	All known occurrences are located outside the study area	Same as Alt 2	Same as Alt 2	Low impact is expected. Risk to vegetation special status species is based on risk to its habitat (wetlands). Alt 3 has the least likelihood of affecting vegetation species of concern because the alignment crosses less riparian habitat than Alts 2 and 4.
Special Status Species – Wildlife Habitat	19.9 miles	11.3 miles	11.7 miles	Alts 3 and 4 would cross the least amount of habitat type used by special status species wildlife.
Air Quality - General	Some localized short-term emissions of particulate matter would occur during construction.	Same as Alt 2	Same as Alt 2	All alternatives have similar low impact

TABLE 3.18-1 (Continued)
SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE

Resource Area/ Resource Attribute	Alternative 2	Alternative 3	Alternative 4	Summary of Impacts
Audible Noise - General	Short-term, localized construction noise. Noise from rain or wind on the transmission line would be below BPA and HUD guidelines.	Same as Alt 2	Same as Alt 2	All alternatives have similar low impact
Social Resources	Increased short-term construction and long-term maintenance employment opportunities	Same as Alt 2	Same as Alt 2	All alternatives have similar impact
Economics – Short Term	Short-term construction-related employment would be available.	Same as Alt 2	Same as Alt 2	All alternatives have similar impact
Economics - Counties	Long-term operation and maintenance employment would be available. County and State tax revenues would increase. Farmers would bear additional costs from having to farm around transmission structures	Same as Alt 2	Same as Alt 2	All alternatives have similar impact
Economics - State	Opportunities to export electric power would increase. Increased competition may reduce cost to ratepayers. Creation of opportunities to start up wind generation facilities.	Same as Alt 2	Same as Alt 2	All alternatives have similar impact

TABLE 3.18-1 (Continued)
SUMMARY COMPARISON OF ENVIRONMENTAL IMPACTS BY ACTION ALTERNATIVE

Resource Area/ Resource Attribute	Alternative 2	Alternative 3	Alternative 4	Summary of Impacts
Paleontological Resources – Miles of Geologic Units Crossed With a High Probability of Containing Fossils.	51.6 miles	44.3 miles	44.6 miles	Alt 3 would cross the fewest miles having a surface expression of the Two Medicine Formation which has a high probability of containing fossils. Alternative 2 would cross the most miles over the Two Medicine Formation.
Cultural Resources- Number of Cultural Resources Crossed	Crosses 6 sites eligible for the NRHP and 13 sites of undetermined eligibility.	Crosses 7 sites eligible for the NRHP and 9 sites of undetermined eligibility.	Crosses 3 sites eligible for the NRHP and 20 sites of undetermined eligibility.	Alt 4 would pose a risk to the lowest number of cultural resource sites. Alt 3 would pose a risk to the greatest number of cultural resource sites.
Visuals - General	Potential impact compared to other alternatives is dependent on proximity to viewers and physical contrast	Potential impact compared to other alternatives is dependent on proximity to viewers and physical contrast.	Potential impact compared to other alternatives is dependent on proximity to viewers and physical contrast	Decline in aesthetic quality of a view shed, visual contrast or landscape change due to contrast with natural landscape.
Visuals – Residences within ¼ mile	20 residences	25 residences	20 residences	Alt 2 would be visible from the fewest residences within ¼ mile. Alts 3 and 4 would have similar proximity to residences.
Visuals – Number of Residences ¼ - ½ Mile	51 residences	65 residences	45 residences	Alt 4 would be visible from the fewest residences within ¼ to ½ mile. Alt 3 would be visible to the most residences.
Visuals – Within ½ mile from a Travel Corridor	6.1 miles	7.6 miles	5.0 miles	Alt 4 would be visible from the shortest length of a travel corridor within ½ mile. Alt 3 would have the longest visibility.

Notes:

Alt	Alternative	BPA	Bonneville Power Administration		
EMF	Electric and Magnetic Field	EPA	U.S. Environmental Protection Agency		
Est	estimated	GPS	Global Positioning System	NRHP	National Register of Historic Places
HUD	U.S. Housing and Urban Development	L & C	Lewis and Clark County	TV	Television

4.0 Cumulative Impacts and Other NEPA and MEPA Considerations

This chapter presents information and analysis necessary to comply with several provisions of NEPA and MEPA. To support the subsequent analyses, the chapter begins with a preface about what a merchant transmission line is and the potential uses of the proposed MATL line. The remaining sections in Chapter 4 discuss:

- Cumulative impacts of the proposed Project and alternatives when combined with past, present, and reasonably foreseeable future actions, including the interconnection of the proposed MATL line and potential wind farms that may use the line (Sections 4.1 through 4.16);
- Unavoidable adverse impacts (Section 4.17);
- Irreversible or irretrievable commitments of resources (Section 4.18);
- Short-term use versus long-term productivity (Section 4.19);
- Regulatory impacts on the applicant's private property rights (Section 4.20); and
- Intentional destructive acts (Section 4.21).

Description of a Merchant Transmission Line

A transmission line is normally built for one of three different situations. The most typical situation is a transmission line constructed by an electric utility to help serve customers' demand for electricity within its service area. A second situation is the construction of a transmission line by various parties (private and utility) interested in connecting a specific power-generating source to the regional electrical system. A third situation is a "merchant line," a line constructed and owned by a private party with no electric service area who owns no other electrical facilities (generating units, distribution lines, or substations). A merchant line is generally intended to serve a need or market for electricity. MATL's proposed 230-kV transmission line project would be a merchant line project.

The merchant transmission line development company finances its project through private sources and recovers its investment in the project by selling rights to use "capacity," or space, on the line. Anyone may purchase capacity on a merchant line, including conventional electric generating sources or renewable sources. The FERC has an "open season" process by which merchant transmission developers offer the capacity for sale through a FERC-approved auction. FERC regulations require an open and fair offering of the capacity to shippers.

The entities that acquire transmission capacity through the open season auction have a guaranteed right to the purchased capacity for the specified period and, in return, have a firm obligation to pay the merchant transmission developer for these rights regardless of whether or not they use them. Generally, this guaranteed payment from the purchasers of the transmission capacity facilitates the financing of merchant transmission projects.

Wind Power and the MATL Transmission Line

As of this writing, various developers of proposed wind farms have purchased all the shipping capacity (**Table 4.1-1**). However, because the capacity rights are a commodity that may be resold or traded, the original purchasers may not be the power suppliers that use the line. MATL has indicated that capacity rights contracts do not require the use of any particular form of power generation.

TABLE 4.1-1
BIDS ACCEPTED BY MATL

Company Name	Total Awarded MW	Direction of Power Flow	Start Date/Contract Term (years)	Project Name/Location
Naturener USA	120	South to North, Cut Bank to Alberta	Unknown/15	McCormick Ranch Wind Park/Glacier and Toole counties
Naturener Canada	180	South to North	2008/24	Rim Rock Wind Farm/Toole County
Wind Hunter LLC	120	North to South	2007/25	Unnamed/unknown
Invenergy Wind Montana	180	North to South	Unknown/25	Unnamed/unknown

Notes:

MW = megawatt

In light of the foregoing, DOE believes that MATL's proposed Project is separate from and has an existence and utility independent from the wind farms. While the wind farms could be the first users of the line, it is reasonably foreseeable that other shippers would use the MATL line. As a result, DOE does not view the wind farms as "connected actions" as defined in 40 CFR 1508.25(a) (1). Therefore, in this EIS the impacts from potential wind farms are evaluated as cumulative impacts, consistent with 40 CFR 1508.7, and not connected actions.

4.1 Cumulative Impacts

The CEQ regulations implementing the procedural provisions of NEPA define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

MEPA defines cumulative impacts as "the collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type" (75-1-220(3), MCA). "Related future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures" (75-1-208(11), MCA). Pursuant to ARM 17.4.627, whenever a state agency prepares a joint environmental impact statement that will comply with NEPA and MEPA, the joint document will be prepared in compliance with both statutes. The State agency may accede to and follow more stringent Federal requirements, such as additional content. NEPA requires reasonably foreseeable future actions to be included in the cumulative impacts analysis, not just those undergoing concurrent review. In order to comply with the more stringent Federal requirement, the cumulative impacts analysis in this document includes consideration of reasonably foreseeable future actions that do not meet the definition of related future actions, including potential wind farms.

DEQ considers cumulative impacts when making the findings under MFSA (ARM 17.20.1604 (1)(b) and 1607(1)(a)(vii)). Analysis of cumulative environmental impacts of a proposed Project and other actions helps to ensure that agency decisions consider the full range of consequences of the agencies' actions to the extent information is available.

Because the proposed Project would have no direct or indirect effects in the area of Engineering, there is nothing to add to the past, present, and reasonably foreseeable future actions. Therefore, there are no cumulative effects from the proposed action on that topic. However, some reasonably foreseeable future actions might result in changes in the local electrical system with a resulting cumulative impact on electric system reliability.

4.1.1 Region of Influence for Cumulative Impacts

Cumulative impacts are identified only where there is a reasonable likelihood that the proposed Project would have a cumulative or incremental effect with other past, present, and reasonably foreseeable future actions.

Depending on which resource is being evaluated, impacts may be: (1) confined to a specific long-term footprint of development; (2) limited to the entire Project study[7] area; or (3) extended over a much larger area beyond the resource analysis area.

4.1.2 Past and Present Actions Potentially Contributing to Cumulative Impacts

At least 17 pipelines and 8 transmission lines transect the Project study area and vicinity. Sources used to locate linear facilities that transect the study area are: 2005 aerial photos, field observations, and U.S. Geological Survey topographic maps at a scale of 1:24,000. Pipelines in the study area are described in Section 3.3.2. Transmission lines that start at either the Great Falls 230-kV switch yard or the Rainbow Substation and transect the study area are:

1. NWE 100-kV transmission line that runs southwest from Great Falls,
2. NWE 100-kV transmission line that runs south from Great Falls,
3. NWE 115-kV transmission line that roughly parallels the alignment proposed under Alternative 3,
4. NWE 161-kV transmission line that runs northeast from Great Falls,
5. WAPA 115-kV transmission line that runs east-west through Shelby and Cut Bank,
6. WAPA 161-kV transmission line that runs from Great Falls to Havre,
7. WAPA 230-kV transmission line that runs between substations located near Shelby, Conrad, and the Great Falls 230-kV switch yard, and
8. PPL Montana 100-kV transmission lines that connect hydroelectric developments to the Great Falls 230-kV switch yard.

Other present and past activities in the vicinity of the proposed Project include farming (irrigated and non-irrigated), grazing, weed management, hunting, and general recreation; growth of cities and towns, residential areas, and industrial and commercial areas; and Federal and state highways and county roads, railroads and railroad rights–

[7] *The Project **study area** is the area that includes the proposed an alternative alignments and areas where roads may be built or improved. The study area was defined by MATL in its MFSA application to DEQ. The **analysis area** is the area evaluated for each resource. Different resources have different analysis areas. For some resources, the analysis area is the entire study area. For other resources, it may be a smaller area defined by the potential extent of impacts or a larger region defined by the units (for example, counties) for which relevant data are available.*

of-way, communication facilities, military installations, conservation easements, airports, and national trails.

4.1.3 Reasonably Foreseeable Future Actions Potentially Contributing to Cumulative Impacts

Reasonably foreseeable future actions that could occur in the Project study area include the development of wind farms, the new Southern Montana Electric Highwood Generating Station coal-fired power plant (250 MW) proposed to be located outside Great Falls, the proposed gas-fired Great Falls Energy Center (277 MW) power plant, and potential development of irrigation systems on cropland that is not now irrigated.

Table 4.1-2 shows the planned energy generation projects in the area. Available information on these and other reasonably foreseeable future actions is presented in more detail below.

Potential to Upgrade the Capacity of the MATL Proposed Transmission Line

MATL could upgrade the capacity of the proposed line from 300 MW to 400 MW in each direction. However, their end-to-end path rating as designated by WECC is for 300 MW (**Appendix M**).

Highwood Generating Station

Southern Montana Electric Generation and Transmission Cooperative, Inc. proposes to build a 250-MW coal-fired power plant and 6-MW wind generation facility, at a site east of Great Falls, Montana. **Figure 4.1-1** shows the proposed location of this project, which is known as the Highwood Generating Station, along with the new transmission line to connect at the Great Falls 230-kV switch yard. Impacts from the proposed Highwood Generating Station are described in the *Final EIS for the Highwood Generating Station*, which was released in January 2007 (USDA Rural Utilities Service and DEQ 2007). DEQ and USDA issued a joint ROD in May 2007 and the air quality permit has been issued by DEQ.

TABLE 4.1-2
POTENTIAL GENERATION PROJECTS[1] IN THE VICINITY OF THE MATL LINE FROM NORTHWESTERN AND WAPA INTERCONNECTION QUEUES

Queue Position	County	Interconnect Point	In-Service Date[2]	Generating Facility Type	Output (MW)
Not Applicable	Cascade	Great Falls NW - Holter 100 kV Line	February 27, 2006	Wind	9
Application Approved	Cascade	Great Falls 230 kV switch yard	March 31, 2009	Base Load- Coal Fired[3]	268
8	Pondera	South Cut Bank to Conrad Auto 115 kV	October 15, 2008	Wind	104
10	Liberty	69 kV line at Chester	December 1, 2007	Wind	20
11	Cascade	Rainbow switch yard	December 31, 2011	Hydro	23
12	Teton	Dutton 69 kV Substation	August 1, 2007	Wind	18.9
13	Teton	Choteau Substation	December 31, 2009	Hydro	15
14	Cascade	Great Falls 230 kV switch yard	Summer 2007	Gas Fired[4]	277
16	Glacier	Cut Bank 115 kV Substation	October 1, 2008	Wind	110
Unknown	Pondera	Conrad	December 1, 2008	Wind	250

Source: OASIS web site http://www.oatioasis.com/nwmt/nwmtdocs/Interconnection_queue.xls updated 11/21/2007.

1 Under FERC regulations on Large Generator Interconnection Agreements, customer names are confidential until agreements have been signed.

2 Dates are those given in the cited source.

3 Assumed to be Highwood Generating Station.

4 Assumed to be Great Falls Energy Center

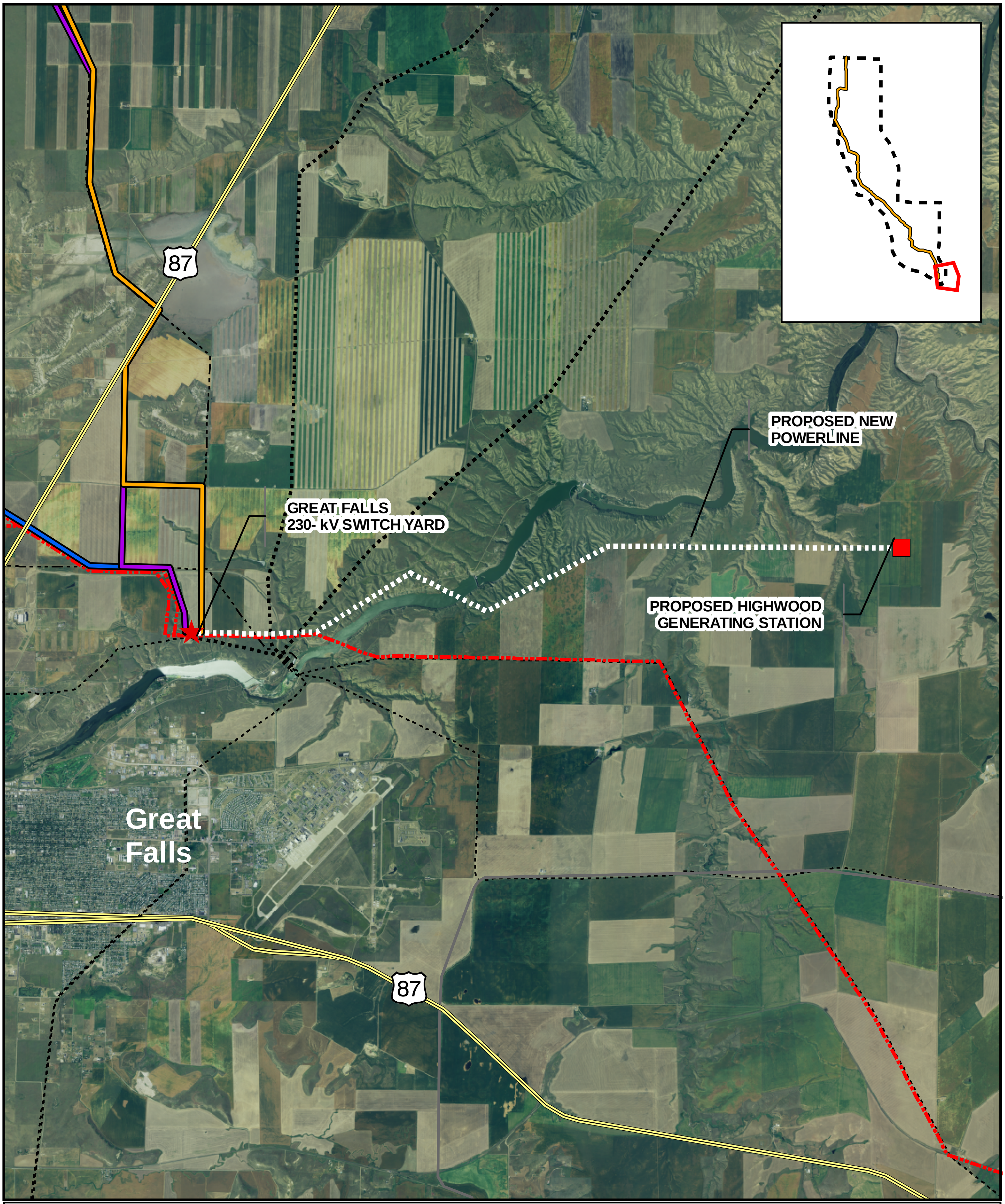


FIGURE 4.1-1
PROPOSED HIGHWOOD
GENERATING STATION

N

0 1
Miles

LEGEND

- ALT2 - PROPOSED ALIGNMENT
- ALT3 - ALIGNMENT
- ALT4 - ALIGNMENT
- 230kV POWERLINE
- 161kV POWERLINE
- 115kV POWERLINE
- 100kV POWERLINE
- ALIGNMENT END POINT
- MAJOR HIGHWAYS
- SECONDARY ROADS
- SECTION LINE

GIS map by Ed Madej -TTEMI-HE Fig4_1-1_MATL_Highwood_Generating_Station_110507.mxd

Great Falls Energy Partners – Great Falls Energy Center

Great Falls Energy Partners purchased the assets and permits for Montana First Megawatts from NorthWestern Energy in February 2007 and renamed their project the Great Falls Energy Center. The proposed project would include a gas-fired, combined cycle power plant capable of producing 275 MW with possible expansion for an additional 275 MW. An air quality permit was issued. The project would be located approximately 2 miles north of Great Falls and 2.2 miles west of the Great Falls 230-kV switch yard. Impacts of this gas-fired generator were addressed in an EA for the original air quality permit (DEQ 2001) as well as in a revised air quality permit (DEQ 2006a).

Wind Farms with MATL Capacity

MATL offered two open seasons to bid on the available capacity (300 MW each direction). The first open season was held between February 3, 2005, and April 15, 2005. MATL received six bids.

The second open season occurred between June 9, 2006, and June 30, 2006. MATL accepted bids for 600 MW of firm capacity from four bidders, all potential developers of wind farms, summarized in **Table 4.1-1**. Two of the early bidders (GE Energy and TransCanada) have withdrawn their bids and did not respond during the second open season (Railton 2006; Thornton 2006). More detailed information on the wind farms appears below. This information was gleaned from newspaper articles and press releases, from FWS or MATL, or is based on professional judgment. The accuracy of the information cannot be confirmed; the location, size, and number of turbines are estimates using the best available information. The potential locations of most individual wind farms remain confidential, and wind farms may not be designed yet.

1. Naturener USA – McCormick Ranch Wind Park

Naturener USA has a guaranteed right to purchase 120 MW of capacity to transmit power northward from Cut Bank into Alberta. According to MATL (MATL 2006b), Naturener USA may also transfer power from north to south. This project would be located between the Marias River north to Hjartarson Road and between McCormick and Sullivan Bridge roads. The wind farm would be on 12,000 acres in Glacier and Toole counties with 45 to 60 wind turbines. Once the construction is complete, it would take at least 15 technicians to operate and maintain year-round. The proposed location of the McCormick Ranch Wind Park and additional anemometer locations are shown on **Figure 4.1-2**.

2. Naturener Canada – Rim Rock Wind Farm
The Rim Rock Wind Farm would be in northwest Toole County on 15,000 acres of privately owned land. Naturener Canada has a guaranteed right to purchase 180 MW of capacity.

3. Wind Hunter LLC – Unnamed Wind Energy Project
Wind Hunter LLC has a guaranteed right to purchase 120 MW of capacity southward. Wind Hunter would likely construct a wind energy project in the Cut Bank area.

4. Invenergy Wind Montana – Unnamed Wind Energy Project
Invenergy Wind LLC has a guaranteed right to purchase 180 MW of capacity southward on the proposed MATL transmission line. Invenergy is interested in constructing other wind energy projects in Montana, potentially in the Cut Bank/Shelby/Conrad area.

Other Wind Farms
DEQ staff is aware of several other initiatives under way to develop wind farms or areas under investigation for wind farm development, as listed below. Because these projects are speculative, they are discussed generally.

Potential wind farm developments in early stages of planning include:

- A wind farm at Trunk Butte (Belgian Hill) would interconnect with NorthWestern Energy's Great Falls to Cut Bank transmission line. The size is unknown.

- A wind farm on Teton Ridge southwest of Dutton would be about 30 MW.

Other wind farms may connect to NorthWestern Energy and WAPA transmission lines. Information is available on developers currently pursuing interconnection agreements with NorthWestern Energy and WAPA (**Table 4.1-2**). Many wind farm projects reach the stage of submitting an initial request for an interconnection study and, after the prospective developers learn the results, they withdraw the request to interconnect.

DEQ has observed anemometers on higher elevation terrain to the west and north of Conrad, between Cut Bank and the Marias River east of the Blackfeet Indian Reservation, a few miles north of Hay Lake north of Cut Bank, and just east of Route 214 about 15 to 20 miles north of Cut Bank (**Figure 4.1-2**). An anemometer does not necessarily indicate that a wind farm is being considered; only that someone is monitoring the wind.

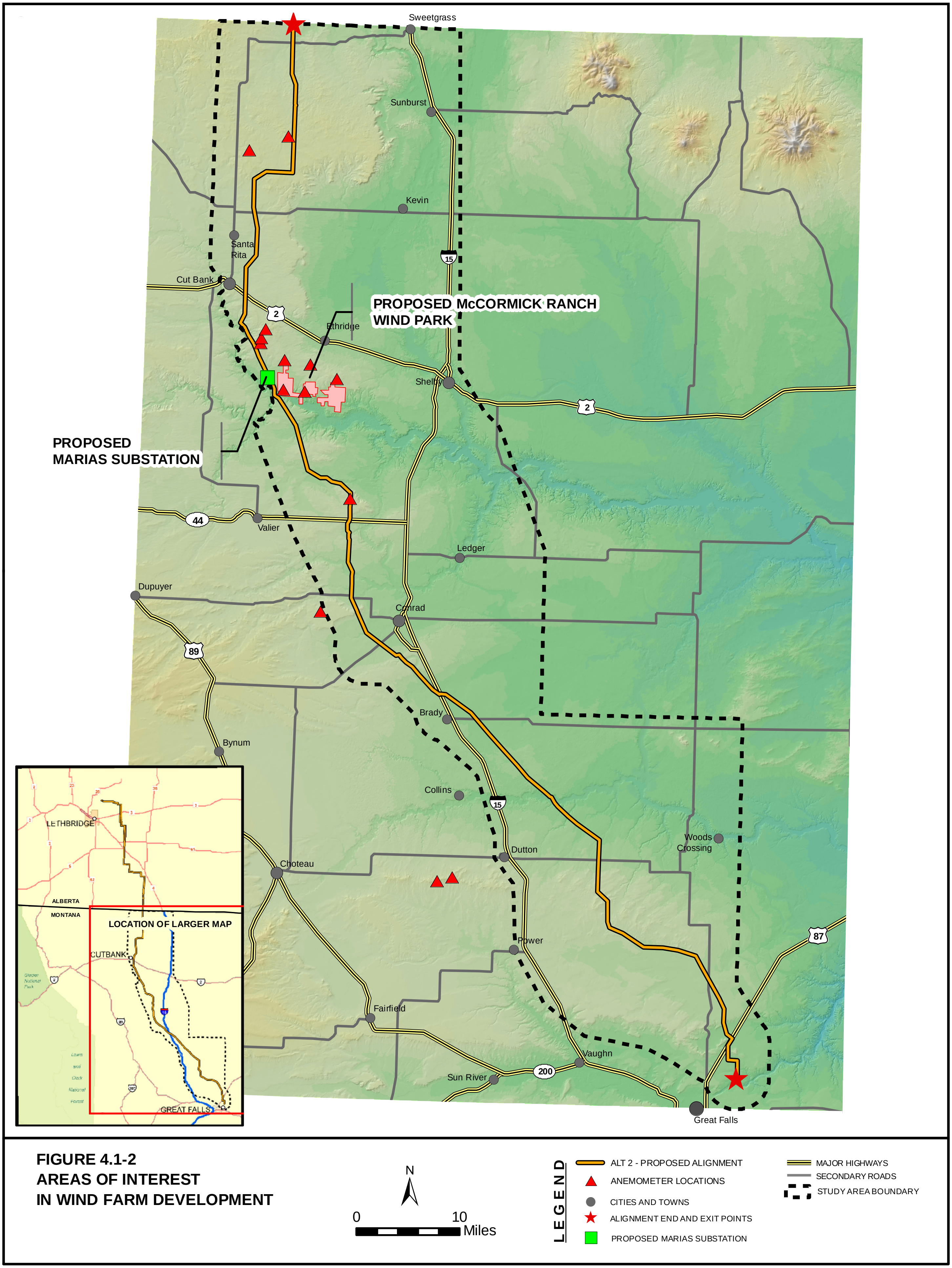


FIGURE 4.1-2
AREAS OF INTEREST
IN WIND FARM DEVELOPMENT

GIS map by Ed Madej -TTEMI-HE Fig4_1-2_MATL_Wind_Farms_010908.mxd

DEQ Analysis of Permitting and Review Requirements for Wind Farms

DEQ administers no permits specifically for wind farms as energy projects. Certain permits may, however, be necessary for proposed wind farms, depending on the locations of the roads, turbines, and power lines. These are listed in **Table 4.1-3**. It is possible that few if any state permits would be necessary if a project were on private land with no stream or wetland crossings or encroachments. If no permits are needed, DEQ would not prepare an environmental assessment (EA) or an EIS.

TABLE 4.1-3
MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY PERMITS AND APPROVALS

Permit/Approval Name	Nature of Permit	Authority
Section 401 Water Quality Certification	Provides a review of potential adverse water quality impacts potentially associated with discharges of dredged or fill materials in wetlands and other waters of the U.S.	Section 401 of the Clean Water Act
MPDES Wastewater Discharge Permit	Permits construction and industrial activities that would result in the discharge of wastewater to waters of the state.	Montana Water Quality Act (75-5-401 et seq., MCA)
General Discharge Permit for Storm Water Associated with Construction Activity	Submit Notice of Intent for coverage under General Permit to authorize storm water discharges to surface waters of the state associated with the construction activities.	Montana Water Quality Act (75-5-401 et seq., MCA)
General Permit for Storm Water Discharges Associated with Industrial Activity	Permits storm water discharges from qualifying industrial activities.	Montana Water Quality Act (75-5-401 et seq., MCA)
Montana Joint Application: 310 Permit	Permits construction activities in or near perennial streams on public and private lands.	Montana Natural Streambed and Land Preservation Act (75-7-101 et seq., MCA)
Certificate of Compliance	Authorizes construction and operation of certain transmission lines with a design capacity greater than 69 kV.	Major Facility Siting Act (75-20-101 et seq., MCA)
Montana Joint Application: 318 Authorization short-term turbidity	Authorizes short-term narrative standards for turbidity associated with construction activities.	Montana Water Quality Act (75-5-101, MCA)
Public Water Supply Approval	Review of engineering plans and specifications for a new public water supply for more than 25 people daily for period of at least 60 days in a one-year period.	75-6-112, MCA: Plan Review and Approval
Open Cut Permit (if new gravel sources are needed for the project)	Permit to excavate 10,000 cubic yards or more total aggregate from one or more pits regardless of surface ownership.	Open Cut Mining Act (84-4-401 et seq., MCA)

DEQ does not maintain a comprehensive list of authorizations, permits, reviews, and approvals required by other state and Federal agencies, but a preliminary list is in **Table 4.1-4**. The Montana Department of Commerce (MDOC) also has information about general permits and licenses for doing business in Montana. The FWS enforces the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. No permit is required per se; however, FWS has developed guidelines for use by wind farm developers to help determine the level of study necessary to address avian mortality issues before a project is built.

The U.S. Department of Defense (DoD) reviews proposals for wind farms and transmission lines to ensure that excavation would not disturb buried cable connecting Minuteman missile silos or interfere with military radar. Entities seeking to develop wind energy projects on BLM-administered lands are required to consult with the DoD regarding the location of wind power projects and turbine siting as early in the planning process as appropriate. An interagency protocol agreement between the BLM and the DoD is being developed to establish a consultation process and to identify the scope of issues for consultation (BLM 2005a).

The Federal Communications Commission (FCC) has regulatory authority to ensure that wind turbines and power lines do not cause microwave, television, radio, telecommunications, or navigation interference. FCC also issues licenses to operate industrial radio service for fixed microwave stations.

Assumptions about Cumulative Effects from Wind Farm Development

For purposes of cumulative impact assessment from wind farms, it is conservatively assumed that: (1) the MATL line capacity is proposed to be 300 MW in each direction and that the line could be upgraded, allowing the line to handle 400 MW in each direction; (2) new wind farms would be built to use the total 800 MW (400 MW in each direction) capacity; and (3) 1.5 to 2 MW turbines would be used. Accordingly, 400 to 533 turbines might generate electricity that would transmit on the MATL line.

The cumulative impacts analysis for potential wind farms is heavily adapted from the *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2005b) and refined for conditions found near the proposed MATL line. Because of the lack of detailed plans on the wind farms, site-specific issues associated with individual wind farms are not assessed in detail. Rather, the range of possible impacts is identified. The BLM EIS includes an extensive list of potential mitigation measures to reduce or eliminate impacts (**Appendix O**). These potential mitigations could be refined for conditions near the proposed MATL transmission line.

TABLE 4.1-4
AUTHORIZATIONS, PERMITS, REVIEWS, AND APPROVALS BY OTHER AGENCIES[1]

Action	Permit/Approval	Approving Authority/ Approving Agency	Statutory or Regulatory Reference
FEDERAL			
Power Line Construction and Operation on Land Under Federal Management	Right-of-Way (ROW) Grant	BLM/USFS	FLPMA 1976 (PL94-579); USC 1761-1771 and 43 CFR Part 2800
Transmission Line Interconnection	Interconnection Agreement	WAPA/BPA	Section 211 Federal Power Act, General Guidelines for Interconnection
NEPA Compliance to Grant ROW and WAPA Interconnection Agreement	EA and/or EIS	Federal Agencies	NEPA, CEQ 40 CFR Part 1500-et. seq.
Review and approval of State Highway permit application and support documentation for transmission lines in the Interstate Highway System right of way	Review and Approval authority	FHWA through MDT	23 CFR 1.23 and 1.27 USC Sections 116, 123, 315 (23 CFR Part 645 Subpart B), 23 CFR 77
Grant of ROW by BLM, USFS or Transmission Line Interconnection Agency	ESA compliance, Biological Assessment (BA), and Biological Opinion (BO)	USFWS	ESA, Section 7
Grant of ROW by BLM, USFS or Transmission Line Interconnection Agency	National Historic Preservation Act (NHPA) compliance, Section 106	BLM, WAPA, and Montana SHPO	NHPA of 1966, 36 CFR part 800, 16 USC 47
Tower location and height relative to air traffic corridors	Notice of Proposed Construction or Alteration	Federal Aviation Administration (FAA)	49 USC 1501; 13 CFR 77 Objects Affecting Navigable Airspace
Fill in a Wetland	404 permit	Army Corps of Engineers	CWA, Section 404
Construction in a navigable river or harbor	Section 10 permit	Army Corps of Engineers	River and Harbors Act of 1899
Crossing of Federally owned canals	Perpetual license for electric line crossings on Bureau of Reclamation land and canals	Bureau of Reclamation	
Oversees Federal agencies regarding impacts on cultural resources		Advisory Council on Historic Preservation	National Historic Preservation Act Section 106
Review to determine if there could be communications interference	Review	Federal Communications Commission	Communications Act of 1934, as amended, 47 CFR parts 301, 303(f).
STATE OF MONTANA			
Allows construction activity within a designated 100 year flood plain	Montana Joint Application; Flood Plain Development Permit	Montana DNRC or County Floodplain Coordinator.	Montana Floodplain and Floodway Management Act (76-5-401 to 406, MCA)
Construction activities on state trust lands and navigable waterways	Easement/Land Use License	Board of Land Commissioners; Montana DNRC	Title 77, MCA
Leasing of State Lands	State Land Lease	Board of Land Commissioners; Montana DNRC	Title 77, Chapter 6, MCA

TABLE 4.1-4 AUTHORIZATIONS, PERMITS, REVIEWS, AND APPROVALS BY OTHER AGENCIES[1]			
Action	**Permit/Approval**	**Approving Authority/ Approving Agency**	**Statutory or Regulatory Reference**
Grant utility crossing permits for transmission line and access roads that may encroach on state maintained highways	Utility Crossing Permit	Montana Department of Transportation (MDT)	RW 131 and/or RW 20
Consults with project applicants and state agencies regarding impacts on cultural resources	Montana Antiquities Act consultation	Montana SHPO	Montana Antiquities Act (22-3-421 through 442, MCA)
Facility Construction	Building permits per relevant building codes	Montana Department of Labor and Industry, Building Codes Bureau	Title 50, Chapter 60 and Title 50, Chapter 74, MCA
COUNTY			
Containment, suppression and eradication of noxious weeds	Noxious Weed Management Plan	County Weed Control District	7-22-2101-2153, MCA
ROW easement grants and road crossing permits for county property and roadways	Easement grants and road crossing permit	County Commissioners	
Construction in or near perennial streams on public and private lands	Montana Joint Application: 310 Permit	Conservation District	Montana Natural Streambed and Land Preservation Act (75-7-101 et seq., MCA)

Notes:

1 This list is not comprehensive and not all of these agency actions would apply for all projects.

BLM – Bureau of Land Management

BPA – Bonneville Power Administration

CEQ – Council on Environmental Quality

CFR – Code of Federal Regulations

CWA – Clean Water Act

DNRC – Department of Natural Resources and Conservation (Montana)

EA – Environmental Assessment

EIS – Environmental Impact Statement

ESA – Endangered Species Act

FAA – Federal Aviation Administration

FHWA – Federal Highway Administration

FLPMA – Federal Land Policy Management Act

MCA – Montana Code Annotated

MDT – Montana Department of Transportation

NEPA – National Environmental Policy Act

NHPA – National Historic Preservation Act

ROW – Right of way

SHPO – State Historic Preservation Officer

USC – Unites Stated Code

USFS – United States Forest Service

USFWS – United States Fish and Wildlife Service

WAPA – Western Area Power Administration

Wind farms are likely to be located in windy areas, within about 30 to 40 miles of a transmission line with available capacity, and where agreements can be negotiated with landowners.

Currently many commercial wind farms are using individual turbines with the ability to generate about 1.5 MW to 2 MW. Larger, more efficient models are in development, but wind farms with smaller generators are still being constructed because the most cost efficient turbines for large-scale development seem to be about 1 to 2 MW.

Development of a wind farm is likely to involve establishing site access; constructing roads; removing vegetation; excavating; constructing towers; and installing turbines, control buildings, meteorological towers, substations, and transmission lines. Construction may take less than a year to several years. Access roads would typically be a minimum of 10 feet wide or as much as 30 feet wide. Existing public or private roadways may be altered to accommodate heavy or oversized vehicles. Based on experience, the final footprint for the above ground facilities is likely to be no more than 10 percent of the total acreage of the wind farm site (BLM 2005b).

The proposed Valley County Wind Energy Project in northeastern Montana (outside the Project study area) includes 114 1.5-MW turbines and covers 6,756 total acres to generate 170 MW. The Supplemental EA (BLM and DNRC 2007) for the wind farm estimated that a total of 244.7 acres would be disturbed for all activities associated with the wind farm including operation and maintenance buildings, access roads, turbine foundations, collector system, substation, staging areas, etc. This amounts to less than 4 percent of the total wind farm area, and approximately 2.15 acres disturbed per turbine (BLM and DNRC 2007). Permanent ground disturbance for the Valley County Wind Energy Project would total about 59 acres (BLM and DNRC 2007), or approximately 0.5 acres per turbine.

During wind farm operation, a 6- to 10-person maintenance crew would likely work at larger sites (Steinhower 2004); smaller sites might just have people on call. Maintenance includes inspection, lubrication, painting, or major overhauls. Technological advances may lead to replacing turbines or blades for efficiency.

Facilities may be removed and recycled when no longer needed. If decommissioning occurs, disturbed land areas could be restored to original grade and reseeded or replanted. During dismantling of electrical substations and storage buildings, the site could be inspected for industrial contamination from minor spills or leaks and decontaminated as necessary.

4.2 Cumulative Impacts on Land Use and Infrastructure

Land use in the area would be affected by projects that connect to the MATL transmission line (including wind farms) or enter the Great Falls 230-kV switch yard (new transmission lines and upgrades). Public comment had identified a public concern regarding the impacts on land uses from wind farm development. These activities have been included in the cumulative effects analysis for land use and infrastructure.

Past, present, and reasonably foreseeable future actions identified in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on land uses.

Past and Present Actions

Transmission lines (see Section 4.1.2), smaller power lines, oil and gas well access, pipelines, communication lines and towers, military installations, and roads have affected, and would continue to affect, land uses in the analysis area for this resource. Depending on their location, these activities may continue to interfere with farming operations, remove farmland from production, and contribute to increased traffic on roads and highways. Transmission lines, smaller power lines, and communication towers may continue to pose obstacles to aircraft.

Reasonably Foreseeable Future Actions

Future transmission line upgrades would not result in cumulative impacts on land use. Although the structures on the rebuild/upgrade of WAPA's Great Falls to Havre transmission line would be slightly wider than those on the existing line, impacts are expected to be similar to those on the existing line. The H-frame line is located in grain fields and rangeland not far from the Rainbow substation and is one of the lines that collectively make farming in the area more difficult. Additional information on this project can be found in the report "*Final Environmental Assessment Havre-Rainbow Transmission Line Rebuild Project*" (WAPA 2007). Similarly, any future upgrade of the MATL transmission line should not result in additional land use impacts because there would be no change to the support structures.

Future maintenance of power lines and pipelines would be infrequent and would not add greatly to traffic on area roads. Traffic would increase from reasonably foreseeable projects as workers commute and fuel and supplies are delivered.

Development of major projects such as the Highwood Generating Station and Great Falls Energy Center typically results in long-term land use changes on project sites. The Highwood Generating Station would convert about 545 acres from crop production to industrial use (USDA Rural Utilities Service and DEQ 2007), while the Great Falls Energy Center would occupy a site of about 55 acres that was previously zoned for industrial use (Ecke 2007). Interconnecting transmission lines, rail spurs, and pipelines associated with these large projects also could disrupt land uses. A 230-kV interconnecting transmission line associated with the Highwood Generating Station would cross rangeland and cropland to connect the generating station with the Great Falls switch yard (**Figure 4.1-1**). This would add to the lines entering and exiting the substation and could interfere further with farming activities near the switch yard.

Construction activities associated with reasonably foreseeable future actions could cause a relatively short-term decrease in the level of service provided by local roadways during the construction period. It is possible that local roads might require fortification of bridges and removal of obstructions to accommodate large and heavy equipment, such as wind turbine components. Construction activities would temporarily affect the recreation setting through noise, dust, traffic, and the presence of a construction workforce. People engaged in activities where solitude is important could be affected the most. Some parks and campsites may have increased use by workers for temporary accommodations during project construction. New access roads could also increase the potential for trespass onto private land closed to hunting. Most long-term effects on recreational settings would relate to visual disturbances. Persons who may otherwise use areas for undisturbed recreational experiences may decide to go elsewhere.

Wind Farm Effects on Land Uses

Most of the areas close to the proposed MATL line where wind farms might be located are privately owned, as indicated in Section 3.1.2 and **Figures 3.1-1, 3.1-2,** and **3.1-3**. Because of turbine spacing, only a small percentage of land would be taken out of use. Depending on the location, size, and design of a wind farm, wind development is compatible with a wide variety of land uses and generally would not preclude recreation, wildlife habitat conservation, military activities, livestock grazing, oil and gas leasing, dry land farming, or other activities that currently occur within the proposed Project area. However, recreation, wildlife habitat conservation, grazing, oil and gas drilling, and farming activities may be modified due to the presence of wind turbines and access roads.

As described above, a recent environmental assessment for a wind farm in northeastern Montana indicated that installation of wind turbines and construction of associated wind farm facilities would temporarily disturb about 2.15 acres per wind turbine and would permanently occupy about 0.5 acres per wind turbine (BLM and DNRC 2007). Given the 400 to 533 turbines assumed to be built by wind farm developers that have contracted for capacity on the MATL transmission line, approximately 860 to 1,146 acres could be disturbed for wind farm construction. About 0.5 acres per turbine, or a total of 200 to 267 acres of this land would be permanently dedicated to use for wind farms (for example, the land occupied by turbines and support facilities) and, thus, converted from its existing uses. Additional wind farm development that could occur unrelated to the MATL line would increase land use impacts proportionately.

Because wind farms are constructed with landowner agreement they would not create a conflict with current and planned agricultural uses of surrounding land, with the exception of aerial crop dusting. Wind farms could adversely affect crop dusting on land adjacent to wind farms.

Grazing and the operation of agricultural equipment could continue around and between wind turbines, though there would be additional obstacles to farm around. Guy wires for anemometers associated with wind farms would occupy only a few square feet and would be installed with landowner permission. They would have a negligible impact on the land area in agricultural use, but plowing and harvesting patterns might need to be modified in the immediate vicinity of the turbines and roads.

Construction and future decommissioning of wind farms could temporarily disrupt livestock access to supplementary feeding and watering stations (BLM et al. 2006). Upon wind farm decommissioning, land converted from cropland and pasture/ rangeland use could be returned to these prior uses. No permanent land use impacts would be expected when the wind farms are decommissioned (BLM et al. 2006).

CRP land disturbance would be minimal over the course of the operational life of wind farms because these lands are set aside for conservation and are usually not used for agricultural purposes. The largest impacts to CRP would be ground disturbance during the construction and decommissioning phases.

Compatibility of Wind Farms with Special Management Areas

BLM Areas of Critical Environmental Concern (ACEC), such as the Kevin Rim ACEC, and the FWS Benton Lake National Wildlife Refuge are unsuitable for wind farm development and would be excluded from consideration for development per agency management plans and direction.

Wind Farm Effects on Aviation

Additional elevated structures in the airspace would be a cumulative element for pilots to avoid.

4.3 Cumulative Impacts on Geology and Soils

Geology and soils in the area would be affected by projects that cause soil erosion or soil disturbance.

Past, present, and reasonably foreseeable future actions identified in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on geology and soils. The review indicated that simply upgrading the capacity of the MATL transmission line would not contribute cumulative effects on geology and soils.

There could be cumulative impacts on geology and soils in the Project study area from the construction and operation of future wind farms and new roads, and the increased need for new or expanded sand, gravel, and concrete operations. Most potential cumulative impacts from soil erosion, landslides, mixing of soil horizons, and soil compaction would have minimal extent, largely being limited to the areas actually disturbed. Erosion and sediment controls would be required on construction-related disturbances of more than 1 acre.

Construction activities that would affect geologic resources and soils include vegetation clearing, excavation, blasting, trenching, grading, and heavy vehicle traffic.

Sand and gravel and/or quarry stone would likely be mined close to the potential construction site, potentially creating soil erosion and mixing of soil horizons.

Construction could activate geological hazards and increase slope instability. Activities could increase the slope, cause toe-cutting at the base of slopes, or increase pore pressure, which weakens the strength of soils on slopes or causes accelerated soil erosion.

Surface disturbance could cause soil erosion, which in turn can result in soil nutrient loss and degradation of water quality in nearby surface water bodies. The magnitude of the impact depends on the project size, erosion potential of the soil, local terrain, vegetative cover, and the distance from a site to nearby surface water bodies. DEQ would require control of storm water during construction, reducing the potential for transport of eroded soils.

4.4 Cumulative Impacts Related to Hazardous Materials

Past, present, and reasonably foreseeable future actions identified in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts related to hazardous materials.

Construction, operation, and decommissioning associated with reasonably foreseeable future actions (including Highwood Generating Station, wind farms, Great Falls Energy Center, and transmission line upgrades) would require the use of some hazardous materials, although the variety and amounts of hazardous materials present during operation would be minimal. Types of hazardous materials that may be used include fuels (e.g., gasoline, diesel fuel), lubricants, cleaning solvents, paints, pesticides, wood preservatives, and explosives. These same types of materials would also continue to be used in farming, weed management, maintenance of roads and rail facilities, and other ongoing activities in the area. Wastes would be managed as required by state and federal law and there would be a low probability that any serious contamination would occur.

4.5 Cumulative Impacts on EMF and Health and Safety

Past, present, and reasonably foreseeable future actions that could affect EMF levels near residences are considered in this cumulative impacts analysis. Additionally, other potential impacts on occupational and public safety are considered. There public concern about impacts on public safety from wind farms.

Residences within ¼ mile of the proposed MATL transmission line corridor may experience cumulative EMF impacts if additional energy-transmission projects are developed nearby.

If the line capacity were increased to 400 MW in each direction, the electric field at the edge of the right-of-way would increase, and the mean magnetic field would also be similar or slightly higher based on the increased wattage. Electric field strength would remain below the state standard of 1 kV/m at the edge of the right-of-way in subdivided and residential areas. There is no Federal standard for EMF. Sensitive stationary receptors could be exposed to magnetic fields greater than the 1 to 2 mG range, a newly suggested standard (BioInitiative Working Group 2007). Collector systems and transmission lines for wind farms could contribute some additional EMF impacts.

Potential effects on occupational health and safety from construction and operation of reasonably foreseeable future actions would be limited. Nevertheless, with the unique occupational hazards associated with heavy construction, wind farms, and the electric power industry, fatalities and injuries from on-the-job accidents could occur.

4.6 Cumulative Impacts on Water Resources

Past, present, and reasonably foreseeable future actions described in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on water resources.

Past and present actions potentially affecting water resources in the vicinity of the analysis area include ongoing weed management, fertilization, crop production, grazing, road use and maintenance, and waterway modifications for stock watering. These activities can result in surface water flow alterations, water diversions, and stream bank modification and destabilization. Weed control and fertilization can introduce pesticides, nutrients, and total dissolved solids (salinity) into water supplies. Irrigation and waterway modifications for stock can result in increased salinity and flow reduction due to stream channel obstructions and diversions and saline seep. Some grazing practices result in sedimentation to surface water due to soil destabilization from reduced vegetation. Maintenance and use of roads at river and stream crossings can destabilize banks and increase sedimentation to surface water. These effects are commonly seen in agricultural areas.

DEQ has determined that seven water bodies in the analysis area have impaired or threatened beneficial uses by one or more of the activities described above: Missouri River, Benton Lake, Lake Creek, Teton River, Pondera Coulee, Cut Bank Creek, and Old Maids Coulee. These water bodies and their impairment causes and sources are described in **Appendix I** (March 2007 document). Two of these water bodies, the Teton River and Pondera Coulee, would be crossed by all action alternatives. The Teton River is classified as Category 4A: "all TMDLs (total maximum daily loads) needed to rectify all identified threats or impairments have been completed and approved but impaired beneficial uses have not yet achieved fully supporting status." Pondera Coulee is classified as Category 5: "one or more applicable beneficial uses have been assessed as being impaired or threatened and a TMDL is required."

Future construction activities in the region, including construction of wind farms, could affect streams and lakes by

- temporarily increasing soil erosion and stormwater runoff due to ground-disturbing activities, heavy equipment traffic, and extraction of geologic materials from borrow areas or quarries;
- temporarily or permanently diverting surface water flows by access road systems, storm water control systems, or excavation activities;
- temporarily or permanently altering the interaction between hydrologically interconnected groundwater and surface water;

- temporarily reducing stream flows due to water withdrawals for construction activities (for example, for concrete preparation and dust control);
- temporarily increasing discharges of wastewater or sanitary water; and increasing the short-term potential for runoff or spillage of fertilizers, pesticides, and
- other hazardous materials used in site preparation, construction, and post-construction revegetation.

In general, impacts from construction activities associated with reasonably foreseeable future actions would be similar to impacts from construction of the proposed MATL transmission line (Section 3.5.3).

These construction activities, when combined with the potential adverse impacts from the proposed Project and the effects of other present and past actions in the analysis area, could cumulatively increase sediment and other pollutants in water resources and potentially affect the quantity and quality of available water resources, cumulatively increasing the possibility of impairment of one or more beneficial uses. However, because most actions would be separated in time or space and because mitigation measures would be employed to reduce the potential for sedimentation and contaminant discharge, these adverse cumulative impacts are likely to be minor and short term.

Reasonably foreseeable future actions that could have long-term effects on stream flows and water quality in the region include potential expansion of irrigated agriculture and the operation of the Highwood Generating Station and the Great Falls Energy Center. The Highwood Generating Station would require 5,175 acre-feet of water per year (USDA Rural Utilities Service and DEQ 2007) for operation and the proposed Great Falls Energy Center would require about 875 acre-feet per year (Ecke 2007). In both cases, about 80% of the water demand would be used consumptively, while the remaining water would be discharged as wastewater to the Great Falls wastewater treatment plant. Estimates of water consumption by potential future irrigation are not available. There is little potential for cumulative long-term impacts with the proposed Project because operation of the MATL transmission line would have negligible water requirements and would not discharge wastewater or contaminated stormwater.

Few potential cumulative adverse impacts to water resources were identified from future operation of wind farms and none were identified for future upgrades of electric transmission lines. Wind farm operations would have minimal impact on water quantity and quality, and future upgrades of electric transmission lines (including the proposed MATL line) would not affect water resources because there would be minimal requirements for water use or wastewater discharge, and storm water controls would be required during construction.

4.7 Cumulative Impacts on Wetlands and Floodplains

Past, present, and reasonably foreseeable future actions identified in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on wetlands and floodplains.

Past and present actions (e.g., farming, road construction) have disturbed many wetlands in the area through plowing or construction activities that destroyed them or that contributed soil erosion or soil disturbance that impacted them indirectly. Ongoing activities (e.g., use of pesticides or fertilizers in farming) have also impacted wetlands in the area.

Wind farm construction and construction associated with other projects identified as reasonably foreseeable future actions (Section 4.1.3) might result in cumulative impacts on wetlands and floodplains. During construction, access roads and transmission lines might cross wetlands and floodplains. As a result, the wetland and aquatic biota could be affected if construction of stream crossings for access routes or the location of a transmission line support tower in a wetland or floodplain is unavoidable.

Construction in wetlands, floodplains, or other aquatic habitats would in most cases require proper permits and review by local conservation districts, DEQ, FWP, and possibly the Corps of Engineers. As part of the permitting process, any such projects (e.g., wind farms) would be developed with mitigating measures to reduce disturbance to the wetlands or floodplains. Upgrading capacity on the MATL line or other transmission lines would not be expected to contribute cumulative effects to wetlands or floodplains, as there would be little, if any, construction as part of the upgrade and, thus, no impacts.

Thus, with successful implementation of mitigation measures, adverse cumulative impacts to wetlands and floodplains are likely to be minor, indirect, and short term.

4.8 Cumulative Impacts on Vegetation

Past, present, and reasonably foreseeable future actions described in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on vegetation.

Vegetation in the area can be directly affected by projects that remove it during construction and indirectly affected by projects that cause soil erosion or other soil disturbance.

Most of the native vegetation communities in the vicinity of the proposed MATL transmission line have been converted to farmland. In some areas where native vegetation is still present, it is subject to grazing pressure. Grazing may change community structure and composition and provide disturbed areas for weedy species establishment. Past development of facilities such as pipelines, oil wells, transmission lines, and access roads has also reduced native vegetation communities.

Vegetation communities would likely be disturbed, fragmented, or reduced by projects such as the Highwood Generating Station and as the reasonably foreseeable future development of wind farms and irrigation systems occurs in the region. Upgrading the capacity of the MATL transmission line would not, however, contribute cumulative effects on vegetation as it would not involve significant construction activities.

During construction of reasonably foreseeable future actions, plant communities would be destroyed on portions of the project sites. Impacts on vegetation communities could also occur from soil compaction, loss of topsoil, and removal of or reductions in the seed bank. Clearing of trees may also be required. Short-term disturbance for construction of wind farms (including turbines, access roads, other support facilities) would total about 2.15 acres per turbine and represent no more than about 5 to 10 percent of the wind farm site (Section 4.1.3). Over the long term, wind farm development would modify land use (thus affecting vegetation) of about 0.5 acres of land per turbine. Careful siting of wind turbines and support facilities could reduce removal of and other impacts to vegetation.

During very dry periods dust from construction may be relatively high at sites of future development and might affect vegetation immediately surrounding the project area. Dust cover on leaves has been shown to increase leaf temperature, which is one of the major parameters controlling photosynthesis (Eller 1977; Hirano et al. 1995), increase water loss (Ricks and Williams 1974; Eveling and Bataille 1984), and decrease carbon dioxide (CO_2) uptake (Thompson et al. 1984; Hirano et al. 1995). Dust coating on leaves may also reduce photosynthesis through shading (Hirano et al. 1995; Thompson et al. 1984) and may physically remove cuticular wax, which may lead to increased water loss and wilting (Eveling and Bataille 1984). Implementation of mitigation measures to control dust could ensure that impacts from dust during construction are short term and localized to the immediate area.

Hazardous materials or wastes (such as waste paints and degreasing agents) may be generated during construction and operation of reasonably foreseeable future actions. Accidental spills or releases of fuel, hazardous materials, and pesticides could adversely impact vegetation on site or could migrate off site and affect vegetation in surrounding areas. After clean up of accidental spills or releases, reestablishment of vegetation might be delayed due to residual soil contamination. Implementation of hazardous materials handling and refueling protection requirements should limit the level of such spills or releases and their impact on vegetation.

Unauthorized off-highway vehicle use, illegal dumping, and illegal collection of plants (PBS&J 2002) could disturb vegetation. Visitors and off-highway vehicles may crush or trample vegetation or destroy roots and other below ground plant structures (Payne et al. 1983; Cole 1995; Douglass et al. 1999). Increased human activity also can increase the potential for fires that may allow invasive species to invade native plant communities and become the dominant species.

With implementation of reclamation and mitigation practices (e.g., weed control programs), cumulative impacts to native vegetation could be minor.

4.9 Cumulative Impacts on Wildlife

Past, present, and reasonably foreseeable future actions described in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on wildlife. Public comments received on the March 2007 document identified a specific concern regarding the impacts on wildlife from future development of wind farms.

Past activities have affected wildlife within the analysis area through loss of native grassland habitat due to agricultural development, loss of wetland habitat due to drainage or conversion for agriculture, and minor loss in habitat and disturbance related to oil and gas development and construction of associated pipelines and transmission lines. These activities have resulted in displacement of individual animals due primarily to habitat loss; however, many wildlife species have adapted to habitat changes and, thus, have not been negatively affected at the population level. Wildlife species that have experienced the greatest impacts from past activities are those that are dependent on native grassland habitats, such as certain birds that have experienced a loss of their grassland nesting habitat.

Agriculture is currently the predominant land use within the analysis area. Since much of the area has already been converted to such use, conversion of grassland and wetland areas to agriculture no longer occurs at a high rate. Thus, land use within the region is relatively stable, and current land use practices do not generally further negatively affect wildlife.

Wildlife in the area could be affected by reasonably foreseeable future actions including the Highwood Generating Station, Great Falls Energy Center, wind farms, and new transmission lines. Upgrading the capacity of the MATL transmission line would not contribute cumulative effects to wildlife as it would not involve significant construction activities that would reduce habitat or operational changes that would impact animal behavior.

Construction of reasonably foreseeable future actions could cause the direct injury or death of animals that are not mobile enough to avoid construction operations (e.g., reptiles, small mammals, young), that utilize burrows (e.g., ground squirrels, burrowing owls), or that are defending nest sites (e.g., ground-nesting birds). More mobile animals, such as deer and adult birds, would move out of the area. It is assumed, however, that adjacent habitats are at carrying capacity and could not support additional biota from the construction areas. Thus, the subsequent competition for resources in adjacent habitats would likely preclude the incorporation of the displaced individuals into the resident populations. Construction could also affect wildlife by disturbing normal behavioral activities such as foraging, mating, and nesting.

Reasonably foreseeable future actions that developed new permanent facilities could result in some permanent change in existing wildlife habitat. Habitat may be reduced, altered, or fragmented, which could affect the diversity and abundance of area wildlife. Revegetation could, however, return some areas disturbed during construction to a habitat that could again support wildlife. The amount of habitat that would be permanently disturbed would, in general, be limited to the area of the footprint of the project. Birds, however, might avoid the area near transmission lines. For example, bird densities along a transmission line right-of-way in Oregon that exhibited noise levels of approximately 50 dB(A) were reported to be reduced up to 25 percent (Lee and Griffith 1978).

Wildlife may also be affected if a facility interferes with migratory movements. While migrating birds and bats are normally expected to fly around most individual buildings and continue their migratory movement (except for potential collisions with wind turbines or wire strikes as discussed below), the presence of a facility could disrupt movements of terrestrial wildlife. For example, herd animals, such as deer and pronghorn antelope, could be affected if facilities are placed along migration paths between winter and summer ranges or in fawning areas (NWCC 2002).

In addition to the impacts discussed above, operation of reasonably foreseeable future facilities such as the Highwood Generating Station could result in long-term increase in mortality of terrestrial mammals due to rail strikes and increased traffic on access roads. There is also some potential for increased mortality to birds and bats from collisions with wind turbines, as discussed below, and some bird mortality from wire strikes would be expected where the proposed transmission line associated with the Highwood Generating Station would cross the Missouri River.

Habitat available for birds could be reduced in wind farms. In southwestern Minnesota, lower bird population densities were reported in areas that were within 262 feet of the turbines than in control areas and areas that were 591 feet away from turbines (Leddy et al. 1999). Operation of wind farms could also impact birds through collisions (as discussed below).

The cumulative impact of habitat loss as described above could affect some wildlife, particularly grassland-dependent birds, but it would not likely reduce the viability of wildlife populations within the region, as structures would reduce habitat by a relatively small amount and would not likely consume critical habitats such as large expanses of grasslands or riparian areas.

Collision Hazards for Birds and Bats

Wind turbines, meteorological towers and associated guy wires, and overhead distribution lines represent a potential collision hazard to birds and bats.

The number of turbines associated with a wind project has been identified as the major variable associated with potential avian mortality (EFSEC 2003). Erickson et al. (2001) projected a total of 33,000 bird fatalities per year from the estimated 15,000 operating wind turbines (by the end of 2001) in the United States, an average of 2.2 avian fatalities per turbine per year for all species combined. **Table 4.9-1** summarizes reported avian fatality rates at a number of wind energy projects. Local conditions heavily influence mortality at any site; the number of bird fatalities per turbine per year in individual studies ranged from none (at Searsburg, Vermont, and Algona, Iowa) to 4.45 (at Buffalo Ridge Phase III, Minnesota).

Based on mortality estimates at wind farms, the mid-range expected for passerine mortality would be approximately 1.2 to 1.8 birds per turbine per year. For wind turbines potentially built by developers with contracted capacity on the proposed MATL transmission line (400 to 533 turbines), this would equate to approximately 480 to 960 bird fatalities per year. For other reasonably foreseeable wind farms in the area (about 500 MW generation capacity derived from an estimated 252 to 335 wind turbines), this would equate to 302 to 603 bird fatalities per year.

Fatalities of raptors are of special concern because of their generally low numbers and protected status. Raptor mortality estimates based on data collected from the various wind farms in the United States indicate an average of 0.033 fatalities per turbine per year (Erickson et al. 2001). Except at the Altamont Pass in California, the number of raptors killed at any facility is small (**Table 4.9-1**; NWCC 2002). Some California wind farm sites have unusually high raptor fatalities due to topography, high raptor densities, and possibly older turbine technology (Kingsley and Whittam 2003). Excluding California, raptor fatalities were estimated at 0.006 per turbine per year (Erickson et al. 2001).

TABLE 4.9-1
AVIAN FATALITY RATES OBSERVED AT SOME WIND ENERGY PROJECTS

Wind Farm	State	No. of Turbines	Bird Fatalities per Turbine per Yr[b]	Bird Fatalities per 100,000 m^2 of RSA per Yr[b]	Raptor Fatalities per Turbine per Yr[b]	Raptor Fatalities per 100,000 m^2 of RSA per Yr[b]
Altamont Pass	CA	5,400 (in 2001), 7,340 (in early 1990s)	0.33 to 0.87, 0.05 to 0.1, 0.19	NA	0.16 to 0.24, 0.007 to 0. 0.048, 0.1	9.0 to 22.0 1.0 to 2.0[c]
Buffalo Ridge (all phases)	MN	354	2.8	161.0	NA	NA
Buffalo Ridge Phase I	MN	73	0.33 to 0.66, 0.98	NA	0.01	NA
Buffalo Ridge Phase 2	MN	143	2.27	NA	0.0	NA
Buffalo Ridge Phase 3	MN	138	4.45	NA	0.0	NA
Foote Creek Rim	WY	69	1.5, 1.75	108.0	0.03, 0.036	3.0, 0,3[c]
Green Mountain (Searsburg)	VT	11	0.0	0.0	0.0	0.0
IDWGP (Algona)	IA	3	0.0	0.0	0.0	0.0
Klondike	OR	16	1.42	NA	0.0	NA
Montezuma Hills	CA	600	NA	NA	0.48	NA
Mountaineer Wind Energy Center	WV	44	4.04	NA	0.33	NA
Nine Canyon Wind Energy Project	WA	37	3.59	119.8	0.08	2.6
Princeton	MA	8	0.0	0.0	0.0	0.0
San Gorgonio	CA	2,900	2.31	NA	0.01	NA
Somerset County	PA	8	0.0	0.0	0.0	0.0
Stateline	OR/WA	454	1.7	96,6	0.05	NA
Vansycle	OR	38	0.63	38.0	0.0	0.0
Wisconsin	WI	31	2.83	73.3	0.02	NA

Abbreviations: IDWGP = Iowa Distributed Wind Generation Project; NA = not applicable (not calculated or appropriate); RSA = rotor-swept area.

[b] Multiple values are included if there were results from more than one study.

[c] Golden eagles only.

Sources: Curry and Kerlinger (2004a,b); Erickson et al. (2001, 2002, 2003a,b); Johnson et al. (2002, 2003a); Kerns and Kerlinger (2004); Osborn et al. (2000); Smallwood and Thelander 2004; Strickland et al., (200la,b); Thelander and Rugge (2001); Young et al. (2003a).

Table 3.8-4 lists the raptors observed in the Kevin Rim Area in Toole County. Also, as indicated in **Section 3.8.2.2**, raptors have been observed during field investigations for the proposed MATL line. Based on the estimated total U.S. average raptor fatalities of 0.033 per turbine per year (Erickson et al. 2001), 13 to 18 annual raptor fatalities would be projected for the 400 to 533 operational turbines in the wind farms with contracted capacity on the proposed MATL line and 8 to 11 raptor fatalities would be projected for other wind farms that might be developed in the area. Excluding values of average raptor fatalities in California (Erickson et al. 2001), raptor fatalities would be estimated at 2 to 3 annually for the turbines potentially associated with the proposed MATL line and 1 to 2 annually for other wind farms that might be developed in the area.

Of the 15 bat species reported in Montana, 8 are likely to occur in the project study area (**Table 3.8-2**). **Table 4.9-2** summarizes data on bat fatalities observed at wind farms. Based on the range of fatalities indicated in Table 4.9-2 for wind farms in non-forested areas (i.e., not including Buffalo Mountain in east Tennessee) (0.07 to 3.21 per turbine per year), the 400 to 533 turbines in the wind farms with contracted capacity on the proposed MATL line could cause estimated bat mortalities of 28 to 1,711 per year. In addition, other wind farms that might be developed in the area could cause estimated bat mortalities of 18 to 1,091 annually.

TABLE 4.9-2
BAT FATALITY RATES OBSERVED AT WIND ENERGY PROJECTS

Wind Resource Area	State	No. of Turbines	Estimated No. of Bat Fatalities per Turbine per Year[a]	Estimated No. of Bat Fatalities per 100,000 m^2 of RSA[b] per Year
Buffalo Mountain	TN	3	10.0	NAc
Buffalo Ridge	MN	354	2.3	164.0
Buffalo Ridge Phase 1	MN	73	0.07, 0.26, 2.02	NA
Buffalo Ridge Phase 2	MN	143	1.78, 2.02	NA
Buffalo Ridge Phase 3	MN	138	2.04, 2.32	NA
Foote Creek Rim	WY	69	1.04, 1.34	97.0
Klondike	OR	16		33.3
Nine Canyon	WA	37	3.21	106.6
Stateline	OR/ WA	454	0.95	53.3
Vansycle	OR	38	0.74	45.0
Wisconsin	WI	31	1.1	246.4

a Multiple values were included if there were results from more than one study.

b RSA — rotor-swept area.

c NA = not applicable (not calculated or appropriate).

Sources: Erickson et al. (2002, 2003a,b); Johnson et al. (2003a); Strickland et al. (2001a,b); Young et al. (2003a,b).

The cumulative impact from collisions from reasonably foreseeable future actions when added to those of the proposed MATL transmission line and past and current activities could cause a small reduction in population size for birds and bats. These impacts may, however, be reduced by employing careful siting practices and other mitigation measures.

4.10 Cumulative Impacts on Fish

Cumulative impacts that adversely affect water resources, as discussed in Section 4.6, could result in adverse effects to fish and fish habitats in the project area. The potential for impacts to fish and their habitats could be reduced by avoidance of fish-bearing streams during construction and other mitigation measures, as discussed in Section 3.9.3.

4.11 Cumulative Impacts on Special Status Species

Past, present, and reasonably foreseeable future actions described in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on special status species (i.e., federally listed threatened, endangered, and candidate species; BLM sensitive species; and species identified by Montana as vulnerable or imperiled).

Present and past activities throughout the analysis area are very similar, with agriculture as the predominant land use. Impacts to special status species within the analysis area from such activities are similar to the effects described in Sections 4.8 and 4.9 on cumulative impacts on vegetation and wildlife. The special status species that have experienced the greatest impacts are those that are dependent on native grassland habitats, such as black-footed ferrets, ferruginous hawks, peregrine falcons, black-tailed prairie dogs, Baird's sparrow, burrowing owls, and long-billed curlews.

Impacts to special status species within the analysis area from reasonably foreseeable future actions including the Highwood Generating Station, Great Falls Energy Center, wind farms, and new transmission lines would be similar to the effects described in Sections 4.8 and 4.9 on cumulative impacts on vegetation and wildlife. That is, construction could cause the direct injury or death to special status species and reduce available habitat, while operation could impact birds from collisions with wind turbines and wire strikes where the proposed transmission line associated with the Highwood Generating Station would cross the Missouri River.

The cumulative impacts of habitat loss would not likely reduce the viability of special status species populations within the region, as structures would reduce habitat by a relatively small amount and would not likely consume critical habitats, such as large expanses of grasslands or riparian areas. Most of these impacts could be reduced with sound siting practices and other mitigation measures. In addition, some projects would likely need to comply with ESA or state of Montana requirements to protect special status species, which would reduce the potential for adverse cumulative impacts.

4.12 Cumulative Impacts on Air Quality

Past, present, and reasonably foreseeable future actions identified in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on air quality.

Past and present actions with potential air quality impacts include: petroleum refining, crude oil pump and natural gas compressor stations, petroleum product terminals, coal-fired electrical generating plants, concrete mix plants, asphalt mix plants, crematoriums, gravel crushers and associated processing equipment, fugitive dust and smoke from farming and field and forest burning, and dust from gravel roads or during construction. For emission sources such as construction activities, burning, and road dust, the effects are temporary.

Air quality in the area would be affected by the reasonably foreseeable future construction and operation of projects such as the coal-fired Highwood Generating Station and the natural gas-fired Great Falls Energy Center. Other than during construction or maintenance activities, wind farms would not be expected to have air quality impacts. Impacts of construction for transmission line upgrades and wind farms would be similar to impacts of the proposed action. Cumulative impacts would not be expected, however, unless different nearby projects are being built at the same time.

The EIS for the Highwood Generating Station included an analysis of the combined air quality impacts from operation of the proposed Highwood Generating Station and other emission sources in the region (including background concentrations plus emissions from a petroleum refinery, ethanol plant, malting plant, and other sources). Modeling results indicated that all ambient air pollutant concentrations would continue to be well below applicable state and federal ambient air quality standards (USDA Rural Utilities Service and DEQ 2007). Regulation of operational air emissions under the Clean Air Act and related state regulations through permits issued by DEQ helps to minimize air quality impacts. Furthermore, because of differences in timing, few impacts would be cumulative with air quality impacts of the proposed Project.

<u>Greenhouse Gas Emissions</u>

Many human activities emit carbon dioxide (CO_2) and other "greenhouse" gases, such as methane and nitrous oxide, contributing to increasing concentrations of these gases in the atmosphere. Emissions of CO_2 from fossil fuel combustion are a major contributor of greenhouse gases, totaling 29 billion tons per year globally during the period 2000 to 2005 (IPCC 2007).

Past and present activities in the study area contribute greenhouse gases to the atmosphere. The Montana Climate Change Advisory Committee has estimated that greenhouse gases with global warming potential equivalent to 41 million tons of CO_2 were emitted in Montana in 2005 (Montana Climate Change Advisory Committee 2007). Fossil fuel consumption accounted for 62 percent of Montana greenhouse gas emissions, agriculture accounted for 21 percent, and production of fossil fuels accounted for 14 percent.

As discussed in Section 3.11, the proposed Project would emit very small amounts of greenhouse gases, principally from vehicle and equipment operation during transmission line construction. However, generation of electricity by potential wind farms with contracted capacity on the proposed MATL transmission line could help to reduce emissions of greenhouse gases by avoiding the need to generate equal amounts of electricity from fossil fuels. Conversely, two of the other reasonably foreseeable actions identified in the region would be contributors to greenhouse gas emissions. Operation of the coal-fired power plant at the Highwood Generating Station would release an estimated 2,380,000 tons/year of CO_2 plus methane and nitrous oxide with global warming potential equivalent to 669,000 tons/year of CO_2 (USDA Rural Development and Montana Department of Environmental Quality 2007), adding up to about 7 percent of Montana's total release of greenhouse gases in 2005. Detailed estimates are not available for the Great Falls Energy Center proposal; however, based on its generating capacity, the gas-fueled generator at that facility also would add to cumulative greenhouse gas emissions from the region by emitting over 1 million tons per year of CO_2.

4.13 Cumulative Noise Impacts

Past, present, and reasonably foreseeable future actions identified in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative noise impacts.

Reasonably foreseeable future actions could result in cumulative noise effects from construction if construction of projects such as wind farms and the Highwood Generating Station occurred simultaneously with construction of the proposed Project. Cumulative impacts from wind turbine and transmission line noise during operation would depend on proximity to residences.

Construction would generally be during the day, when noise is tolerated better because of the masking effect of background noise. Nighttime noise levels probably would drop to the background levels of the project area. Noise levels for typical construction equipment that would likely be used are about in the 80 to 90 dB(A) range at a distance of 50 feet, as shown in Section 3.12.3. Blasting may be required for installation of wind turbine foundations. If blasting is needed, it is anticipated that most foundations would require one to two blasts.

Transformers and switchgears from substations, corona noise from transmission lines, noise from generation facilities, and vehicular traffic noise are sources that would contribute cumulative effects in the MATL project study area. Wind blowing through power lines may also cause noise. Operating wind turbines produce mechanical and aerodynamic noise. The highest sound levels from wind turbines typically occur in frequency ranges that are inaudible to humans because they are below the threshold of human hearing. However, under certain conditions, turbines can produce audible noise loud enough that nearby humans would experience it as a doubling of background noise (Rogers et al. 2006). The level and character of noise produced varies depending on turbine design. Sound levels decline significantly with increasing distance from the source, and noise levels would depend on the observer's location.

4.14 Cumulative Socioeconomic and Environmental Justice Impacts

Socioeconomic conditions in the region would be affected by projects that contribute to the economy, increase employment (temporarily or permanently), increase the demand for public services, or change tax revenue. A review indicated that reasonably foreseeable future actions that could produce these types of effect include construction and operation of a potential MATL transmission line, wind farms, and other energy generation facilities. Therefore, these activities have been included in the cumulative effects analysis for socioeconomics and environmental justice.

The Highwood Generating Station would contribute economic activity to the local and regional area. Plant operation would employ approximately 65 permanent workers (USDA Rural Utilities Service and DEQ 2007). Additionally, there would be increases in total purchases of goods and services, and an increase in the tax base.

Case studies of three wind generation projects elsewhere in the nation indicate that economic benefits may vary widely from project to project (Northwest Economic Associates 2003). For instance, the construction phase of a wind generation project may generate up to 100 jobs, while the operation and maintenance phase may provide between 6 and 31 permanent jobs and between $103,000 and nearly $1 million in additional annual personal income. Wind projects also provide additional landowner revenue in the form of lease payments. Assuming that these types of projects cause little or no increase in government or school budgets, tax payments made by project owners may have the additional benefit of reducing the local tax burden for other local tax payers (Northwest Economic Associates 2003).

Economic effects of wind generation were estimated for several different levels of wind generation activity. For this cumulative impacts assessment, it is assumed that 600 to 800 MW of wind generation capacity would eventually be built to use transmission capacity of the proposed MATL transmission line. Additionally, to be conservative, the estimated economic effects from 600 MW of wind power are cut in half (which would be the same as the economic activity from 300 MW of wind power) to provide a lower bound number for the economic activity caused by future wind farms in the study area. Finally, because another 500 MW of wind power are in queues for interconnection to transmission lines operated by NorthWestern and WAPA, 1,300 MW of wind generation is treated as an upper bound.

Flowers and Tegen (NREL 2007) used a Jobs and Economic Development Impacts analysis to estimate economic impacts that may occur in the study area as a result of 600 MW of wind farms. They assumed that the 600 MW would be made up of six different projects of about 100 to 120 MW each.

Table 4.14-1 summarizes the economic effects of 300 MW, 600 MW, 800 MW and 1,300 MW of new wind generation based on the Flowers and Tegen study. The results from their study are used to proportionally estimate the economic impact of 300, 800, and 1,300 MW of wind power.

TABLE 4.14-1
SUMMARY OF ESTIMATED ECONOMIC EFFECTS OF DIFFERENT LEVELS OF WIND GENERATION IN THE STUDY AREA

Amount of Wind Generation	Construction Jobs (Short Term)	Permanent Jobs over Lifetime of Wind Farms	Construction Earnings to Montana Workers	Annual Earnings from Wind Farm Operation	Annual County Revenue ($ Millions)	Payments to Local Land-Owners ($ Millions)
300 MW	530	25-30	$20,000,000	$2,300,000	2.3 to 3.0	1.0
600 MW	1,060	50-60	$40,000,000	$4,500,000	5.5 to 6.0	2.0
800 MW	1,400	Up to 80	$53,000,000	$6,000,000	Up to 8.0	2.7
1,300 MW	2,300	Up to 130	$87,000,000	$9,750,000	Up to 13.0	4.4

Note: 1,300 MW would impose larger costs on the local area in terms of demand for services, change in the character of the area, and change in land use.

Assuming a 1-2 year construction period, Montanans would earn $20-$53 million total for the construction of 300 to 800 MW of wind power. Again, the 600 MW numbers taken directly from the NREL study are cut in half to arrive at the conservative lower numbers in these economic ranges.

Over 20 years of operation of this wind energy development, Montanans would earn approximately $2.3-$6.0 million annually from plant operations and maintenance expenditures on all projects. The wind projects would generate another $2.3-$8.0 million per year in county revenue from property taxes along with another $1.0-$2.7 million per year in payments to local landowners who have turbines on their land (or about $5,000 per turbine), bringing the annual operational total economic benefit from wind farms in the area to about $6-$16 million in Montana. Total property taxes paid by wind farm owners would be about $9,000 per MW per year.

The wind developments would provide jobs to both in-state and out-of-state construction workers, as well as jobs related to local purchases of goods and services (such as cement suppliers, rebar suppliers, etc.). The construction phase would support about 530 to 1,400 direct jobs for Montanans during a 1- to 2-year period, with additional jobs going to out-of-state workers.

The potential for wind energy development projects to decrease residential property values has often been a concern in the vicinity of locations selected for wind power. Although wind farms could lower property values, a review of three studies that examined potential property value impacts of wind power facilities suggests that there would not be any measurable negative impacts (ECONorthwest 2002, Sterzinger et al. 2003, and Poletti and Associates 2007). However, these studies did not exclusively cover rural and agricultural lands. Thus, it is possible that wind farms could have an adverse effect on farm land values.

Additional socioeconomic impacts resulting from new energy generation projects enabled by the existence of the proposed MATL line would be similar to those described in Section 3.13.3 for the proposed MATL line. For example, each new project would have beneficial impacts to local economies due to the presence of construction and operation workers moving to the region and each project's potential utilization of local labor pools. These benefits would increase local employment opportunities and increase local economic transactions as these workers and their families draw upon service and commodity providers. Each new project would also create new facilities subject to state and local taxation, thus further increasing each county's tax revenue. Benefits may also be realized to the rate payer due to increased competition and abundant energy supplies that may become available as new wind farms come on-line. However, each new generation project would also require land commitments that could remove a small amount of land from production. The lease payments for wind sites are considered to be higher than the value of the land removed from crop and cattle production. Thus, wind farms also would provide a new revenue stream to landowners.

Overall, additional development of wind energy generation projects and transmission capability would add employment to the area, which could increase demand for public services (schools, fire, police, etc.), add tax revenue, and increase need for goods locally and regionally. There may be a demand for additional housing associated with the increased employment, but it is anticipated that the existing housing supply could accommodate the additional workers and their families.

Cumulative Impacts on Environmental Justice

As discussed in Section 3.13.3.4, the proposed Project would not contribute to impacts that would cause a disproportionately high and adverse impact on minority or low-income populations compared to populations in the surrounding communities, the state of Montana, or the United States. Future activities by other entities could make such a contribution depending on the nature, location and size of the activities, but construction and operation of the proposed MATL transmission line would not make a significant contribution to such cumulative impacts.

4.15 Cumulative Impacts on Paleontological and Cultural Resources

Past, present, and reasonably foreseeable future actions identified in Sections 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on paleontological and cultural resources. Paleontological and cultural resources in the area would be affected by projects that connect to the MATL transmission line (including wind farms), enter the Great Fall 230-kV switch yard (new transmission lines and upgrades), and other development actions that cause additional ground disturbance. Therefore, these activities have been included in the cumulative effects analysis for paleontological and cultural resources.

The review indicated that upgrading the MATL transmission line would not contribute cumulative effects on paleontological and cultural resources.

Paleontological Resources

Past and present actions including historic settlements, farming, roads, railroads, canals, transmission lines, telephone and fiber optic lines, and urban-related development have contributed to cumulative impacts to paleontological resources throughout all environmental settings in the area of the proposed MATL line.

Paleontological resources are generally identified on a project-specific basis. If there is a strong potential for fossil remains to be present in a project area, a survey could be conducted. The following describes the potential cumulative impacts to paleontological resources if they are present at a project site (e.g., a wind farm).

Impacts to paleontological resources could potentially occur from ground-disturbing activities and unauthorized collection of fossils during site monitoring, testing, construction, and operation. The level of impacts would be proportional to the scale of the project. If clearing, grading, excavation, and road construction are very limited, the impacts would also be limited. If more extensive excavation or road construction is needed during construction, more extensive impacts are possible. Impacts during operation would normally be less than those during construction.

Erosion caused by traffic and ground clearing could potentially affect fossils. Fossils could also be affected in small localized areas (e.g., in borings for geotechnical surveys, where guy wires are installed). Finally, the collection of fossils would be another possible impact. Although many of the activities (e.g., during the monitoring and testing phases) are characterized as temporary actions, paleontological resources are nonrenewable, and once impacted (i.e., removed or damaged) can not normally be recovered or recreated in the appropriate context for scientific analysis.

Cultural Resources and Traditional Cultural Properties

An unknown number of prehistoric cultural resources or traditional cultural properties important to area tribes have already been destroyed in the study area by past and present actions including historic settlement, farming, roads, railroads, canals, transmission lines, and telephone and fiber optic lines. While the construction of the MATL project could be designed to avoid impacts to prehistoric and historic properties, impacts from reasonably foreseeable non-linear projects, such as the Highwood Generating Station and the Great Falls Energy Center, may be more difficult to avoid.

Field review of portions of the MATL Project study area for traditional cultural properties indicates a concern for further impacts to a tipi ring site (24PN24), which is considered to be a traditional cultural property by members of the Blackfeet Tribe (Section 3.14.3). The property is located along a segment of the proposed Project that is common to both Alternatives 2 and 3. The site is currently crossed by two pipelines and a transmission line. Therefore, construction of the MATL Project across the property would add to past impacts.

The construction phase of reasonably foreseeable future actions (e.g., additional transmission lines, irrigation, energy generation facilities) could uncover or destroy cultural resources. If the resources are uncovered but not destroyed, the discoveries could be beneficial to professional archaeologists. Otherwise, Federal and state legislation are designed to minimize the potential for impacts to the extent possible when there is Federal or state involvement in a proposed project. To minimize adverse effects, cultural resources should be fully evaluated for NRHP eligibility prior to construction. In addition, an unanticipated discoveries plan for cultural resources should be prepared prior to construction.

4.16 Cumulative Visual Resource Impacts

Past, present, and reasonably foreseeable future actions identified in Section 4.1.2 and 4.1.3 were reviewed for potential cumulative impacts on visual quality. Visual quality in the area would be affected by projects that connect to the proposed MATL transmission line (including wind farms), enter the Great Falls 230-kV switch yard (e.g., new transmission lines and upgrades), or are visible from the alignment. Public comment had identified a public concern regarding the impacts on visual quality from wind farm development between Great Falls and the Canadian border. These activities have been included in the cumulative effects analysis for visual impacts.

All action alternatives, when combined with past and present actions and reasonably foreseeable future actions (e.g., rebuilding the WAPA Havre to Rainbow transmission line) would increase the developed character of the regional landscape for the long term. In particular, the Highwood Generating Station would result in major adverse aesthetic impacts and contribute to cumulative impacts to the Great Falls Portage National Historic Landmark (USDA Rural Utilities Service and DEQ 2007). Construction of other new generation projects, such as the Great Falls Energy Center north of Great Falls, would contribute to a more developed and industrial character in the area. The proposed center's 92-foot tall stack and 300-foot long building housing the gas turbines would be visible in foreground views from Highway 87.

During construction of reasonably foreseeable future actions, road development (i.e., new roads or expansion of existing roads) may introduce strong visual contrasts in the landscape. Small-vehicle traffic for worker access and large-equipment (e.g., trucks, graders, excavators, and cranes) traffic for road construction, site preparation, and construction would be conspicuous and frequent. Both would produce visible activity and dust in dry soils. If these roads are not removed after construction is complete, they would continue to contribute to the cumulative impact on visual resources.

Ground disturbance would result in visual impacts, including contrasts of color, form, texture, and line. Excavating, trenching, grading and surfacing roads and clearing, leveling, and stockpiling soil and spoils would create dust, expose slope faces, and damage vegetation.

Figure 4.16-1. Two 1.5 MW turbines with passing crane truck and Crazy Mountains in the background.

Wind Farms

Wind generation facilities would be highly visible because of the introduction of turbines into typically rural or natural landscapes with few other comparable structures. Wind turbines may have visually incongruous "industrial" associations for some, particularly in a predominantly natural landscape. Visual evidence of wind turbines is difficult to avoid or conceal due to turbine size and exposed location. In addition, the temporary presence during construction of large cranes or a self-erection apparatus to construct wind farms would introduce contrasting elements to the landscape.

Figures 4.16-1 through **4.16-3** show the Judith Gap Energy Center wind farm. This 135-MW facility is located in central Montana between Harlowton and Judith Gap, adjacent to US Highway 191. Photos were taken in June 2007 from viewpoints within the wind farm.

Figure 4.16-3. Judith Gap operations and control facility with foothills of Big Snowy Mountains in the background.

Studies performed in the United Kingdom suggest a large area of visual influence for wind farms. Sinclair (2001)

Figure 4.16-2. Turbines on west side of US Highway 191 with Little Belt Mountains in background.

provides a basis for determining the potential visual impacts and area of study for wind farms. The Sinclair-Thomas matrix based on numerous field observations of operating wind farms in the United Kingdom, identifies bands of visual influence surrounding wind farms. Sinclair suggests that bands or zones of visual influence having dominant to low visual impact can surround a wind farm for up to 15 miles.

For the Valley County Wind Energy Project (Wind Hunter 2004) with 1.5 MW turbines, the Sinclair-Thomas matrix was adapted to determine zones of visual influence that extended 18 miles from the proposed wind farm. Five levels of visual influence were assigned for potential impact levels:

Proximate (0 – 1.5 miles)
High (1.5 – 4.0 miles)
Moderate (4.0 – 10.0 miles)
Low (10.0 – 18.0 miles)
None (18.0+ miles)

This analysis indicates that a potentially high level of visual impact can extend up to 4.0 miles from wind farms with 1.5 MW turbines, with moderate and low impacts at distances up to 18 miles. Zones of visual influence could be expected to extend further for 2.0 or 2.5 MW turbines that are up to 500 feet high. Factors such as location of viewers, proximity, viewer sensitivity, duration of views, degree of project visibility and contrast, scale of the project in relation to its setting, and presence of valued scenic resources could be used to guide the assessment of potential impacts for any project (National Academy of Sciences 2007).

Daily and seasonal low sunlight conditions striking ridgelines and towers would tend to make turbines more visible and more prominent. Given the typical pale color of turbines, their color contrast with surroundings would likely be the least in winter when snow cover is present. In regions with variable terrain, wind developments along ridgelines would be most visible, particularly when viewed from other similar or lower elevations, owing partly to silhouetting against the sky. Higher viewing points relative to wind farm locations would reduce silhouetting (Burton 1997; EFSEC 2003; Owens 2003; WDFW 2003a). Interposition of turbines between observers and the sun, particularly in the early and late hours of the day and during the winter season when sun angles are low, could produce flickering shadows cast onto the ground and objects by the moving rotors. Shadow flicker could be very noticeable because of its motion and frequency, and may increase with snow cover, but would be a temporary effect and limited to daylight hours.

> FAA provides guidelines for the marking and lighting of wind turbine farms (FAA 2007), defined as developments with more than three turbines with heights over 200 feet above ground level. Marking recommendations recognize that not all turbines within an installation need to be lighted. Guidelines specify that it is important to define the periphery of the turbine array, and that within the array no unlighted gap greater than one-half statute mile should be present. Flashing red or white lights may be used to light wind turbines. Lights are placed as high as possible on the turbine nacelle, so as to be visible from 360 degrees.

Reflection of the sun off rotating turbine blades could produce blade glint noticeable at distances of about 6 to 9 miles and may be especially pronounced when aligned with roadways or other viewing corridors. This temporary effect varies with the orientation of the nacelle, angle of the rotor, and location of the observer relative to the sun.

If security and safety lighting were used for support facilities, even if they were downwardly focused, visibility of the site would increase, particularly in the dark nighttime sky typical of rural areas. It would also contribute to sky glow resulting from ambient artificial lighting. Any degree of lighting may produce off-site “light trespass”; it would be most abbreviated if the lighting were limited to the substation and controlled by motion sensors.

Additional construction and installation of monitoring equipment may be required during site operation. Infrequent outages, disassembly, and repair of equipment could occur and produce the appearance of idle or missing rotors, “headless” towers (when nacelles are removed), and lowered towers. Negative visual perceptions of “lost benefits” (e.g., loss of wind power) and “bone yards” (for storage) may result.

For ground viewers of aeronautical safety markings white lights could be less obtrusive in daylight. Red lights would likely be conspicuous at great distances against dark skies (Gipe 2002). Although aeronautical safety beacons would concentrate light in the horizontal plane, they would increase visibility of the turbines, particularly in dark nighttime settings typical of rural areas. Because of their intermittent operations, beacons would likely not contribute to sky glow from artificial lighting. Their emission of light to off-site areas could, however, be considerable.

If decommissioning occurred, impacts on visual resources would be similar to those encountered during construction. Restoring a decommissioned site to pre-project conditions would entail recontouring, grading, scarifying, seeding, planting, and, perhaps, stabilizing disturbed surfaces. Newly disturbed soils would create a visual contrast that would persist at least several seasons before revegetation would begin to disguise past activity. Restoration to pre-project conditions may take much longer. Invasive species may colonize newly and recently reclaimed areas. Non-native plants would likely produce contrasts of color, form, texture, and line.

4.17 Unavoidable Adverse Impacts

This section summarizes the adverse impacts that cannot be avoided that are expected to occur with implementation of the proposed Project.

Construction and operation activities could have adverse impacts on wetland resources from the alteration of surface water drainage patterns, disturbances and trampling of vegetation during construction, and from an increase in sedimentation to localized wetland areas from disturbances on adjacent properties. Transmission line structures would not be placed in wetland areas, so no long-term impacts are expected for wetland resources. Native vegetation would be unavoidably disturbed, and weed infestations may occur. Travel routes could be unavoidably obstructed during construction. Long-term impacts to land use include loss of production from farmland, increased risk to aircraft, and interference with farming activities. An increase in avian mortality would be unavoidable and long term. There would be unavoidable major adverse impacts to the visual quality of the landscape where the transmission line crosses the Teton and Marias rivers or passes within 1/2 mile of residences or major highways.

4.18 Irreversible or Irretrievable Commitments of Resources

If concrete footings are used, the concrete would be left and irreversibly committed. Fuel used during construction and decommissioning would be irreversibly committed to the project. The wood used in structures would not be available for future transmission projects and would be irreversibly committed to the project. Energy lost during transmission line operation (line losses) would be irretrievably committed to the project.

Paleontological and cultural resources, including traditional cultural properties, are nonrenewable resources. The MATL project would increase access to the areas where these resources may be located. This increased access could lead to intentional damage from looting and vandalism, including unauthorized relic collecting, theft, and defacement, and result in the loss of information and destruction of the resource. Impacts to these resources would constitute an irreversible commitment of resources.

4.19 Relationship between Short-Term Uses and Long-Term Productivity

As applied to the proposed Project, short-term uses of man's environment are characterized by existing land use of the Project study area as modified by the proposed Project, together with all activities that such land use facilitates. Maintenance and enhancement of long-term productivity involves sustaining the interrelationships of each resource in a condition sufficient to support ecological, social, and economic health.

All action alternatives would manage resources within regulatory standards for air quality, water quality, cultural resource preservation, and wildlife management. Impacts from any of the action alternatives on farming would not adversely affect long-term productivity of the resource. Beneficial impacts on socioeconomic resources would be realized from all action alternatives. Because Alternative 4 contains environmental mitigation measures (relative to Alternatives 2 and 3) for avoiding adverse impacts on farming, riparian areas, and surface water, this alternative presents the most protective alternative for the maintenance and enhancement of long-term productivity of the environment while benefiting socioeconomic resources.

Long-term impacts on cultural and paleontological resources would result from increased access to areas that were formerly not accessible. This access can lead to intentional damage to paleontological and cultural resources from unauthorized collecting, theft, and defacement, and result in the loss of information and destruction of the resource. In addition, the presence of the proposed MATL transmission line would allow development of wind energy projects that could contribute to cumulative impacts to paleontological or cultural resources. The location of the MATL Project on or near traditional cultural properties could have long-term effects on traditional cultural practices. In addition, the transmission line structures would be highly visible for the life of the project.

4.20 Regulatory Restrictions Analysis

MEPA requires agencies to evaluate any regulatory restrictions and incremental costs that could be imposed on the use of private property in connection with a proposed action.

Alternatives 3 and 4, local routing options, and mitigation measures are designed to protect environmental, cultural, visual, and social resources, although they add to the cost of the Project. Alternatives and mitigation measures that are required by Federal or state laws and regulations to meet minimum environmental standards do not need to be evaluated for extra costs to the proponent.

Bond requirements and other mitigation measures that might be imposed by DEQ would add from 1.3 to 1.9 percent to the basic construction cost of Alternative 2 (**Table 4.20-1**). Alternative 3 would be less expensive to build than Alternative 2. Alternative 4, including bond, would cost 12.5 percent more than the basic construction cost of Alternative 2 or 11.1 percent more than the cost of Alternative 2 including bond (**Table 4.20-1**).

Mitigation measures whose costs can be estimated are precision mapping of unstable soils, archaeologist observation of construction, use of conductors with dulled, non-reflective surfaces, wetlands delineation, and bonding for reclamation and revegetation. Monopole structures in addition to the 53 miles that MATL has committed to use for diagonal crossings of cultivated cropland might also be required in some areas.

The costs of other measures, such as damage payments, are not readily quantifiable but would add to the total cost of the proposed Project.

MATL has already negotiated easements across portions of the proposed Project alignment. The cost to MATL is unknown. If MATL has already paid for right-of-way access to lands that may be crossed by the Alternative 2 alignment and that alignment is not permitted, MATL may lose the money already spent. Additionally, if landowners along Alternative 2 were expecting compensation for the costs of farming around structures and that alignment is not permitted, the landowners would not received their expected compensation.

TABLE 4.20-1
REGULATORY RESTRICTIONS ANALYSIS

	Alternative 2		Alternative 3	Alternative 4
	With Bond and 53 Miles of Monopoles Only	With Bond, 53 Miles of Monopoles, and Additional Mitigation Measures	With Bond, No Monopoles, and Additional Mitigation Measures	With Bond, 88.9 Miles of Monopoles, and Additional Mitigation Measures
Length (miles)	129.9 (53 miles monopoles, 76.9 miles H-frames)	129.9 (53 miles monopoles, 76.9 miles H-frames)	121.6 (all H-frames)	139.9 (88.9 miles monopoles, 51 miles H-frames)
Construction cost[a]	$39,874,650	$39,874,650	$35,689,600	$43,994,350
Precision mapping of unstable soils[b]	0	$11,000 (11 miles)	$6,000 (6 miles)	$24,000 (24 miles)
Professional archaeologist to observe construction[c]	0	$160,000 (35 sections)	$160,000 (37 sections)	$160,000 (35 sections)
Delineate wetlands on alignment through Teton County[d]	0	$11,500 (23 miles)	$13,000 (26 miles)	$13,000 (26 miles)
Use of conductors with dulled, non-reflective surfaces[e]	0	$62,000 (129.9 miles)	$58,000 (121.6 miles)	$67,000 (139.9 miles)
Estimated bond	$500,000	$500,000	$420,000	$615,000
Total cost	$40,374,650	$40,619,150	$36,346,600	$44,873,350
Percent difference from basic construction cost of Alternative 2	+1.3	+1.9	-9.1	+12.5
Percent difference from total cost of Alternative 2	0	+0.6	-10.0	+11.1

Notes:
a H-frame structures $293,500 per mile; monopole structures $326,500 per mile (assuming long-span monopoles; MATL 1/26/07)
b $1,000 per mile of alignment, 500 feet wide.
c $1,000 per day each for two full-time archeologists for 4 months.
d $1,000 per day per wetland specialist at 2 linear miles of alignment per day.
e $30 per 1,000 feet per conductor additional cost for non-specular conductor (BPA 2007).

4.21 Intentional Destructive Acts

Intentional destructive acts, such as sabotage, terrorism, vandalism, and theft, sometimes occur at power utility facilities. These acts include shooting at insulators, power lines, transmission towers, or substation equipment; vandalism; and theft of equipment, supplies, tools, or materials. Vandalism and thefts are most common. The impacts from vandalism and theft, though expensive, do not generally cause a disruption of service to the area. Stealing equipment from electrical substations can, however, be extremely dangerous. Some would-be thieves have been electrocuted while attempting to steal equipment from energized facilities.

Utilities use physical deterrents such as fencing, cameras, warning signs, rewards, and other measures to help prevent theft, vandalism, and unauthorized access. In addition, some utilities offer rewards for information that leads to the arrest and conviction of individuals committing crimes against their facilities.

Depending on the size and voltage of the line, destroying towers or other equipment could disrupt electrical service. The effects of these acts would vary depending on the particular act and configuration of the transmission system. While in some situations these acts would have no noticeable effect on electrical service, in other situations service could be disrupted in the local area or, in the case of damage to equipment that is part of the main transmission system, a much larger area could be left without power.

The MATL transmission line would be made up of transmission line support structures, electric conductors, and electric substations. The support structures would be emplaced in the ground and would be difficult to dislodge. The overhead transmission conductors and the structures that carry them would be mostly on unfenced utility rights of way.

Given the characteristics of the proposed MATL transmission line project and its rural location, it is unlikely that intentional destructive acts would occur. Even if such an act did occur, it would not have a major impact on the transmission system or electrical service, since the grid is designed to withstand the loss of key elements and still provide uninterrupted service to customers. Service is provided by the network, not by individual transmission lines. Any impacts from sabotage or terrorist acts likely could be quickly isolated. In addition, security measures are included to prevent such acts and to allow for a quick response.

5.0 Consultation and Coordination

MFSA requires that a project applicant consult with government agencies to identify their concerns over the facility's possible locations or effects on the environment, to discuss mitigation measures suggested by the agencies, and to explain how the agency concerns were incorporated into identifying the proposed Project and alternative locations. MEPA and NEPA require DEQ and DOE to consult with local, Federal, and state agencies about the proposed Project during the project scoping.

DEQ and DOE have consulted with the applicant, other Federal and state agencies, local governments, and with individuals and non-government stakeholders. The consultation process took place during scoping and follow-up discussions. Interested individuals and organizations, affected Federal, state, and local agencies, as well as affected Indian Tribes were invited to submit comments to DEQ and DOE. MFSA requires FWP, DNRC, MDT, the Department of Revenue, and the Public Service Commission to report their recommendations on this project to DEQ. Results of this reporting would be incorporated into the final EIS.

Initial Consultation and Coordination

The MFSA consultation process began on May 9, 2005, when MATL representatives met with DEQ personnel to introduce the proposed Project and discuss issues or concerns during initial stages of the MFSA application process. MATL conducted open house sessions in Conrad and Cut Bank, Montana, on June 29 and 30, 2005, to provide the public an opportunity to meet representatives of the MATL project team and obtain information on the scope of the project. These open houses provided a venue for the public to voice and document their concerns and issues to MATL.

DEQ hosted an interagency project meeting on August 26, 2005, in Helena, Montana, to familiarize participating agency personnel with the proposed Project, to field agency questions, and to formalize agency roles and responsibilities. Attendees for the August 26, 2005, meeting included personnel from the following agencies:

- DEQ
- U.S. Department of Energy (DOE; via teleconference)
- Montana Fish, Wildlife and Parks (FWP)
- Montana Department of Transportation (MDT)
- Montana Department of Commerce
- DNRC

MATL submitted a MFSA application to DEQ on December 1, 2005, and submitted additional information and/or amended the application on January 11, January 24, March 16, March 30, June 9, July 31, August 11, November 30, and December 15, 2006.

Public Scoping

Three public scoping meetings were held in Cut Bank, Conrad, and Great Falls in early December 2005. The scoping process is discussed in Section 1.5. A follow-up meeting was held in Cut Bank on June 26, 2006. The December 2005 and June 2006 public meetings were advertised in *The Valierian, The Cut Bank Pioneer Press, The Glacier Reporter*, and *The Shelby Promoter* for a 3-week period prior to meetings. Based on the additional public comments and to address deficiencies in the original December 1, 2005, application, MATL revised its MFSA application and provided additional information as discussed above.

DOE also published a Notice of Intent to Prepare an Environmental Assessment and to Conduct Public Scoping Meetings in the *Federal Register* on November 18, 2005 (70 FR 69962). A copy of this notice was transmitted by mail to landowners in the study area.

Formal and Informal Consultation and Coordination

In addition to the general meetings and telephone contacts, DEQ hosted a meeting in Great Falls on October 6, 2006, to share information about multiple projects that may involve construction in and around the NWE Great Falls 230-kV switch yard. Meeting attendees for the October 6, 2006, Great Falls meeting included personnel from the following agencies and organizations:

- DEQ
- MATL
- NorthWestern Energy Corporation
- Western Area Power Administration (WAPA)
- PPL Montana
- Montana Fish, Wildlife and Parks (FWP)
- Sheffels Farms, Inc.
- Joe Stanek Farms (area landowner)
- Tetra Tech

Concerned citizens have submitted written comments and suggestions and have called DEQ throughout the process.

DEQ, DOE, and MATL have sought consultation from other interested individuals, SHPO, USFWS, and non-government organizations, as well as affected Indian Tribes. Consultation with SHPO and USFWS is ongoing. **Table 5.0-1** provides a listing of the non-government stakeholders that were contacted by MATL or DEQ about the proposed MATL project.

MATL also sought consultation with the Blackfeet Tribal Council in Browning. On September 12, 2005, MATL and representatives from their project team met with Blackfeet Tribal Council members in Browning to discuss potential effects on tribal economic, social, and traditional lands interests. Blackfeet Tribal Council members, staff, and interested parties in attendance included: Owna Scott-Big Bull, William Big Bull, John Murray, Teri Lawrence, Wendy Running Crane, Brian Crawford, Terry Tatsey, Douglas Quade, Curly Bear Wagner, Joseph Weatherwax, Kenneth Augare, Gerald Wagner, Pat Schildt, and Earl Old Person. Following introductions and a brief project overview provided by MATL personnel, Blackfeet Councilmen, staff, and tribal members raised several substantive issues that were addressed or recorded for follow-up. See Section 3.14 for discussion of cultural resources.

Public Hearings on the March 2007 Document

In March 2007, the DEQ and DOE published a draft document that was both the Federal EA and the State of Montana Draft EIS (March 2007 document). The document was distributed for public comment, and three public hearings were conducted to receive comments on the document during a 55-day public comment period. The public hearings were held at:

- Conrad on Tuesday, March 27, 2007
- Cut Bank on Wednesday, March 28, 2007
- Great Falls on Thursday, March 29, 2007

Based on comments received on the March 2007 document relating to land use and potential effects on farming, DOE has now determined an EIS to be the proper NEPA compliance document. Comments on the document were also submitted in writing to the agencies. Over 600 comments were received and are responded to in Volume II of this document. Accordingly, on June 7, 2007, DOE published in the *Federal Register* (72 FR 31569) a Notice of Intent to Prepare an EIS and to Conduct Scoping.

TABLE 5.0-1 MATL PROPOSED PROJECT NON-GOVERNMENTAL ORGANIZATIONS CONTACTED		
Organization	**Contact Person**	**Contact Information**
Ducks Unlimited	Layne Krumwiede Regional Director	1023 West St. Lewistown, MT 59457 (406) 538-9094
Northern Plains Resource Council	Teresa Erickson Staff Director	220 South 27th Street Suite A Billings, MT 59101 (406) 248-1154
Montana Environmental Information Center	Patrick Judge Energy Program Director	P.O. Box 1184 Helena, MT 59624 (406) 443-2520
Montana Stockgrowers Association	Steve Pilcher Director	420 No. California Ave. Helena, MT 59601 (406) 442-3420
Montana Stockgrowers Association	Keith Schott President	750 6th St. S.W. P.O. Box 1165 Great Falls, MT 50403 (406) 761-4596
The Nature Conservancy	Susan Benedict Program Associate	32 South Ewing Helena, MT 59601 (406) 443-0303
Montana Land Reliance	William Long Managing Director	324 Fuller Ave. P.O. Box 355 Helena, MT 59624-0355 (406) 443-7027
National Audubon Society, Montana Chapter	Janet Ellis Acting Exec. Director	P.O. Box 595 Helena, MT 59624 (406) 443-3949
Alternative Energy Resources Organization	--	432 N. Last Chance Gulch Helena, MT 59601 (406) 443-7272
Natural Heritage Program	Sue Crispin Director	1515 East 6th Avenue P.O. Box 201800 Helena, MT 59620
Sheffels Farms	Jim or John Sheffels Owners/operators	Box 1545 Great Falls, MT 59403
Stanek Property	Joe Stanek or Lyle Meeks	Lyle Meeks, P.E. NCI Engineering Inc. P.O. Box 6350 Great Falls, MT 59401
Diamond Valley Area Landowners	Katrina Martin	Ms. Katrina Martin Dutton, MT 59433 (406) 463-2337

6.0 List of Preparers

Department of Environmental Quality

Tom Ring	Project Coordinator	B.S., Fish and Wildlife Management B.S., Earth Science
Greg Hallsten	Project Coordinator	B.S., MS Range Management B.S., Wildlife Biology
Warren McCullough	EIS Reviewer	B.A., Anthropology M.S. Geology
Nancy Johnson	Visuals EIS Reviewer	B.S., Education M.S., Secondary Education M.L.A, Landscape Architecture
Jeff Blend	Socioeconomics Transmission System Analysis	B.S., Economics M.S., Economics PhD., Agricultural Economics
Craig Jones	Land Use/EIS Reviewer	B.A., Political Science

Tetra Tech

Cameo Flood	Assistant Project Manager Land Use, Farming and Ranching	B.S., Forestry
J. Edward Surbrugg	EIS Project Manager Vegetation/Wetlands	B.S., Range Ecology M.S., Land Rehabilitation Ph.D., Soil Science
Jim Dushin	Visual Simulations	A.AS., Forestry B.S., Wildlife Biology
Chris Reynolds	Geology and Soils	B. S., Geology M.S. Geochemistry/Hydrogeology
Ed Madej	Database/GIS	B.S., Biology and Oceanography
Stacy Pease	Wildlife/Fisheries	M.S. Watershed Management B.S. Wildlife and Fisheries Science
Gary Sturm, P.E.	Engineering	B.S., Engineering Physics M.S., Civil Engineering
Alicia Stickney	Editorial Review, Community Resources	B.A., English M.S., Geology
Alice Stanley	MEPA/NEPA Specialist Hydrology	B.S., Geology M.S., Geology
Alane Dallas	Word Processing/ Admin Record	
Linda Daehn	Public Relations	B.S., Journalism
Dan Buffalo	Groundwater	M.S., Water Resources Management B.S., Biology
Chris Martin	Surface Water/Visuals	M.S. Coursework, Mathematics Teacher Cert/B.A. Equiv., Mathematics B.S., Watershed Science – Hydrology
Earl Griffith	Utilities and Transportation	B.S., Earth Science (Geology) M.S., Earth Science (Geology)

Tetra Tech (Cont.)

H. Mark Blauer	Human Health and Environment	PhD., Nuclear Chemistry M.S., Earth and Space Sciences B.S., Chemistry
Heidi Raymer	Electromagnetic Effects	B.S., Nursing B.S., Environmental Occupational Safety and Health
Jay Rose	Presidential Permit	B.S., Ocean Engineering J.D.
Amy Sivers	Hazardous Materials	M.S., Geosciences B.A., Geography
C. Ray Windmueller	Air	B.S., Petroleum Engineering
Nancy Linscott	Socioeconomics and Environmental Justice	B.S., Earth Science (Geology) M.S., Environmental Policy and Management
Keith Cron	Noise	M.S., Industrial Hygiene B.S., Science and Engineering
Mike DaSilva	NEPA/MEPA Specialist	B.A., Biology M.S., Biology

HRA

Weber Greiser	Cultural Resources	B.S., Anthropology M.A., Anthropology

Glossary

Affected Environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air Pollution: Dust, fumes, smoke, other particulate matter, vapor, gas, odorous substances or any combination of these.

Alignment: The facility location.

Alluvial: Composed of alluvium or deposited by a stream or running water.

Alluvium: A general term for all deposits resulting from the operations of modern rivers and creeks, including the sediments laid down in riverbeds, floodplains, and fans at the foot of mountain slopes.

Ambient Air Quality Standard: An established concentration, exposure time, and frequency of occurrence of air contaminant(s) in the ambient air that shall not be exceeded.

Ambient Level: The existing level of air pollutants, noise, or other environmental factors used to describe background conditions (i.e., conditions before a project is implemented).

Analysis area: The area, defined for each resource, which the impact analysis addresses. The analysis boundary is different for each resource. For instance, the impact to soils or vegetation of a transmission pole may be confined to the structure footprint. The impact to land use may be the entire field in which the structure is placed.

Aquifer: Rock or sediment which is saturated with water and sufficiently permeable to transmit economic quantities of water to wells.

Benthic: of, relating to, or occurring at the bottom of a body of water.

Best Management Practices: A practice or combination of practices that is determined to be the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals.

Big Game: Those species of large mammals normally managed as a sport hunting resource.

Centerline: See reference centerline.

Class 3 farmland- In accordance with the provisions of 15-7-202, MCA, contiguous parcels of land under one ownership as defined in ARM 42.20.601, 160 acres or larger in size shall be valued as agricultural land, provided that no portion of the ownership meets the criteria for forest land classification and there are no covenants, easements, deed restrictions, or other operations of law that prohibit the land from being used as agricultural, or the land is not used for residential, commercial, or industrial purposes. (42-20-640, MCA)

Class 10 timberland- contiguous land of 15 acres or more in one ownership that is capable of producing timber that can be harvested in commercial quantities (can produce 25 cubic feet or more of stemwood per acre per year in live softwood trees at the culmination of the mean annual increment for fully stocked, natural sands and (2) meets the stocking requirements set forth by an administrative rule. (ARM 42.20.701)) and that is producing timber unless the trees have been removed by man through harvest or by natural disaster. (15-44-102, MCA)

Colluvium: Rock detritus and soil accumulated at the foot of a slope.

Conductor: Wires or lines that carry the electrical current in a transmission line.

Corona: Breakdown of the air, for example, on the surface of a high-voltage conductor, to produce air ions

CRP Lands: Farmlands for which a landowner receives an annual payment and cost-share assistance to establish long-term resource conserving covers. Administered by the U.S. Farm Service Agency.

Cultural Resources: Those fragile and nonrenewable remains of human activities, occupations, and endeavors as reflected in sites, buildings, structures, or objects, including works of art, architecture, and engineering.

Cumulative effect: Environmental effects that result from the incremental impact of a Proposed Action in addition to other actions (past, present, or future) in the vicinity. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Current: The flow of electricity. A voltage will always try to drive a current. The size current that is driven depends on the resistance of the circuit.

dB(A): Stands for A weighted decibels. This decibel scale is used to approximate the way human hearing responds more to some frequencies than to others.

Dead end: A point on a distribution line where conductors terminate. A "double dead-end" has conductors terminating from two directions. Jumper wires are used to connect these two sets of conductors.

Dead end: (angle greater than 45°): A transmission line structure that would be used where the line turns at an angle greater than 45°. The structure used in this instance would be a 3 pole dead end.

Dead end: (angle less than 1°): A transmission line structure that would be used where the line turns less than 1°. The structure used in this instance would be a 4 pole dead end.

Direct impact: An effect that results solely from the construction or operation of the Proposed Action.

DGPS: Differential Global Positioning System is an enhancement to Global Positioning System that uses a network of fixed ground based reference stations to broadcast the difference between the positions indicated by the satellite systems and the known fixed positions. These stations broadcast the difference between the measured satellite pseudoranges and actual (internally computed) pseudoranges, and receiver stations may correct their pseudoranges by the same amount.

Easement: a general term for a limited right to make use of a property owned by another party.

Electric fields: Produced by voltages, irrespective of how much current is flowing and indeed whether any current is flowing at all. The electric field is the region around a conductor where a force will be experienced by a charge.

Electric Grid: All parts of an electrical system that are directly connected to each other through alternating current transmission lines. The term used in the industry is "Interconnection."

Electric Transmission Grid: The western grid moves power from many different generating plants to customers and their electric loads.

Electromagnetic interference: high frequency electrical noise that can cause radio and television interference.

Emergent Wetland: Any area of a vegetated wetland where non-woody vegetation (e.g. cattail, grasses, sedges) comprises at least 30 percent areal cover.

Eminent Domain: In common law legal systems is the inherent power of the state to seize a citizen's private property, expropriate property, or rights in property, without the owner's consent. The property is taken either for government use or by delegation to third parties who will devote it to "public use." The most common uses of property taken by eminent domain are public utilities, highways, and railroads. Some states require that the government body offer to purchase the property before resorting to the use of eminent domain.

Emission: The release of air contaminants into the ambient air.

Emission Standard: A requirement established under the Federal Clean Air Act which limits the quantity, rate, or concentration of emissions of air contaminants on a continuous basis.

EMFs: Electric and magnetic fields. Sometimes also defined as electromagnetic fields.

Environmental effect: Any change that an action may cause in the environment, including biological resources, land use, health and socioeconomic conditions, cultural heritage, geology, and paleontology.

Environmental Justice: Evaluation of potential disproportionately high and adverse impacts on low income and/or minority populations that may result from a Proposed Action.

Ephemeral Drainage: A stream or stream segment that flows only briefly in response to local precipitation and has no base flow.

Erosion: Wearing away of soil and rock by weathering and the actions of surface water, wind, and underground water.

Farmland of Statewide Importance: Land that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

Federal Energy Regulatory Commission (FERC): The Federal commission that regulates interstate and wholesale power transactions, including power sales and transmission services, as well as licensing of hydroelectric projects.

Floodplains: Floodplains are the lowlands and relatively flat areas adjoining inland and coastal waters and the flood prone areas of offshore islands. Regulatory floodplain means an area inundated by a 100-year flood as depicted on a Flood Insurance Rate Map (FIRM) published by the Federal Emergency Management Agency. The 100-year flood is the flood event estimated as having a 1.0 percent chance of occurring in any given year.

Fugitive Dust: A particulate emission made airborne by forces of wind, human activity, or both. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust.

Heavy angle structure: A transmission line structure that would be used where the line turns between 30° and 45°.

Impact zone: The study area in which data are collected during the baseline study in order to make a determination of the impacts from construction, operation, maintenance, or decommissioning of a proposed facility or associated facility at preferred and reasonable alternative locations.

Indirect impact: An effect that is related to but removed from a Proposed Action by an intermediate step or process.

Insulators: a device made of porcelain or polymer that prevents energized conductors from coming in contact with each other. They also prevent conductors from energizing structures or facilities that are not designed to carry electricity. Bushings are a type of insulator.

Intermittent Stream: A stream that flows in a well-defined channel in response to precipitation and is dry for part of the year.

Jurisdictional wetlands: Wetlands protected by the Clean Water Act. They must have a minimum of one positive wetland indicator from each parameter (i.e., vegetation, soil, and hydrology). The U.S. Army Corps of Engineers requires a permit to fill or dredge jurisdictional wetlands.

Kilovolt (kV): 1,000 Volts. The Volt is unit for measuring electrical potential, or "pressure."

Kilovolt ampere (kVA): The practical unit of apparent power, which is 1,000 volt-amperes. The volt-amperes of an electric circuit are the mathematical products of the volts and amperes of the client.

Kilowatt (kW): The electric unit of power equal to 1,000 watts.

Kilowatt-Hour (kWh): The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit for one hour.

Lacustrine: Of, relating to, formed in, living in, or growing in lakes.

Lek: A traditional courtship display area attended by male sharp-tailed grouse or sage grouse.

Linear facility: An electric transmission line or pipeline covered under Montana's Major Facility Siting Act.

Load: The amount of electric power delivered or required at any specified point or points on a system. Load originates primarily at the power consuming equipment of the customer.

Megawatt (MW): One million watts.

Megawatt-hour (MWh): One thousand kilowatt-hours or one million-watt hours.

Medium angle structure: A transmission line structure that would be used where the line turns between 5° and 30°.

Mesic: Characterized by, relating to, or requiring a moderate amount of moisture.

Milligauss: A unit of measurement for magnetic fields.

Mitigation: An action to avoid, minimize, reduce, eliminate, replace or rectify the impact of a management practice.

Montana Major Facility Siting Act (MFSA): This law governs the siting of most large energy transporting facilities in Montana.

Nacelle: The structure in a wind turbine that houses the rotor shaft, gearbox, and generator.

National Environmental Policy Act of 1969 (NEPA): This act requires Federal agencies to evaluate the environmental effects of Proposed Actions.

Nitrogen Dioxide (NO_2): A reddish brown gas that is a component of smog.

Nitrogen Oxides (NO_x): A group of compounds containing varying proportions of nitrogen and oxygen.

No Action Alternative: The No Action alternative is required by MEPA and regulations implementing NEPA. The No Action alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the No Action alternative is defined as one where No Action or activity would take place.

Nonattainment: Description of areas of the state not yet in compliance with National Ambient Air Quality Standards.

North American Electric Reliability Council (NERC): NERC consists of eight regional reliability councils: Electric Reliability Council of Texas, Inc. (ERCOT), Florida Reliability Coordinating Council (FRCC), Midwest Reliability Organization (MRO), Northeast Power Coordinating Council (NPCC), Reliability First Corporation (RFC), Southeastern Electric Reliability Corporation (SERC), Southwest Power Pool, Inc. (SPP), and Western electricity Coordinating Council (WECC).

Noxious Weed: Exotic (non-native) species of plants that proliferate and reduce the value of land for agriculture, forestry, livestock, wildlife, or other beneficial uses.

Operational right-of-way: MATL defined the transmission line operational right-of-way as 45 feet wide (22.47 feet to either side of the centerline).

Palustrine: Inland wetland that lacks flowing water and contains less than 0.05 percent ocean-derived salts.

Passerine: Large order of birds which include songbirds of perching habits.

Per capita personal income: According to the U.S. Bureau of Economic Analysis, the average income received per person. This includes income received from all sources such as wages, proprietor's income, rental income, and dividend income.

Personal income (Total): Income received from all sources.

Prime Farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.

Raptor: Bird of prey.

Reference centerline: The facility location. DEQ approves a 500-foot-wide facility location (250 feet to either side of a presumed centerline unless there is a compelling reason to enlarge or narrow this width.

Right-of-way: The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, pipeline, or power lines are built.

Ruling Span- a calculated weighted average of span lengths between deadend power line towers. Ruling span is used to design transmission lines and then subsequently used in monitoring sag of the lines.

Salmonid: Any of a family (Salmonidae) of elongate bony fishes (as a salmon or trout) that have the last three vertebrae upturned.

Special Status Species: Those species of plants or animals that have a protective status designated by a state or Federal agency because of general or localized population decline.

Substation: an installation which accomplishes one or more of the following:

- voltage changed from one level to another level.
- voltage regulated to compensate for system voltage changes.
- electric transmission and distribution circuits switched into and out of the system.
- electric power flowing in the transmission and distribution circuits measured.
- communication signals are connected to the circuits.

System reliability: the ability of a power system to provide uninterrupted service.

Tertiary: The Tertiary period or system of rocks.

Topsoil: Fertile soil or soil material, usually rich in organic matter, used to top dress disturbed areas. Topsoil is better suited to supporting plants than other materials.

Total Maximum Daily Load (TMDL): The total amount of a pollutant, per day, (including a margin of safety) that a waterbody may receive from any source (point, nonpoint, or natural background) without exceeding the state water quality standards. The term frequently refers to a plan or strategy to return a waterbody to compliance with the water quality standards and therefore fully supporting of its designated uses.

Transmission capacity: the maximum load that a transmission line or network of transmission lines is designed to carry.

Transmission lines: High voltage electric conductors used for bulk movement of large volumes of power across relatively long distances.

Transmission restricted: the existing transmission capability is limiting the flow of electricity into and out of the area, in this case, Montana.

Utility: A regulated entity which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring "utility" refers to the regulated, vertically integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system which serves retail customers.

Viewshed: The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor.

Volatile Organic Compound (VOC): Any of several compounds of carbon that participate in atmospheric photochemical reactions, forming secondary pollutants.

Volt: A unit of electrical pressure. It measures the force or push of electricity. Volts represent pressure, correspondent to the pressure of water in a pipe. A volt is the unit of electromotive force or electric pressure analogous to water pressure in pounds per square inch. It is the electromotive force which, if steadily applied to a circuit having a resistance of one ohm, will produce a current one ampere.

Volt-amperes: The volt-amperes of an electric circuit are the mathematical products of the volts and amperes of the client.

Voltage: Measure of the force of moving energy.

Watt: The electric unit of power or rate of doing work. One horsepower is equivalent to approximately 746 watts.

Watt-Hour: One watt of power expended for one hour.

WECC: Western Electricity Coordinating Council is a regional forum for promoting regional electric service reliability in Western Canada and the Western United States.

Western Grid: The Western Grid includes the western third of the continental United States (excluding Alaska), the Canadian provinces Alberta and British Columbia, and a portion of Baja California Norte, Mexico.

Wetlands: Areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances, does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wide Area Augmentation System (WAAS): Augments GPS with additional signals for increasing the reliability, integrity, accuracy and availability of GPS.

Xeric: Characterized by, relating to, or requiring only a small amount of moisture.

Acronym List

ACSR	Aluminum Core Steel Reinforced
AESO	Alberta Electric System Operator
aMW	average megawatts
APLIC	Avian Power Line Interaction Committee
ARM	Administrative Rules of Montana
BLM	U.S. Bureau of Land Management
BPA	Bonneville Power Administration
CAMA	Computer Assisted Mass Appraisal
CEQ	Council on Environmental Quality
cfs	Cubic feet per second
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
CO	Carbon monoxide
CRP	Conservation Reserve Program
dBA	A-weighted decibels
DEQ	Montana Department of Environmental Quality
DNRC	Department of Natural Resources & Conservation
DOE	U.S. Department of Energy
DGPS	Differential Global Positioning System
EA	Environmental Assessment
EEI	Edison Electric Institute
EIS	Environmental impact statement
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
EMF	Electric and magnetic field
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Maps
ft	feet
ft^2	square feet
ft/day	feet per day
FWP	Montana Fish, Wildlife and Parks
FWS	U.S. Fish and Wildlife Service

GIS	Geographic Information System
GPS	Global Positioning System
HUC	Hydrologic unit codes
HUD	Housing and Urban Development
Kcmil	1,000 circular mils
kV	Kilovolt
kV/m	Kilovolts per meter
kWh	Kilowatt hour
L_{dn}	day-night average noise level
LIDAR	Light Detection and Ranging
mA	Milliampere
MATL	Montana-Alberta Tie, Ltd.
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFSA	Major Facility Siting Act
mG	Milligauss
MHz	megahertz
MPDES	Montana Pollutant Discharge Elimination System
MRMC	Missouri River Medical Center
mVA	Megavolt-amperes
MW	Megawatt
ND	No data
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NESC	National Electric and Safety Code
NHP	Montana Natural Heritage Program
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen oxide
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System
NWE	NorthWestern Energy
NWR	National Wildlife Refuge
NWS	National Weather Service

OASIS	Open Access Same Time Information System
OSHA	Occupational Safety and Health Act
PAB	Palustrine Aquatic Bed wetlands
Pb	Lead
PEM	Palustrine emergent
PM_{10}	Particulate matter equal to or smaller than 10 microns
$PM_{2.5}$	Particulate matter equal to or smaller than 2.5 microns
PPL	Pacific Power and Light
ppm	Parts per million
PSD	Prevention of Significant Deterioration
PUB	Palustrine Unconsolidated Bottom wetlands
PUS	Palustrine Unconsolidated Shore wetlands
ROW	Right-of-way
SHPO	State Historic Preservation Office
SO_2	Sulfur dioxide
SSSA	Soil Science Society of America
SWPPP	Storm Water Pollution Prevention Plan
TBD	To be determined
TMDL	Total maximum daily load
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
WAAS	Wide Area Augmentation System
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WPA	Waterfowl Production Area
WRCC	Western Regional Climate Center
$\mu g/m^3$	Micrograms per square meter
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

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9.0 Distribution List

The Draft EIS distribution list is available upon request and can be downloaded from DOE's website: www.eh.doe.gov/nepa/documentspub.html

APPENDIX F:
REVISED DRAFT DEQ ENVIRONMENTAL SPECIFICATIONS

Draft DEQ Environmental Specifications

The following specifications have been developed by the DEQ for projects receiving a Certificate of Compliance and would become conditions to the Certificate of Compliance if it is approved.

CONTENTS

DEFINITIONS

ACCESS EASEMENT: Any land area over which the OWNER has received an easement or other permission from a LANDOWNER allowing travel to and from the project. Access easements may or may not include access roads.

ACCESS ROAD: Any travel course which is constructed by substantial recontouring of land and which is intended to permit passage by most four-wheeled vehicles.

BEGINNING OF CONSTRUCTION: Any project-related earthmoving or removal of vegetation (except for clearing of survey lines).

BOND: Performance bond to guarantee successful reclamation and revegetation of the project as allowed under 75-20-302(2),MCA

CERTIFICATE: Certificate of Compliance issued by the Department of Environmental Quality.

CONTRACTOR: Constructors of the Facility (agent of owner)

FWP: Montana Fish, Wildlife and Parks

DNRC: Montana Department of Natural Resources and Conservation

DOT: Montana Department of Transportation

DEQ: Montana Department of Environmental Quality

LANDOWNER: The owner of private property or the managing agency for public lands.

OWNER: The owner(s) of the facility, or the owner’s agent.

SENSITIVE AREA: Area which exhibits environmental characteristics that may make it susceptible to impact from construction of a transmission facility. The extent of these areas is defined for each project but may include any of the areas listed in Circular MFSA-2 Sections 3.2(1)(d) and 3.4(1).

SHPO: State Historic Preservation Office

STATE INSPECTOR: DEQ employee or DEQ designee with the responsibility for monitoring the OWNER’s and contractor’s compliance with terms and conditions of the Certificate of Compliance issued for a project.

INTRODUCTION

The purpose of these specifications is to ensure mitigation of potential environmental impacts during the construction, operation and maintenance of a transmission facility.

For non-exempt facilities, the Montana Major Facility Siting Act supersedes all state and local environmental permit requirements except for those dealing with air and water quality, public health and safety, water appropriations and diversions, and easements across state lands (75-20-103 and 401, MCA). A major purpose of these conditions is to ensure that the intent of the laws which are superseded is met, even though the procedures of applying for and obtaining permits from various state agencies are not. As specified later in this document, the STATE INSPECTOR will have the responsibility for arranging reviews and inspections by other state agencies, which would otherwise have been done through a permit application process.

Appendices A through Q refer to the site-specific concerns and areas that apply for a specific project. These addenda, as needed, will be prepared by DEQ working in consultation with the OWNER prior to the start of construction.

0.0 GENERAL SPECIFICATIONS

0.1. SCOPE

These specifications apply to all lands affected by the project. Where the LANDOWNER requests practices other than those listed in these specifications, the OWNER may authorize such a change provided that the STATE INSPECTOR is notified in writing of the change and that the change would not be in violation of: (1) the intent of any state law which is superseded by the Montana Major Facility Siting Act; (2) the Certificate; (3) any conditions imposed by DEQ; (4) DEQ's finding of minimum adverse impact; or (5) the regulations in ARM 17.20.1901 and 17.20.1902.

0.2. ENVIRONMENTAL PROTECTION

The OWNER shall conduct all operations in a manner to protect the quality of the environment and to reduce impacts to the greatest extent practical.

0.3. CONTRACT DOCUMENTS

These specifications shall be part of or incorporated into the contract documents; therefore, the OWNER and the OWNER'S agents shall be held responsible for adherence to these specifications in performing the work

0.4. BRIEFING OF EMPLOYEES

The OWNER shall ensure that the CONTRACTOR and all field supervisors are provided with a copy of these specifications and informed of which sections are applicable to specific procedures. It is the responsibility of the OWNER, its CONTRACTOR and the CONTRACTOR's Construction Supervisors to ensure that the intent of these measures is met. Supervisors shall inform all employees on the applicable environmental constraints spelled out herein prior to and during construction. Site-specific measures spelled out in the appendices attached hereto shall be incorporated into the design and construction specifications or other appropriate contract document.

0.5. COMPLIANCE WITH REGULATIONS

All project-related activities of the OWNER shall comply with all applicable local, state, and federal laws, regulations, and requirements.

0.6. LIMITS OF LIABILITY

The OWNER is not responsible for correction of environmental damage or destruction of property caused by negligent acts of DEQ employees during construction monitoring activities.

0.7. DESIGNATION OF SENSITIVE AREAS

DEQ, in its evaluation of the project, has designated certain areas along the right-of-way or access roads as SENSITIVE AREAS. The OWNER shall take all reasonable actions to avoid adverse impacts in these SENSITIVE AREAS and adopt the measures in Appendix A.

0.8. PERFORMANCE BOND

To ensure compliance with these specifications, the OWNER shall submit to the State of Montana or its authorized agent a BOND or BONDS pertaining specifically to the restoration and revegetation of the right-of-way and adjacent land damaged during construction. Post-construction monitoring by DEQ will determine compliance with these specifications and other mitigating measures included herein. At the time cleanup and restoration are complete, and revegetation is progressing satisfactorily, the OWNER shall be released from its obligation for restoration. At the time the OWNER is released, a portion of this BOND or a separate BOND shall be established by the OWNER and submitted to the State of Montana or its authorized agent. This BOND shall be held for five years or until monitoring by DEQ indicates that reclamation, weed control, and road closures have been adequate. The amount and bonding mechanisms for this section shall be specified by DEQ and agreed to by the OWNER under provisions established by 17.20.1902(9) as specified in Appendix B and attached. Proof of bond shall be submitted to DEQ two weeks prior to the start of construction.

0.9. DESIGNATION OF STRUCTURES

Each structure for the project shall be designated by a unique number on plan and profile maps, and a shape file, route, or geodatabase showing line, structure, and access locations submitted to DEQ. References to specific poles or towers in Appendices A through Q shall use these numbers. If this information is not available because the survey is not complete, station numbers or mileposts shall indicate locations along the centerline. Station numbers or mileposts of all angle points shall be designated on plan and profile maps.

0.10. ACCESS

When easements for construction access are obtained for construction personnel, provision will be made by the OWNER to ensure that DEQ personnel or contractors will be allowed access to the right-of-way and to any off-right-of-way access roads used for construction during the term of the CERTIFICATE. Liability for damage caused by providing such access for the STATE INSPECTOR shall be limited by section 0.6 LIMITS OF LIABILITY.

0.11. DESIGNATION OF STATE INSPECTOR

DEQ shall designate a STATE INSPECTOR or INSPECTORS to monitor the OWNER'S compliance with these specifications and any other project–specific mitigation measures adopted by DEQ as provided in ARM 17.20.1901 through 17.20.1902. The STATE INSPECTOR shall be the OWNER's liaison with the State of Montana on construction, post-construction, and reclamation activities. All communications regarding the project shall be directed to the STATE INSPECTOR. The name of the STATE INSPECTOR can be obtained by contacting the Bureau Chief of the Environmental Management Bureau, Permitting and Compliance Division, Department of Environmental Quality, or the Bureau Chief's successor (see Appendix P).

1.0. PRE-CONSTRUCTION PLANNING AND COORDINATION

1.1. PLANNING

1.1.1. Planning of all stages of construction and maintenance activities is essential to ensure that construction-related impacts will be kept to a minimum. The CONTRACTOR and OWNER shall, to the extent possible, plan the timing of construction, construction and maintenance access and requirements, location of special use sites, and other details before the commencement of construction.

1.1.2. Preferably thirty days, but at least fifteen days before the start of construction, the OWNER shall submit plan and profile map(s) and an electronic equivalent acceptable to the STATE INSPECTOR depicting the location of the centerline and of all construction access roads, maintenance access roads, structures, clearing backlines, and, if known, special use sites. The scale of the map for special use sites shall be 1:24,000 or larger.

1.1.3. If special use sites are not known at the time of submission of the plan and profile, the following information shall be submitted no later than five days prior to the start of construction. The location of special use sites including staging sites, pulling sites, batch plant sites, splicing sites, borrow pits, and storage or other buildings shall be plotted on one of the following and submitted to DEQ: ortho-photomosaics of a scale 1:24,000 or larger, or available USGS 7.5′ plan and profile maps of a scale 1:24,000 or larger, or an electronic equivalent acceptable to the STATE INSPECTOR.

1.1.4. Changes or updates to the information submitted in 1.1.2 and 1.1.3 shall be submitted to DEQ as they become available. In no case shall a change be submitted less than five (5) working days prior to its anticipated date of construction. Changes in these locations prior to construction where designated SENSITIVE AREAS are affected must be submitted to DEQ seven (7) working days before construction and approved by the STATE INSPECTOR prior to construction.

1.1.5. Long-term maintenance routes to all points on the line should be planned before construction begins. Where known, new construction access roads intended to be maintained for permanent use shall be differentiated from temporary access roads on the maps required under 1.1.2 above.

1.2. PRE-CONSTRUCTION CONFERENCE

1.2.1. At least one week before commencement of any construction activities, the OWNER shall schedule a pre-construction conference. The STATE INSPECTOR shall be notified of the date and location for this meeting. One of the purposes of this conference shall be to brief the CONTRACTOR and land management agencies regarding the content of these specifications and other DEQ approved mitigating measures, and to make all parties aware of the roles of the STATE INSPECTOR and of the federal inspectors (if any).

1.2.2. The OWNER's representative, the CONTRACTOR's representative, the STATE INSPECTOR, and representatives of affected state and federal agencies who have land management or permit and easement responsibilities shall be invited to attend the pre-construction conference.

1.3. PUBLIC CONTACT

1.3.1. Written notification by the OWNER's field representative or the CONTRACTOR shall be given to local public officials in each affected community prior to the beginning of construction to provide information on the temporary increase in population, when the increase is expected, and where the workers will be stationed. If local officials require further information, the OWNER shall hold meetings to discuss potential temporary changes. Officials contacted shall include the county commissioners, city administrators, and law enforcement officials. It is also suggested that local fire departments, emergency service providers, and a representative of the Chamber of Commerce be contacted.

1.3.2. The OWNER shall negotiate with the LANDOWNER in determining the best location for access easements and the need for gates.

1.3.3. The OWNER shall contact local government officials, or the managing agency, as appropriate, regarding implementation of required traffic safety measures.

1.4. HISTORICAL AND ARCHAEOLOGICAL SURVEY

1.4.1. The OWNER must develop and carry out a plan submitted to the State Historic Preservation Office (SHPO) that includes steps which have been and will be taken to identify, evaluate, and avoid or mitigate damage to cultural resources affected by the project. The plan (Appendix I) shall include: (1) actions taken to identify cultural resources during initial intensive survey work; (2) an evaluation of the significance of the identified sites and likely impacts caused by the project; (3) recommended treatments or measures to avoid or mitigate damage to known cultural sites; (4) steps to be taken in the event other sites are identified after approval of the plan; and (5) provisions for monitoring construction to protect cultural resources. Except for monitoring, all steps of the plan must be carried out prior to the start of construction. The requirements for this plan should not be construed to exempt or alter compliance by the OWNER or managing agency with 36 CFR 800. This plan must be filed with SHPO.

2.0 CONSTRUCTION

2.1. GENERAL

2.1.1. The preservation of the natural landscape contours and environmental features shall be an important consideration in the location of all construction facilities, including roads, storage areas, and buildings. Construction of these facilities shall be planned and conducted so as to minimize destruction, scarring, or defacing of the natural vegetation and landscape. Any necessary earthmoving shall be planned and designed to be as compatible as possible with natural landforms.

2.1.2. Temporary construction sites and staging areas shall be the minimum size necessary to perform the work. Such areas shall be located where most environmentally compatible, considering slope, fragile soils or vegetation, and risk of erosion. After construction, these areas shall be restored as specified in Section 3.0 of these specifications unless the STATE INSPECTOR authorizes a specific exemption in writing.

2.1.3. All work areas shall be maintained in a neat, clean, and sanitary condition at all items. Trash or construction debris (in addition to solid wastes described in section 2.14) shall be regularly removed during the construction, restoration, and reclamation periods.

2.1.4. In areas where mixing of soil horizons would lead to a significant reduction in soil productivity, increased difficulty in establishing permanent vegetation, or an increase in weeds, mixing of soil horizons shall be avoided insofar as possible. This may be done by removing and stockpiling topsoil, where practical, so that it may be spread over subsoil during site restoration. Known areas where stockpiling of topsoil is required are listed in Appendix L. Prior to construction the STATE INSPECTOR may designate other areas.

2.1.5. Vegetation such as trees, plants, shrubs, and grass on or adjacent to the right-of-way which do not interfere with the performance of construction work or operation of the line itself shall be preserved.

2.1.6. The OWNER shall take all necessary actions to avoid adverse impacts to SENSITIVE AREAS listed in Appendix A. The STATE INSPECTOR shall be notified two working days in advance of initial clearing or construction activity in these areas. The OWNER shall mark or flag the clearing backlines and limits of disturbance in certain SENSITIVE AREAS as indicated in Appendix A. All construction activities must be conducted within this marked area.

2.1.7. The OWNER shall either acquire appropriate land rights or provide compensation for damage for the land area that will be disturbed by construction. The width of the area disturbed by construction shall not exceed a reasonable distance from the centerline as necessary to perform the work. For this project, work should be contained within the area specified in Appendix C.

2.1.8. Flow in a stream course may not be permanently diverted. If temporary diversion is necessary, flow will be restored before a major runoff season or the next spawning season, as determined by the STATE INSPECTOR in consultation with the managing agency.

2.2. CONSTRUCTION MONITORING

2.2.1. The STATE INSPECTOR is responsible for implementing the monitoring plan required by ARM 17.20.1902. The plan specifies the type of monitoring data and activities required, and terms and schedules of monitoring data collection, and assigns responsibilities for data collection, inspection reporting, and other monitoring activities. It is attached as Appendix Q.

2.2.2. The STATE INSPECTOR, the OWNER, and the OWNER'S agents will attempt to rely upon a cooperative working relationship to reconcile potential problems relating to construction in SENSITIVE AREAS and compliance with these specifications. When construction activities would cause excessive environmental impacts due to seasonal field conditions or damage to sensitive features, the STATE INSPECTOR will discuss possible mitigating measures or minor construction rescheduling to avoid these impacts with the OWNER. The STATE INSPECTOR will be prepared to provide the OWNER with written documentation of the reasons for the modifications within 24 hours of their imposition.

2.2.3. The STATE INSPECTOR may require mitigating measures or procedures at some sites beyond those listed in Appendix A in order to minimize environmental damage due to unique circumstances that arise during construction, such as unanticipated discovery of a cultural site. The STATE INSPECTOR will follow procedures described in the monitoring plan when such situations arise.

2.2.4. In the event that the STATE INSPECTOR shows reasonable cause that compliance with these specifications is not being achieved, DEQ would take corrective action as described in 75-20-408, MCA.

2.3. TIMING OF CONSTRUCTION

2.3.1. Construction and motorized travel may be restricted or prohibited at certain times of the year in certain areas. Exemptions to these timing restrictions may be granted by DEQ in writing if the OWNER can clearly demonstrate that no environmental impacts will occur as a result. These areas, listed in Appendix D, include areas deemed as SENSITIVE AREAS.

2.3.2. In order to prevent rutting and excessive damage to vegetation, construction will not take place during periods of high soil moisture when construction vehicles will cause severe rutting.

2.4. PUBLIC SAFETY

2.4.1. All construction activities shall be done in compliance with existing health and safety laws.

2.4.2. Requirements for aeronautical hazard marking shall be determined by the OWNER in consultation with the Montana Aeronautical Division, the FAA, and DEQ. These requirements are listed in Appendix E. Where required, aeronautical hazard markings shall be installed at the time the wires are strung, according to the specifications listed in Appendix E.

2.4.3. Noise levels shall not exceed established DEQ standards as a result of operation of the facility and associated facilities. For electric transmission facilities, the average annual noise levels, as expressed by an A-weighted day-night scale (Ldn) will not exceed 50 decibels at the edge of the right-of-way in residential and subdivided areas unless the affected LANDOWNER waives this condition.

2.4.4. The facility shall be designed, constructed, and operated to adhere to the National Electric Safety Code regarding transmission lines.

2.4.5. The electric field at the edge of the right-of-way will not exceed 1 kilovolt per meter measured 1 meter above the ground in residential or subdivided areas unless the affected LANDOWNER waives this condition, and the electric field at road crossings under the facility will not exceed 7 kilovolts per meter measured 1 meter above the ground.

2.5. PROTECTION OF PROPERTY

2.5.1. Construction operations shall not take place over or upon the right-of-way of any railroad, public road, public trail, or other public property until negotiations and/or necessary approvals have been completed with the managing agency. Roads and trails will be protected and kept open for public use. Where it is necessary to cross a trail with access roads, the trail corridor will be restored. Adequate signing and/or blazes will be established so the user can find the route. All roads and trails designated by government agencies as needed for fire protection or other purposes shall be kept free of logs, brush, and debris resulting from operations under this agreement. Any such road or trail damaged by project construction or maintenance shall be promptly restored to its original condition.

2.5.2. Reasonable precautions shall be taken to protect, in place, all public land monuments and private property corners or boundary markers. If any such land markers or monuments are destroyed, the marker shall be reestablished and referenced in accordance with the procedures outlined in the "Manual of Instruction for the Survey of the Public Land of the United States" or, in the case of private property, the specifications of the county engineer. Reestablishment of survey markers will be at the expense of the OWNER

2.5.3. Construction shall be conducted so as to prevent any damage to existing real property including but not limited to transmission lines, distribution lines, telephone lines, railroads, ditches, and public roads crossed. If such property is damaged by operations under this agreement, the OWNER shall repair such damage immediately to a reasonably satisfactory condition in consultation with the property owner.

2.5.4. In areas with livestock, the OWNER shall make a reasonable effort to comply with the reasonable requests of LANDOWNERs regarding measures to control livestock. Unless requested by a LANDOWNER, care shall be taken to ensure that all gates are closed after entry or exit. The LANDOWNER shall be compensated for any losses to personal property due to construction or maintenance activities. Gates shall be inspected and repaired when necessary during construction and missing padlocks shall be replaced. The OWNER shall ensure that gates are not left open at night or during periods of no construction activity unless the LANDOWNER makes other requests. Any fencing or gates cut, removed, damaged, or destroyed by the OWNER shall immediately be replaced with new materials. Fences installed shall be of the same height and general type as a nearby fence on the same property, and shall be stretched tight with a fence stretcher before stapling or securing to the fence post. Temporary gates shall be of sufficiently high quality to withstand repeated opening and closing during construction, to the satisfaction of the LANDOWNER.

2.5.5. The CONTRACTOR must notify the OWNER, the STATE INSPECTOR, and, if possible, the affected LANDOWNER within two working days of damage to land, crops, property, or irrigation facilities, contamination or degradation of water, or livestock injury caused by the OWNER's construction activities, and the OWNER shall reasonably restore any damaged resource or property or provide reasonable compensation to the affected party.

2.5.6. Pole holes and anchor holes must be covered or fenced in any fields, pastures, or ranges being used for livestock grazing or where a LANDOWNER's requests can be reasonably accommodated.

2.5.7. When requested by the LANDOWNER, all fences crossed by permanent access roads shall be provided with a gate. All fences to be crossed by access roads shall be braced before the fence is cut. Fences not to be gated should be restrung temporarily during construction and restrung permanently within 30 days following construction, subject to the reasonable desires of the LANDOWNER.

2.5.8. Where new access roads cross fence lines, the OWNER shall make reasonable effort to accommodate the LANDOWNER's wishes on gate location and width.

2.5.9. Any breaching of natural barriers to livestock movement by construction activities will require fencing sufficient to control livestock.

2.6. TRAFFIC CONTROL

2.6.1. At least 30 days before any construction within or over any state or federal highway right-of-way or paved secondary highway maintained by DOT, the OWNER will notify the appropriate DOT field office to review the proposed occupancy and to obtain appropriate permits and authorizations. The OWNER must supply DEQ with documentation that this consultation has occurred. This documentation should include any measures recommended by DOT and to what extent the OWNER has agreed to comply with these measures. In the event that recommendations or regulations were not followed, a statement as to why the OWNER chose not to follow them should be included. If there is a disagreement, DEQ will resolve the matter.

2.6.2. In areas where project construction creates a hazard, traffic will be controlled according to the applicable DOT regulations. Safety signs advising motorists of construction equipment shall be placed on major state highways, as recommended by DOT. The installation of proper road signing will be the responsibility of the OWNER.

2.6.3. The managing agency shall be notified, as soon as practicable, when it is necessary to close public roads to public travel for short periods to provide safety during construction.

2.6.4. Construction vehicles and equipment will be operated at speeds safe for existing road and traffic conditions.

2.6.5. Traffic delays will be restricted on primary access routes, as determined by DOT or the managing agency.

2.6.6. Access for fire and emergency vehicles will be provided for at all times.

2.6.7. Public travel through and use of active construction areas shall be limited at the discretion of the managing agency.

2.7. ACCESS ROADS AND VEHICLE MOVEMENT

2.7.1. Construction of new roads shall be the minimum reasonably required to construct and maintain the facility. State, county, and other existing roads shall be used for construction access wherever possible. Access roads intended to be permanent should be initially designed as such. The location of access roads and towers shall be established in consultation with affected LANDOWNERs, and LANDOWNER concerns shall be accommodated where reasonably possible and not in contradiction to these specifications or other DEQ conditions.

2.7.2. All new roads, both temporary and permanent, shall be constructed with the minimum possible clearing and soil disturbance to minimize erosion, as specified in Section 2.11 of these specifications.

2.7.3. Where practical, all roads shall be initially designed to accommodate one-way travel of the largest piece of equipment that will be required to use them; road width shall be no wider than necessary.

2.7.4. Roads shall be located in the right-of-way insofar as possible. Travel outside the right-of-way to enable traffic to avoid cables and conductors during conductor-stringing shall be kept to the minimum possible. Road crossings of the right-of-way should be near support structures.

2.7.5. Where practical, temporary roads shall be constructed on the most level land available. Where temporary roads cross flat land they shall not be graded or bladed unless necessary, but will be flagged or otherwise marked to show their location and to prevent travel off the roadway.

2.7.6. In order to minimize soil disturbance and erosion potential, no cutting and filling for access road construction shall be allowed in areas of up to 5 percent sideslope. In areas of over 5 percent sideslope, road building that may be required shall conform to a 4 percent outslope. The roads shall be constructed to prevent channeling of runoff, and shoulders or berms that would channel runoff shall be avoided.

2.7.7. The OWNER will maintain all permanent access roads, including drainage facilities, which are constructed for use during the period of construction. In the event that a road would be left in place, the OWNER and LANDOWNER may enter into agreements regarding maintenance for erosion control following construction.

2.7.8. Any damage to existing private roads, including rutting, resulting from project construction or maintenance shall be repaired and restored to a condition as good or better than original as soon as possible. Repair and restoration of roads should be accomplished during and following construction as necessary to reduce erosion.

2.7.9. All permanent access road surfaces, including those under construction, will be prepared with the necessary erosion control practices as determined by the STATE INSPECTOR or the managing agency prior to the onset of winter.

2.7.10. Any necessary snow removal shall be done in a manner to preserve and protect roads, signs, and culverts, to ensure safe and efficient transportation, and to prevent excessive erosion damage to roads, streams, and adjacent land.

2.7.11. At the conclusion of line construction, final maintenance will be performed on all existing private roads used for construction access by the CONTRACTOR. These roads will be returned to a condition as good or better than when construction began.

2.7.12. At least 30 days prior to construction of a new access road approach intersecting a state or federal highway, or of any structure encroaching upon a highway right-of-way, the OWNER shall submit to DOT a plan and profile map showing the location of the proposed construction. At least five days prior to construction, the OWNER shall provide the STATE INSPECTOR written documentation of this consultation and actions to be taken by the OWNER as provided in 2.6.1.

2.8. EQUIPMENT OPERATION

2.8.1. During construction, unauthorized cross-country travel and the development of roads other than those approved shall be prohibited. The OWNER shall be liable for any damage, destruction, or disruption of private property and land caused by his construction personnel and equipment as a result of unauthorized cross-country travel and/or road development.

2.8.2. To prevent excessive soil damage in areas where a graded roadway has not been constructed, the limits and locations of access for construction equipment and vehicles shall be clearly marked or specified at each new site before any equipment is moved to the site. Construction foremen and personnel should be well versed in recognizing these markers and shall understand the restriction on equipment movement that is involved.

2.8.3. Dust control measures shall be implemented on access roads where required by the managing agency or where dust would pose a nuisance to residents. Construction activities and travel shall be conducted to minimize dust. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used. Oil or similar petroleum-derivatives shall not be used.

2.8.4. Work crew foremen shall be qualified and experienced in the type of work being accomplished by the crew they are supervising. Earthmoving equipment shall be operated only by qualified, experienced personnel. Correction of environmental damage resulting from operation of equipment will be the responsibility of the OWNER. Repair of damage to a condition reasonably satisfactory to the LANDOWNER, managing agency, or if necessary, DEQ, is required.

2.8.5. Sock lines will be strung using methods that minimize disturbance of soils and vegetation.

2.8.6. Following construction in areas designated by the local weed control board or STATE INSPECTOR as a noxious weed area the CONTRACTOR shall thoroughly clean all vehicles and equipment to remove weed parts and seeds immediately prior to leaving the area.

2.9. RIGHT-OF-WAY CLEARING AND SITE PREPARATION

2.9.1. The STATE INSPECTOR shall be notified at least ten days prior to any timber clearing. The STATE INSPECTOR shall be responsible for notifying the DNRC Forestry Division.

2.9.2. During clearing of survey lines or the right-of-way, shrubs shall be preserved to the greatest extent possible. Shrub removal shall be limited to crushing where necessary. Plants may be cut off at ground level, leaving roots undisturbed so that they may re-sprout.

2.9.3. Right-of-way clearing shall be kept to the minimum necessary to meet the requirements of the National Electric Safety Code. Trees to be saved within the clearing backlines and danger trees located outside the clearing backlines shall be marked. Clearing backlines in SENSITIVE AREAS will be indicated on plan and profile maps. All snags and old growth trees that do not endanger the line or maintenance equipment shall be preserved. In designated SENSITIVE AREAS, the STATE INSPECTOR shall approve clearing boundaries prior to clearing.

2.9.4. In no case should the entire nominal width of the right-of-way be cleared of trees up to the edge, unless approved by the STATE INSPECTOR and the LANDOWNER. Clearing should instead produce a "feathered edge" right-of-way configuration, where only specified hazard trees and those that interfere with construction or conductor clearance are removed. In areas where there is potential for long, tunnel views of transmission lines or access roads as identified in Appendix A, care shall be taken to screen the lines from view. For areas identified in Appendix A, a separating screen of vegetation shall be retained where the right-of-way parallels or crosses highways and rivers.

2.9.5. During construction, care will be taken to avoid damage to small trees and shrubs on the right-of-way that do not interfere with the clearing requirements under 2.9.3. and would not grow to create a hazard over a ten-year period.

2.9.6. Soil disturbance and earth moving will be kept to a minimum.

2.9.7. The OWNER shall be held liable for any unauthorized cutting, injury or destruction to timber whether such timber is on or off the right-of-way.

2.9.8. Unless otherwise requested by the LANDOWNER or managing agency, felling shall be directional in order to minimize damage to remaining trees. Maximum stump height shall be no more than 12 inches on the uphill side or 1/3 the tree diameter whichever is greater. Trees will not be pushed or pulled over. Stumps will not be removed unless they conflict with a structure, anchor, or roadway.

2.9.9. Special logging, clearing, or excavation techniques may be required in certain highly sensitive or fragile areas, as listed in Appendix A.

2.9.10. Crane landings shall be constructed on level ground unless extreme conditions (such as slope, soft, or marshy ground) make other construction necessary. In areas where more than one crane landing per tower site would be built, the STATE INSPECTOR will be notified at least 5 days prior to the beginning of construction at those sites.

2.9.11. No motorized travel on, scarification of, or displacement of talus slopes shall be allowed except where approved by the STATE INSPECTOR and LANDOWNER.

2.9.12. To avoid unnecessary ground disturbance, grounding wires or counterpoise should be placed or buried in disturbed areas whenever possible.

2.9.13. Slash resulting from project clearing that may be washed out by high water the following spring shall be removed and piled outside the floodplain before runoff. Instream slash resulting from project clearing must be removed within 24 hours.

2.9.14. Streamside trees will be felled away from streams rather than into or across streams.

2.10. GROUNDING

Grounding of fences, buildings, and other structures on and adjacent to the right-of-way shall be done according to the specifications of the National Electric Safety Code and any other specifications listed in Appendix G.

2.11. EROSION AND SEDIMENT CONTROL

2.11.1. Clearing and grubbing for roads and rights-of-way and excavations for stream crossings shall be carefully controlled to minimize silt or other water pollution downstream from the rights-of-way. At a minimum, erosion control measures described in the OWNER's Storm Water Control Plan shall be implemented. Sediment retention basins will be installed as required by the STATE INSPECTOR or managing agency.

2.11.2. Roads shall cross drainage bottoms at sharp or nearly right angles and level with the stream bed whenever possible. Temporary bridges, fords, culverts, or other structures will be installed to avoid stream bank damage.

2.11.3. Under no circumstances shall stream bed materials be removed for use as backfill, embankments, road surfacing, or for other construction purposes.

2.11.4. No excavations shall be allowed on any river or perennial stream channels or floodways at locations likely to cause detrimental erosion or offer a new channel to the river or stream at times of flooding.

2.11.5. Installation of transmission line structures, culverts, bridges, or other structures in or within 250 feet of perennial streams along with clearing on stream beds and banks will be done as specified by the STATE INSPECTOR following on-site inspections by DEQ, with the certificate holder, FWP, and local conservation districts invited to attend. All culverts shall be installed with the culvert inlet and outlet at natural stream grade or ground level.

2.11.6. Construction of transmission line structures, access roads, bridges, fill slopes, culverts, or impoundments, or channel changes within the high-water mark of any perennial stream, lake, or pond, requires consultation with FWP and the local conservation district and application of applicable water quality standards. Within 15 days prior to the start of construction, the OWNER shall submit written documentation that consultation has occurred. Included in this documentation should be the recommendation of the agencies consulted and the actions that OWNER expects to take to completely implement them.

2.11.7. No blasting shall be allowed in streams. Blasting may be allowed near streams if precautions are taken to protect the stream from debris and from entry of nitrates or other contaminants into the stream.

2.11.8. The OWNER shall maintain private roads while using them. All ruts made by machinery shall be filled or graded to prevent channeling. In addition, the OWNER must take measures to prevent the occurrence of erosion caused by wind or water during and after use of these roads. Some erosion-preventive measures include but are not limited to, installing or using cross-logs, drain ditches, water bars, and wind erosion inhibitors such as water, straw, gravel, or combinations of these. Erosion control shall be accomplished as described in the Montana Pollution Discharge Elimination System (MPDES) General Permit for Storm Water Discharges Associated with Construction Activity.

2.11.9. The OWNER shall prevent material from being deposited in any watercourse or stream channel. Where necessary, measures such as hauling of fill material, construction of temporary barriers, or other approved methods shall be used to keep excavated materials and other extraneous materials out of watercourses. Any such materials entering watercourses shall be removed immediately.

2.11.10. The OWNER shall be responsible for the stability of all embankments created during construction. Embankments and backfills shall contain no stream sediments, frozen material, large roots, sod, or other materials that may reduce their stability.

2.11.11. Culverts, arch bridges, or other stream crossing structures shall be installed at all permanent crossings of flowing or dry watercourses where fill is likely to wash out during the life of the road. Culvert or bridge installation is prohibited in areas of important fish spawning beds identified by FWP and during specified fish spawning seasons on less sensitive streams or rivers. All culverts shall be large enough to handle approximately 15-year floods. Culvert size shall be determined by standard procedures taking into account the variations in vegetation and climatic zones in Montana, the amount of fill, and the drainage area above the crossing, and shall be approved as specified in 2.11.6. All culverts shall be installed at the time of road construction and maintained for the life of the project. The areas where stream-crossing measures must be taken are listed in Appendix H.

2.11.12. No fill material other than that necessary for road construction shall be piled within the high water zone of streams where floods can transport it directly into the stream. Excess floatable debris shall be removed from areas immediately above crossings to prevent obstruction of culverts or bridges during periods of high water.

2.11.13. No skidding of logs or driving of vehicles across a perennial watercourse shall be allowed, except via authorized construction roads.

2.11.14. No perennial watercourses shall be permanently blocked or diverted.

2.11.15. Skidding with tractors shall not be permitted within 100 feet of streams containing flowing water except in places designated in advance, and in no event shall skid roads be located on these stream courses. Skid trails shall be located high enough out of draws, swales, and valley bottoms to permit diversion of runoff water to natural undisturbed forest ground cover.

2.11.16. Construction methods shall prevent accidental spillage of solid matter, contaminants, debris, petroleum products, and other objectionable pollutants and wastes into watercourses, lakes, and underground water sources. Secondary containment catchment basins capable of containing the maximum accidental spill shall be installed at areas where fuel, chemicals or oil are stored. Any accidental spills of such materials shall be cleaned up immediately.

2.11.17. To reduce the amount of sediment entering streams, a strip of undisturbed vegetation will be provided between areas of disturbance (road construction or tower construction) and stream courses, and around first order or larger streams that have a well-defined stream course or aquatic or riparian vegetation, unless otherwise required by the LANDOWNER. Buffer strip width is measured from the high water line of a channel and will be determined by the STATE INSPECTOR and managing agency. When braided streams with more than one discernible channel (ephemeral or permanent) are encountered, the high water line of the outermost channel shall be used. In the event that vegetation cannot be left undisturbed, structural sediment containment, approved by the STATE INSPECTOR, must be substituted before soil-disturbing activity commences.

2.11.18. When no longer needed, all temporary structures or fill installed to aid stream crossing shall be removed and the course of the stream reestablished to prevent future erosion.

2.11.19. All temporary dams built on the right-of-way shall be removed after line construction unless otherwise approved by the STATE INSPECTOR. Dams allowed to remain shall be upgraded to permanent structures and shall be provided with spillways or culverts, a continuous sod cover on their tops, and downstream slopes meeting dam safety standards. Spillways may be protected against erosion with riprap or equivalent means.

2.11.20. Damage resulting from erosion or other causes shall be repaired after completion of grading and before revegetation is begun.

2.11.21. Point discharge of water will be dispersed in a manner to avoid erosion or sedimentation of streams as required in DEQ permits.

2.11.22. Riprap or other erosion control activities will be planned based on possible downstream consequences of activity, and installed during the low flow season if possible.

2.11.23. Water used in embankment material processing, aggregate processing, concrete curing, foundation and concrete lift cleanup, and other wastewater processes shall not be discharged into surface waters without a valid discharge permit from DEQ.

2.12. ARCHAEOLOGICAL, HISTORICAL AND PALEONTOLOGICAL RESOURCES

2.12.1. All construction activities shall be conducted so as to prevent damage to significant archaeological, historical, or paleontological resources, in accordance with the requirements of 1.4.1 and Appendix I.

2.12.2. Any relics, artifacts, fossils or other items of historical, paleontological, or archaeological value shall be preserved in a manner acceptable to both the LANDOWNER and the State Historic Preservation Officer. If any such items are discovered during construction, SHPO shall be notified immediately. Work that could disturb the materials or surrounding area must cease until the site can be properly evaluated by a qualified archaeologist (either employed by the

OWNER, managing agency or representing SHPO) and recommendations made by that person based on the Historic Preservation Plan outlined in Appendix I (but in no case more than 10 days). For significant sites, the OWNER must follow recommendations of SHPO.

2.12.3. The OWNER shall conform to treatments recommended for cultural resources by either SHPO or the Advisory Council on Historic Preservation (ACHP).

2.13. PREVENTION AND CONTROL OF FIRES

2.13.1. Burning, fire prevention, and fire control shall comply with the burning plan and fire plan in Appendix J. These plans shall meet the requirements of the managing agency and/or the fire control agencies having jurisdiction. The STATE INSPECTOR shall be invited to attend all meetings with these agencies to discuss or prepare these plans. The STATE INSPECTOR, in turn, shall notify DNRC of all such meetings.

2.13.2. The OWNER shall direct the CONTRACTOR to comply with regulations of any county, town, state or governing municipality having jurisdiction regarding fire laws and regulations.

2.13.3. Blasting caps, powder, and other explosives shall be stored only in approved areas and containers and always separate from each other.

2.13.4. The OWNER shall direct the CONTRACTOR to properly store and handle combustible material that could create objectionable smoke, odors, or fumes. The OWNER shall direct the CONTRACTOR not to burn refuse such as trash, rags, tires, plastics, or other debris, except as permitted by the county, town, state, or governing municipality having jurisdiction.

2.14. WASTE DISPOSAL

2.14.1. The OWNER shall direct the CONTRACTOR to use licensed solid waste disposal sites. Inert materials (Group III wastes) may be disposed of at licensed Class III landfill sites; mixed refuse (Group II wastes) must be disposed of at licensed Class II landfill sites.

2.14.2. Emptied pesticide containers or other chemical containers must be triple rinsed to render them acceptable for disposal in Class II landfills or for scrap recycling pursuant to ARM 17.54.201 for treatment or disposal. Pesticide residue and pesticide containers shall be disposed of in accordance with ARM 17.30.637.

2.14.3. All waste materials constituting a hazardous waste defined in ARM 16.44.303, and wastes containing any concentration of polychlorinated biphenyls must be transported to an approved designated hazardous waste management facility (as defined in ARM 17.53.201) for treatment or disposal.

2.14.4. All used oil shall be hauled away and recycled or disposed of in a licensed Class II landfill authorized to accept liquid wastes or in accordance with 2.14.2 and 2.14.3 above. There shall be no intentional release of crankcase oil or other toxic substances into streams or soil. In the event of an accidental spill into a waterway, the substances will be cleaned up and the STATE INSPECTOR will be contacted immediately. Any spill of refined petroleum products greater than 25 gallons must be reported to the State at Disaster and Emergency Services at 406-841-03911.

2.14.5. Sewage shall not be discharged into streams or streambeds. The OWNER shall direct the CONTRACTOR to provide refuse containers and sanitary chemical toilets, convenient to all principal points of operation. These facilities shall comply with applicable federal, state, and local health laws and regulations. A septic tank pump licensed by the State shall service these facilities.

2.14.6. In order to reduce fire hazard, small trees and brush cut during construction should be chipped, burned, and/or scattered. Slash 3 inches in diameter or greater may be scattered in quantities of up to 15 tons/acre unless otherwise requested by the LANDOWNER. Tops, limbs and brush less than 3 inches in diameter and 3 feet in length may be left in quantities less than 3 tons per acre except on cropland and residential land or where otherwise specified by the LANDOWNER. In certain cases the STATE INSPECTOR will authorize chipping and scattering of tops, limbs and brush in excess of 3 tons per acre as an erosion control measure. Merchantable timber should be decked and removed at the direction of the LANDOWNER or managing agency

2.14.7. Refuse burning shall require the prior approval of the LANDOWNER and a Montana Open Burning Permit must be obtained from DEQ. Any burning of wastes shall comply with section 2.13 of these specifications.

2.15. SPECIAL MEASURES

2.15.1. Poles with a low reflectivity constant should be used to reduce potential for visual contrast.

2.15.2. At river crossings, strategic placement of structures should be done both as a means to screen views of the transmission line and right-of-way and to minimize the need for vegetative clearing. Crossings of rivers should be designed to avoid diagonal crossings.

3.0 POST-CONSTRUCTION CLEANUP AND RECLAMATION

3.1. CLEANUP

3.1.1. All litter resulting from construction is to be removed from the right-of-way and along access roads leading to the right-of-way. Such litter shall be legally disposed of as soon as possible, but in no case later than 60 days following completion of wire clipping. If requested by the LANDOWNER, the OWNER shall provide for removal of any additional construction-related debris discovered after this initial cleanup.

3.1.2. Insofar as practical, all signs of temporary construction facilities such as haul roads, work areas, buildings, foundations or temporary structures, soil stockpiles, excess or waste materials, or any other vestiges of construction shall be removed and the areas restored to as natural a condition as practical, in consultation with the LANDOWNER.

3.2. RESTORATION, RECLAMATION, AND REVEGETATION

3.2.1 Restoration, reclamation, and revegetation of the right-of-way, access roads, crane pads, splicing or stringing sites, borrow sites, gravel fill, stone, or aggregate excavation, or any other disturbance shall be in accordance with the reclamation and revegetation plan (Appendix K). The OWNER may choose to develop this plan in consultation with appropriate land management agencies as part of easement negotiations. In this case, the OWNER shall provide written documentation of consultation with those agencies and a copy of the agreed-to plan. This plan and any conditions to the Certificate approved by DEQ shall be attached as Appendix K.

3.2.2. Scarring or damage to any landscape feature listed in Appendix A shall be restored as nearly as practical to its original condition. Bare areas created by construction activities will be reseeded in compliance with Appendices K and L to prevent soil erosion.

3.2.3. After construction is complete, and in cooperation with the LANDOWNER, temporary roads shall be closed.

3.2.4. In agricultural areas where soil has been compacted by movement of construction equipment and unless otherwise specified by the LANDOWNER, the OWNER shall direct the CONTRACTOR to rip the soil deep enough to restore productivity, or if complete restoration is not possible, the OWNER shall compensate the LANDOWNER for lost productivity.

3.2.5. Earth next to access roads that cross streams shall be replaced at slopes less than the normal angle of repose for the soil type involved.

3.2.6. All drainage channels shall be restored to a gradient and width that will prevent accelerated gully erosion.

3.2.6. Drive-through dips, open-top box culverts, waterbars, or cross drains shall be added to roads at the proper spacing and angle as necessary to prevent erosion.

3.2.7. Interrupted drainage systems shall be restored.

3.2.8. Sidecasting of waste materials may be allowed on slopes over 40 percent after approval by the LANDOWNER, however, this will not be allowed within the buffer strip established for stream courses, in areas of high or extreme soil instability, or in other SENSITIVE AREAS identified in Appendix A. Surplus materials shall be hauled to LANDOWNER-approved sites in such areas.

3.2.9. Seeding prescriptions to be used in revegetation, requirements for hydroseeding, fertilizing, and mulching, as jointly determined by representatives of the OWNER, DEQ, and other involved state and federal agencies, are specified in Appendix L.

3.2.10. Piling and windrowing of material for burning shall use methods that will prevent significant amounts of soil from being included in the material to be burned and minimize destruction of ground cover. Non-mechanized methods are recommended if necessary to minimize soil erosion and vegetation disturbance. Piles shall be located so as to minimize danger to timber and damage to ground cover when burned.

3.2.11. During restoration in areas where topsoil has been stockpiled, the site will be graded to near natural contours and the topsoil will be replaced on the surface.

3.2.12. Excavated material not suitable or required for backfill shall be evenly filled back onto the cleared area prior to spreading any stockpiled soil. Large rocks and boulders uncovered during excavation and not buried in the backfill will be disposed of as approved by the STATE INSPECTOR and/or LANDOWNER.

3.2.13. Application rates and timing of seeds and fertilizer, and purity and germination rates of seed mixtures, shall be as determined in consultation with DEQ. Reseeding shall be done at the first appropriate opportunity after construction ends.

3.2.14. Where appropriate, hydro seeding, drilling, or other appropriate methods shall be used to aid revegetation. Mulching with straw, wood chips, or other means shall be used where necessary. Areas requiring such treatment are listed in Appendix L.

3.2.15. All temporary roads shall be obliterated and reclaimed (with the concurrence of the LANDOWNER), as specified in Appendix M. All temporary roadways shall be graded and scarified as specified to permit the growth of vegetation and to discourage traffic. Permanent unsurfaced roadbeds not open to public use will be revegetated as soon after use as possible unless specified otherwise by the LANDOWNER.

3.3. MONITORING

3.3.1. Upon notice by the OWNER, the STATE INSPECTOR will schedule initial post-construction field inspections following cleanup and road closure. Follow-up visits will be scheduled as required to monitor the effectiveness of erosion controls, reseeding measures, and the right-of-way management plan (Appendix N). The STATE INSPECTOR will contact the LANDOWNER for post-construction access and to determine LANDOWNER satisfaction with the OWNER's restoration measures.

3.3.2. The STATE INSPECTOR shall document observations for inclusion in monitoring reports regarding bond release or the success of mitigating measures required by DEQ.

3.3.2. Failure of the OWNER to adequately reclaim all disturbed areas in accordance with section 3.2 and ARM 17.20.1902(10) shall be cause for forfeiture of the reclamation BOND(s) or penalties described in Section 0.3. Success of revegetation shall be based on criteria specified in ARM 17.20.1902(10). Failure of the OWNER to achieve adequate revegetation of disturbed areas may be cause for forfeiture of the revegetation BOND(s) or penalties described in Section 0.3.

4.0. OPERATION AND MAINTENANCE

4.1. RIGHT-OF-WAY MANAGEMENT AND ROAD MAINTENANCE

4.1.1. Maintenance of the right-of-way and permanent access roads shall be as specified in the right-of-way management plan (Appendix N). This plan shall provide for the protection of SENSITIVE AREAS identified prior to and during construction as well as control of erosion on permanent access roads.

4.1.2. Vegetation that has been saved through the construction process and which does not pose a hazard or potential hazard to the transmission line, particularly that of value to fish and wildlife as specified in Appendix A, shall be allowed to grow on the right-of-way.

4.1.3. Vegetative cover adjacent to the transmission line in areas other than cropland shall be maintained in cooperation with the LANDOWNER.

4.1.4. Grass cover, water bars, cross drains, the proper slope, and other agreed to measures shall be maintained on permanent access roads and service roads in order to prevent soil erosion.

4.2. MAINTENANCE INSPECTIONS

4.2.1. The OWNER shall have responsibility to correct soil erosion, noxious weed, or revegetation problems on the right-of-way or access roads as they become known. Appropriate corrective action will be taken where necessary. The OWNER, through agreement with the LANDOWNER or managing agency, may provide a mechanism to identify and correct such problems but the OWNER is responsible for correcting these problems.

4.2.2. Operation and maintenance inspections using ground vehicles shall be timed so that routine maintenance will be done when access roads are firm, dry, or frozen, wherever possible. Maintenance vegetative clearing shall be done according to criteria spelled out in Appendix N.

4.3. CORRECTION OF LANDOWNER PROBLEMS

4.3.1. When the facility causes interference with radio, TV, or other stationary communication systems after the facility is operating, the OWNER will correct the interference with mechanical corrections to facility hardware, or antennas, or will install remote antennas or repeater stations, or will use other reasonable means to correct the problem.

4.3.2. The OWNER will respond to complaints of interference by investigating complaints to determine the origin of the interference. If the interference is not caused by the facility, the OWNER shall so inform the person bringing the complaint. The OWNER shall provide the STATE INSPECTOR with documentation of the evidence regarding the source of the interference if the person brings the complaint to the STATE INSPECTOR or DEQ.

4.4. HERBICIDES AND WEED CONTROL

4.4.1. Weed control, including any application of herbicides in the right-of-way, will be done by applicators currently licensed in Montana and in accordance with recommendations of the Montana Department of Agriculture, and in accordance with the right-of-way maintenance plan in Appendix N.

4.4.2. Herbicides will not be used in certain areas identified by DEQ and FWP, as listed in Appendix O or as requested by the LANDOWNER.

4.4.3. Proper herbicide application methods will be used to keep drift and nontarget damage to a minimum.

4.4.4. Herbicides must be applied according to label specifications and in accordance with 4.4.1 above. Only herbicides registered in compliance with applicable federal and state laws may be applied.

4.4.5. Herbicides shall not be sprayed during heavy rains or threat of heavy rains. Vegetation buffer zones shall be left along all identifiable stream channels. Herbicides shall not be used in any public water supply watershed identified by DEQ.

4.4.6. In areas disturbed by the transmission line, the OWNER will cooperate with LANDOWNERs in control of noxious weeds as designated by the weed control board having jurisdiction in the county crossed by the line.

4.4.6. The OWNER shall notify the STATE INSPECTOR in writing 30 days prior to any broadcast or aerial spraying of herbicides. The notice shall provide details as to the time, place, and justification for such spraying. DEQ, FWP, and the Montana Department of Agriculture shall have the opportunity to inspect the portion of the right-of-way or access roads before, during, and after spraying.

4.4.7. During the second and third growing seasons following the completion of restoration and reseeding, the OWNER and STATE INSPECTOR shall inspect the right-of-way and access roads for newly established stands of noxious weeds. The county weed control supervisor shall be invited to attend this inspection. In the event that stands of weeds are encountered, the OWNER shall take appropriate control measures.

4.5. MONITORING

4.5.1. DEQ may continue to monitor operation and maintenance activities for the life of the project in order to ensure compliance with the specifications in this section (see Appendix Q).

4.5.2. The OWNER will be responsible to DEQ for the term of the reclamation BOND (Section 0.8). Following BOND release, the OWNER will report to individual LANDOWNERs and managing agencies except as specified in conditions to the certificate.

4.5.3. Upon reasonable complaint from an affected LANDOWNER or managing agency, DEQ may require the OWNER to fund additional monitoring efforts to resolve problems that develop after release of the BONDs. Such efforts would be limited to determining compliance with these specifications and other conditions of the Certificate.

5.0 ABANDONMENT

When the transmission line is no longer used or useful, structures including poles, guy wires, and footings; conductors; and ground wires shall be removed and disturbed areas reclaimed using methods outlined in Appendix K.

APPENDICES

APPENDIX A: SENSITIVE AREAS FOR THE MATL TRANSMISSION LINE PROJECT

The following sensitive areas have been identified where special measures would be implemented to reduce impacts:

Land Use/Infrastructure

To minimize impacts to farming, DEQ could require the use of monopoles in the following sensitive areas to reduce impacts associated with crossing of farmland where routing around this farmland would be difficult, where the proposed transmission line would closely parallel an existing power line, and near substations where transmission lines converge:

Alternative 2 between mileposts 0 and 1.13, 1.35 and 1.85; irrigated cropland between mileposts 69.58 and 69.79, 69.81 and 70.72, 85.32 and 85.46; local routing options where the line would diagonally cross crop and CRP land; Belgian Hill Local Routing Option (1.56 miles), and 54.9 miles of land where the line would diagonally cross crop and CRP land.

Alternative 3 between mileposts 0.79 and 2.32.

Alternative 4 on all crop and CRP lands plus crop and CRP lands along the following local routing options: the selected Diamond Valley Local Routing Option (South, Middle, or North), Teton River Crossing, Belgian Hill Local Routing Option (1.0 mile), Bullhead Coulee South, and Bullhead Coulee North.

Geological/Soils

Black Horse Lake

Alternatives 2 and 3 at milepost 4.35 to 4.52 the alignment would be widened an additional 500 feet further south to allow flexibility in pole placement that would avoid an area occasionally flooded by Black Horse Lake.

Teton River Crossing Area

Precision mapping for unstable soils would be conducted along the alignment between the milepost markers identified below:

Alternative 2 between mileposts 35.3 and 35.8, 36.2 and 36.6, 36.9 and 37.4, and between mileposts 38 and 40

Alternative 3 between mileposts 32.3 and 32.7, 33.08 and 33.47, and between mileposts 33.8 and 34.0 (where a landslide is crossed)

Alternative 4 between mileposts 36.18 and 36.7, 37.27 and 37.55, 37.9 and 38.4, and between mileposts 39.08 and 41.15

On Alternative 2 the alignment would be narrowed south of the river to avoid a landslide and north of the river would be widened by an additional 250 feet north of the centerline between mileposts 38 and 40 to avoid areas of slope instability in this area. A similar measure would be applied should Alternative 4 be selected.

Dry Fork of Marias River Crossing

Alternative 4 between mileposts 69.8 and 70.2, 70.5 and 70.8, 71.1 and 71.4, 71.65 and 72.8, 73.7 and 73.75, 75.1 and 75.7, 76.1 and 76.4, 77.05 and 77.4, 77.7 and 78.05, 80.15 and 81.15, 81.35 and 81.9:

The alignment would be widened to 1000 feet except on cultivated land to allow flexibility in pole placement should new cultural resource sites be encountered. Precision mapping for unstable soils should be conducted along the alignment between the milepost markers identified above. Structures and roads would be located to avoid unstable slopes. If cultural resource sites are encountered and the alignment moved, additional mapping of unstable soils would be required.

Marias River Crossing Area

Alternative 2 between mileposts 88.75 and 88.82, 89.1 and 89.4, 89.8 and 90.0, 90.35 and 90.72

Alternative 3 between mileposts 84.3 and 84.65, 84.78 and 84.95, 85.4 and 85.8

Alternative 4 between mileposts 95.2 and 97.1:

Precision mapping for unstable soils must be conducted along the alignment between the milepost markers identified above.

<u>Wildlife</u>

On the selected alternative, areas of native vegetation that have not been surveyed for grouse leks would be surveyed prior to construction. Construction would not occur during the breeding season from April to Mid-June within 2 miles of active leks. Anti - perching devices would be installed and maintained on structures within 2 miles of leks.

Overhead ground wires would be marked in the following areas within 2 miles of leks to reduce the potential for avian collisions with the transmission line:

Alternative 2 between mileposts 85.7 and 92

Alternative 3 between mileposts 81 and 87

Alternative 4 between mileposts 9.5 and 10.5 and 95.5 and 101.5

Overhead ground wires near wetlands would be marked to reduce the potential for collisions after inspection and field verification of the need for marking by FWP and FWS biologists.

Cultural Resources

Cultural resource surveys would be completed along unsurveyed areas with a high probability of discovering new sites. If cultural resource sites are discovered, structure locations and access routes would be modified to avoid sensitive features or the site recorded.

A professional archeologist would observe construction in high probability areas listed below during pole placement. If cultural resources are discovered during excavation, construction would be temporarily halted while the OWNER completes recovery of artifacts. Artifacts are the property of the LANDOWNER.

Wetlands

MATL would delineate wetlands within 500 feet of the alignment of the approved alternative for the portion through Teton County where wetlands have not been mapped by the USFWS.

Alternative 2 between mileposts 23 and 35

Alternative 3 between mileposts 17 and 42

Alternative 4 between mileposts 23 and 48

Vegetation

MATL would avoid placing roads and poles in designated 100 year floodplains.

Additional areas for monitoring or for application of mitigation measures may be identified following the pre-construction monitoring trip by the State Inspector or the Inspector's designee.

APPENDIX B: PERFORMANCE BOND SPECIFICATIONS

Construction and reclamation bonds shall be used to ensure performance with these specifications. Bond amounts are as follows:

Construction bond:

Reclamation bond:

Bonds shall be held and released as provided in ARM 17.20.1902 (6) and (9)- (12).

Appendix C: Variations In Right-of-Way Width

See Appendix A for variations in right-of way widths.

DEQ does not recommend specific widths for construction easements. In accordance with the specifications, construction activities shall be contained in the minimum area necessary for safe and prudent construction.

DEQ does not recommend specific variations in right-of-way widths beyond those required to meet the National Electric Safety Code for electric transmission line operations and those necessary to meet standards established in ARM 17.20.1607(2).

Appendix D: Areas Where Construction Timing Restrictions Apply

Except for those areas described in Appendix A, no restrictions in the timing of construction are recommended, beyond those considered necessary on the basis of on-site inspections of stream crossings required in Section 2.11.6 of these specifications and in other sections of these specifications, or as negotiated by LANDOWNERs in individual easement agreements.

Appendix E: Aeronautical Hazard Markings

For all alternatives, the OWNER would install FAA-recommended aerial markers for aviation safety, as well as at crossings of the Conoco pipeline and crossings of the Cenex pipeline.

For all alternatives, the OWNER would install FAA-recommended aerial markers to make the line more visible to low flying aircraft at crossings of Interstate 15 and U.S. Highways 87 and 2. Marker balls would also be placed at all river crossings.

Appendix F: Noxious Weed Areas

Presence of noxious weed areas will be determined during a joint inspection by the OWNER, affected weed control boards, and LANDOWNERs. Weeds will be controlled as directed by county Noxious Weed Control programs, state law, and these Environmental Specifications.

Appendix G: Grounding Specifications

Power lines, fences, and pipelines shall be grounded in accordance with the National Electrical Safety Code. The OWNER shall ensure that operation of the transmission line does not interfere with operation of cathodic protection systems of any pipelines crossed or paralleled.

Appendix H: Culvert and Bridge Requirements

It does not appear that new culverts or bridges will be needed during construction. In the event a culvert or bridge is needed, it shall be installed to the standards set forth in Section 2.11.11 of the specifications and following review of the proposed installation by the STATE INSPECTOR. The STATE INSPECTOR may require site specific measures to reduce impacts.

Appendix I: Historic Preservation Plan

The OWNER, in consultation with SHPO, shall develop a plan for identification and treatment of historical or archaeological sites affected by construction. Copies of these plans shall be part of this Appendix. The plan shall identify proposed treatments to be employed to avoid, mitigate or offset project effects on cultural resource sites or culturally significant tribal resources as agreed to by SHPO.

Appendix J: Burning Plan and Fire Plan

The need for a detailed burning or fire plan is not anticipated for this project. In the event that burning is required prior to or during construction, such burning shall occur in accordance with Sections 0.5, 2.13, and 2.14 of the specifications.

Appendix K: Reclamation and Revegetation Plan

At least 30 days prior to the start of construction, a reclamation and revegetation plan must be developed and submitted to DEQ for approval. This plan must, at a minimum, specify seeding mixtures, rates, seeding methods and timing of seeding. It must address LANDOWNER wishes, and satisfy requirements of the MPDES General Permit for Storm Water Discharges Associated with Construction Activity and ARM 17.20.1902(10).

The reclamation and revegetation plans must be structured to comply with ARM 17.20.1902 (6) and (9)-(12).

Appendix L: Areas Where Stockpiling of Topsoil, Hydro Seeding, Fertilizing, or Mulching is Required

At each area where cut and fill would be necessary to construct a road or crane pad, the OWNER shall salvage and stockpile topsoil, and spread the topsoil over disturbed areas following construction to increase re-vegetation success.

Appendix M: Roads to be Closed and/or Obliterated

If permanent roads are necessary for construction or maintenance of the project, the OWNER shall close or obliterate the roads during decommissioning as requested by the LANDOWNER.

Appendix N: Right-of-Way Management Plan

DEQ does not recommend a specific right-of-way management plan. To the extent possible, all maintenance and operation activities shall be performed to comply with the requirements of the environmental specifications.

Appendix O: Watersheds and Other Areas Where Herbicides are Prohibited

DEQ does not recommend any areas or watersheds where herbicide use is prohibited. Herbicide use shall conform to all applicable local, state, and federal restrictions.

Appendix P: Name and Address of State Inspector

STATE INSPECTOR OWNER'S LIAISON

Environmental Science Specialist
Montana Dept of Environmental Quality
P.O. Box 200901
1520 East Sixth Avenue
Helena, Montana 59620-0901
(406) 444-_____

Appendix Q: Monitoring Plan

The STATE INSPECTOR is responsible for implementing this monitoring plan required by 75-20-303(b) and (c), MCA, and for reporting whether terms of the Certificate of Compliance and Environmental Specifications are being met, along with any conditions in the Stormwater Discharge permit and state land easements. The STATE INSPECTOR may identify additional mitigating measures in order to minimize environmental damage due to unique circumstances that arise during construction. These measures will be presented in writing to the OWNER's Liaison who will see that such measures are implemented in a timely manner.

Within 60 days of the completion of construction the STATE INSPECTOR shall review the project area for adequate cleanup, restoration of compacted soils, any necessary earthwork, and repair of damaged property. The STATE INSPECTOR shall notify the OWNER of additional construction cleanup and restoration of disturbed areas. Once the area is restored and revegetated, the bond or bonds shall be released as indicated in ARM 17.20.1902(6) and (9)-(12).

In the growing season following construction the STATE INSPECTOR will determine the adequacy of erosion controls, check for successful seed germination, and determine in conjunction with county weed supervisors areas where weed control would be necessary.

After one and five complete growing seasons following construction, the STATE INSPECTOR will determine whether revegetation efforts have been sufficient to meet the requirements of Appendix K of these Environmental Specifications. If revegetation is not adequate to meet the requirements of Appendix K, the STATE INSPECTOR shall determine whether it is in the best interest of the State to seize the BOND or BONDs and reclaim and revegetate remaining disturbed areas or to continue to monitor these areas. The STATE INSPECTOR shall respond to complaints from citizens for the life of the project.

When violations of the Certificate are identified, the STATE INSPECTOR shall report the violation in writing to the OWNER, who shall immediately take corrective action. If violations continue, penalties described in 75-20-408, MCA may be imposed.

APPENDIX H:
LAND USE TYPES BY MILEPOST

The following tables provide a breakdown of land uses along the alignments analyzed in the EIS. Mile posts run from south to north. The analysis was done with GIS based on photo interpretation of the land uses.

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.827	0.827	**Non-Irrigated**
0.827	0.865	0.038	**ROW**
0.865	1.142	0.277	**Non-Irrigated**
1.142	1.179	0.036	**Riparian**
1.179	1.358	0.180	**Rangeland/Native**
1.358	1.836	0.477	**Non-Irrigated**
1.836	2.800	0.964	**ROW**
2.800	3.770	0.971	**Non-Irrigated**
3.770	3.798	0.028	**ROW**
3.798	3.930	0.132	**Rangeland/Native**
3.930	4.471	0.541	**Non-Irrigated**
4.471	5.000	0.528	**Rangeland/Native**
5.000	5.044	0.044	**ROW**
5.044	5.490	0.446	**Rangeland/Native**
5.490	5.503	0.014	**ROW**
5.503	5.647	0.144	**Rangeland/Native**
5.647	5.654	0.007	**ROW**
5.654	5.756	0.102	**Rangeland/Native**
5.756	5.769	0.013	**ROW**
5.769	6.140	0.371	**Rangeland/Native**
6.140	6.450	0.310	**Non-Irrigated**
6.450	6.922	0.472	**Rangeland/Native**
6.922	11.329	4.406	**Non-Irrigated**
11.329	11.358	0.029	**ROW**
11.358	15.098	3.740	**Non-Irrigated**
15.098	15.125	0.027	**Rangeland/Native**
15.125	15.503	0.378	**Non-Irrigated**
15.503	15.508	0.005	**ROW**
15.508	15.960	0.451	**Non-Irrigated**
15.960	15.962	0.003	**ROW**
15.962	16.720	0.758	**Non-Irrigated**
16.720	16.725	0.005	**ROW**
16.725	17.639	0.914	**Non-Irrigated**
17.639	17.799	0.160	**Rangeland/Native**
17.799	18.197	0.398	**Non-Irrigated**
18.197	18.625	0.428	**Rangeland/Native**
18.625	18.637	0.012	**ROW**
18.637	19.550	0.913	**Rangeland/Native**
19.550	19.569	0.019	**ROW**
19.569	19.644	0.075	**Rangeland/Native**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
19.644	19.730	0.085	**Non-Irrigated**
19.730	19.741	0.011	**ROW**
19.741	21.662	1.921	**Rangeland/Native**
21.662	22.034	0.372	**Non-Irrigated**
22.034	22.050	0.016	**ROW**
22.050	22.585	0.536	**Non-Irrigated**
22.585	23.329	0.744	**Rangeland/Native**
23.329	23.347	0.018	**ROW**
23.347	23.824	0.477	**Rangeland/Native**
23.824	24.340	0.516	**Non-Irrigated**
24.340	24.348	0.009	**ROW**
24.348	25.338	0.990	**Non-Irrigated**
25.338	25.406	0.067	**Rangeland/Native**
25.406	25.784	0.378	**Non-Irrigated**
25.784	25.881	0.097	**Rangeland/Native**
25.881	27.750	1.869	**Non-Irrigated**
27.750	27.774	0.025	**ROW**
27.774	28.710	0.936	**Non-Irrigated**
28.710	28.738	0.028	**Riparian**
28.738	29.656	0.918	**Non-Irrigated**
29.656	29.703	0.047	**Rangeland/Native**
29.703	29.752	0.048	**Non-Irrigated**
29.752	29.789	0.037	**ROW**
29.789	29.975	0.186	**Non-Irrigated**
29.975	30.072	0.097	**Rangeland/Native**
30.072	30.498	0.427	**Non-Irrigated**
30.498	30.561	0.063	**Rangeland/Native**
30.561	31.442	0.881	**Non-Irrigated**
31.442	31.476	0.034	**Rangeland/Native**
31.476	31.492	0.016	**Riparian**
31.492	31.528	0.037	**Rangeland/Native**
31.528	31.719	0.191	**Non-Irrigated**
31.719	31.729	0.010	**ROW**
31.729	31.750	0.020	**Non-Irrigated**
31.750	31.756	0.007	**ROW**
31.756	31.934	0.178	**Non-Irrigated**
31.934	31.954	0.020	**Rangeland/Native**
31.954	33.588	1.634	**Non-Irrigated**
33.588	33.754	0.166	**Riparian**
33.754	34.135	0.381	**Non-Irrigated**
34.135	34.152	0.017	**ROW**
34.152	35.342	1.190	**Non-Irrigated**
35.342	35.562	0.220	**Rangeland/Native**
35.562	35.594	0.031	**Riparian**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
35.594	35.678	0.084	**Rangeland/Native**
35.678	35.838	0.160	**Non-Irrigated**
35.838	35.848	0.011	**Rangeland/Native**
35.848	36.097	0.249	**Non-Irrigated**
36.097	36.102	0.005	**ROW**
36.102	36.339	0.237	**Non-Irrigated**
36.339	36.388	0.049	**Rangeland/Native**
36.388	36.395	0.007	**Riparian**
36.395	36.561	0.166	**Rangeland/Native**
36.561	37.023	0.463	**Non-Irrigated**
37.023	37.237	0.214	**Rangeland/Native**
37.237	37.339	0.102	**Non-Irrigated**
37.339	37.369	0.030	**Rangeland/Native**
37.369	37.443	0.074	**Riparian**
37.443	37.452	0.010	**Rangeland/Native**
37.452	37.985	0.532	**Non-Irrigated**
37.985	38.335	0.350	**Rangeland/Native**
38.335	38.620	0.286	**Non-Irrigated**
38.620	39.053	0.432	**Rangeland/Native**
39.053	39.208	0.155	**Non-Irrigated**
39.208	39.275	0.067	**Rangeland/Native**
39.275	39.522	0.247	**Non-Irrigated**
39.522	39.838	0.317	**Rangeland/Native**
39.838	40.866	1.028	**Non-Irrigated**
40.866	40.881	0.015	**ROW**
40.881	41.158	0.277	**Non-Irrigated**
41.158	41.173	0.015	**ROW**
41.173	45.128	3.954	**Non-Irrigated**
45.128	45.141	0.013	**ROW**
45.141	45.250	0.109	**Non-Irrigated**
45.250	45.269	0.019	**ROW**
45.269	47.518	2.249	**Non-Irrigated**
47.518	47.543	0.025	**Riparian**
47.543	48.056	0.513	**Non-Irrigated**
48.056	48.142	0.087	**Rangeland/Native**
48.142	48.451	0.309	**Non-Irrigated**
48.451	48.465	0.013	**Riparian**
48.465	48.476	0.011	**ROW**
48.476	48.490	0.014	**Riparian**
48.490	48.499	0.009	**ROW**
48.499	49.161	0.662	**Non-Irrigated**
49.161	49.173	0.012	**ROW**
49.173	50.864	1.691	**Non-Irrigated**
50.864	50.885	0.020	**ROW**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
50.885	51.120	0.235	**Non-Irrigated**
51.120	51.170	0.051	**Riparian**
51.170	51.759	0.589	**Non-Irrigated**
51.759	51.833	0.074	**Rangeland/Native**
51.833	52.229	0.396	**Non-Irrigated**
52.229	52.249	0.020	**ROW**
52.249	52.748	0.499	**Non-Irrigated**
52.748	52.820	0.071	**Rangeland/Native**
52.820	52.883	0.064	**ROW**
52.883	53.043	0.160	**Rangeland/Native**
53.043	53.331	0.288	**Non-Irrigated**
53.331	53.723	0.392	**Rangeland/Native**
53.723	53.774	0.051	**Non-Irrigated**
53.774	53.803	0.028	**Rangeland/Native**
53.803	53.870	0.068	**Non-Irrigated**
53.870	53.912	0.042	**Riparian**
53.912	53.936	0.024	**Non-Irrigated**
53.936	53.983	0.046	**Riparian**
53.983	55.399	1.416	**Non-Irrigated**
55.399	55.425	0.026	**ROW**
55.425	55.906	0.481	**Non-Irrigated**
55.906	56.305	0.399	**Rangeland/Native**
56.305	56.347	0.042	**ROW**
56.347	56.536	0.189	**Non-Irrigated**
56.536	56.815	0.279	**Rangeland/Native**
56.815	56.857	0.042	**Non-Irrigated**
56.857	56.988	0.131	**Rangeland/Native**
56.988	57.355	0.367	**Non-Irrigated**
57.355	57.548	0.192	**Rangeland/Native**
57.548	57.669	0.121	**Non-Irrigated**
57.669	57.791	0.122	**Rangeland/Native**
57.791	57.833	0.042	**ROW**
57.833	57.898	0.065	**Non-Irrigated**
57.898	57.998	0.100	**Rangeland/Native**
57.998	58.032	0.033	**Non-Irrigated**
58.032	58.147	0.115	**Rangeland/Native**
58.147	58.437	0.290	**Non-Irrigated**
58.437	58.455	0.019	**Rangeland/Native**
58.455	58.470	0.015	**ROW**
58.470	58.547	0.077	**Rangeland/Native**
58.547	58.764	0.217	**Non-Irrigated**
58.764	58.800	0.036	**Rangeland/Native**
58.800	59.819	1.019	**Non-Irrigated**
59.819	59.840	0.021	**ROW**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
59.840	60.607	0.767	**Non-Irrigated**
60.607	60.642	0.036	**ROW**
60.642	60.779	0.136	**Non-Irrigated**
60.779	60.925	0.146	**Rangeland/Native**
60.925	61.538	0.614	**Non-Irrigated**
61.538	61.559	0.021	**ROW**
61.559	62.296	0.737	**Non-Irrigated**
62.296	62.317	0.021	**Rangeland/Native**
62.317	62.334	0.018	**Riparian**
62.334	62.385	0.051	**Rangeland/Native**
62.385	62.928	0.543	**Non-Irrigated**
62.928	62.939	0.011	**ROW**
62.939	63.747	0.808	**Non-Irrigated**
63.747	63.759	0.011	**ROW**
63.759	64.042	0.284	**Non-Irrigated**
64.042	64.052	0.010	**ROW**
64.052	64.316	0.264	**Non-Irrigated**
64.316	65.448	1.132	**Rangeland/Native**
65.448	65.991	0.543	**Non-Irrigated**
65.991	66.025	0.034	**ROW**
66.025	66.431	0.405	**Non-Irrigated**
66.431	66.989	0.558	**Rangeland/Native**
66.989	67.469	0.480	**Non-Irrigated**
67.469	67.478	0.008	**ROW**
67.478	68.135	0.658	**Non-Irrigated**
68.135	68.150	0.014	**Water**
68.150	69.55	1.400	**Non-Irrigated**
69.550	69.565	0.015	**Rangeland/Native**
69.565	69.582	0.016	**ROW**
69.582	69.796	0.214	**Irrigated**
69.796	69.820	0.024	**ROW**
69.820	70.181	0.361	**Irrigated**
70.181	70.188	0.007	**Water**
70.188	70.727	0.538	**Irrigated**
70.727	70.741	0.015	**Water**
70.741	71.569	0.828	**Non-Irrigated**
71.569	71.581	0.013	**ROW**
71.581	71.980	0.398	**Non-Irrigated**
71.980	72.002	0.022	**Riparian**
72.002	72.660	0.658	**Non-Irrigated**
72.660	72.681	0.021	**Riparian**
72.681	72.694	0.013	**Rangeland/Native**
72.694	72.702	0.007	**ROW**
72.702	72.784	0.082	**Rangeland/Native**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
72.784	72.808	0.025	**Riparian**
72.808	72.899	0.090	**Rangeland/Native**
72.899	73.148	0.249	**Non-Irrigated**
73.148	73.319	0.171	**Irrigated**
73.319	73.559	0.240	**Rangeland/Native**
73.559	73.576	0.017	**Water**
73.576	73.661	0.085	**Rangeland/Native**
73.661	73.700	0.039	**ROW**
73.700	73.897	0.197	**Non-Irrigated**
73.897	74.221	0.325	**Rangeland/Native**
74.221	74.917	0.695	**Non-Irrigated**
74.917	74.934	0.017	**Rangeland/Native**
74.934	75.789	0.855	**Non-Irrigated**
75.789	75.847	0.058	**Rangeland/Native**
75.847	76.590	0.743	**Non-Irrigated**
76.590	76.665	0.076	**Rangeland/Native**
76.665	76.868	0.203	**Non-Irrigated**
76.868	77.015	0.147	**Rangeland/Native**
77.015	77.045	0.030	**Non-Irrigated**
77.045	77.195	0.150	**Rangeland/Native**
77.195	77.289	0.094	**Non-Irrigated**
77.289	77.665	0.376	**Rangeland/Native**
77.665	77.740	0.075	**Non-Irrigated**
77.740	77.805	0.065	**Rangeland/Native**
77.805	77.866	0.061	**Non-Irrigated**
77.866	77.936	0.069	**Rangeland/Native**
77.936	77.979	0.043	**Non-Irrigated**
77.979	78.000	0.021	**Rangeland/Native**
78.000	78.065	0.065	**Non-Irrigated**
78.065	78.258	0.193	**Rangeland/Native**
78.258	78.371	0.113	**Non-Irrigated**
78.371	79.505	1.134	**Rangeland/Native**
79.505	79.746	0.242	**Non-Irrigated**
79.746	79.786	0.040	**Rangeland/Native**
79.786	79.794	0.008	**Riparian**
79.794	80.203	0.409	**Non-Irrigated**
80.203	80.894	0.692	**Rangeland/Native**
80.894	80.911	0.016	**ROW**
80.911	80.960	0.049	**Rangeland/Native**
80.960	80.968	0.009	**ROW**
80.968	81.189	0.221	**Rangeland/Native**
81.189	81.200	0.011	**Riparian**
81.200	81.340	0.140	**Rangeland/Native**
81.340	81.513	0.173	**Non-Irrigated**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
81.513	81.521	0.008	**ROW**
81.521	81.616	0.095	**Non-Irrigated**
81.616	81.624	0.008	**Water**
81.624	82.402	0.778	**Non-Irrigated**
82.402	82.424	0.022	**Rangeland/Native**
82.424	82.737	0.313	**Non-Irrigated**
82.737	82.808	0.071	**Rangeland/Native**
82.808	83.089	0.281	**Non-Irrigated**
83.089	83.094	0.005	**ROW**
83.094	84.288	1.195	**Non-Irrigated**
84.288	84.446	0.158	**Rangeland/Native**
84.446	84.468	0.022	**Non-Irrigated**
84.468	84.649	0.181	**Rangeland/Native**
84.649	84.802	0.154	**Non-Irrigated**
84.802	84.916	0.114	**Rangeland/Native**
84.916	85.218	0.302	**Non-Irrigated**
85.218	85.226	0.008	**ROW**
85.226	85.321	0.095	**Non-Irrigated**
85.321	85.460	0.138	**Irrigated**
85.460	85.823	0.364	**Rangeland/Native**
85.823	86.903	1.080	**Non-Irrigated**
86.903	86.909	0.006	**ROW**
86.909	87.508	0.599	**Non-Irrigated**
87.508	87.513	0.006	**ROW**
87.513	88.185	0.671	**Non-Irrigated**
88.185	88.228	0.044	**Rangeland/Native**
88.228	88.416	0.187	**Non-Irrigated**
88.416	89.181	0.766	**Rangeland/Native**
89.181	89.190	0.008	**ROW**
89.190	89.359	0.169	**Rangeland/Native**
89.359	89.371	0.012	**ROW**
89.371	89.745	0.375	**Rangeland/Native**
89.745	89.764	0.019	**Riparian**
89.764	89.804	0.040	**Water**
89.804	89.822	0.018	**Riparian**
89.822	89.992	0.170	**Rangeland/Native**
89.992	90.165	0.173	**Non-Irrigated**
90.165	90.219	0.054	**Rangeland/Native**
90.219	90.367	0.148	**Non-Irrigated**
90.367	90.739	0.372	**Rangeland/Native**
90.739	91.124	0.385	**Non-Irrigated**
91.124	91.137	0.013	**ROW**
91.137	91.692	0.555	**Non-Irrigated**
91.692	91.696	0.004	**ROW**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
91.696	91.940	0.244	**Non-Irrigated**
91.940	92.198	0.258	**Rangeland/Native**
92.198	92.575	0.378	**Non-Irrigated**
92.575	92.582	0.006	**ROW**
92.582	92.809	0.227	**Non-Irrigated**
92.809	92.813	0.005	**ROW**
92.813	93.913	1.100	**Rangeland/Native**
93.913	93.933	0.020	**ROW**
93.933	94.101	0.169	**Rangeland/Native**
94.101	94.138	0.037	**ROW**
94.138	94.920	0.782	**Rangeland/Native**
94.920	95.059	0.139	**Non-Irrigated**
95.059	95.828	0.769	**Rangeland/Native**
95.828	95.836	0.008	**Riparian**
95.836	96.061	0.225	**Rangeland/Native**
96.061	96.077	0.016	**Riparian**
96.077	97.026	0.949	**Rangeland/Native**
97.026	97.038	0.012	**Riparian**
97.038	98.837	1.799	**Rangeland/Native**
98.837	98.840	0.003	**ROW**
98.840	99.529	0.689	**Rangeland/Native**
99.529	99.532	0.003	**ROW**
99.532	99.893	0.361	**Non-Irrigated**
99.893	99.974	0.081	**ROW**
99.974	100.159	0.185	**Non-Irrigated**
100.159	100.164	0.005	**ROW**
100.164	101.103	0.939	**Non-Irrigated**
101.103	101.115	0.011	**ROW**
101.115	102.349	1.234	**Non-Irrigated**
102.349	102.354	0.005	**ROW**
102.354	102.518	0.165	**Non-Irrigated**
102.518	102.673	0.155	**Riparian**
102.673	102.942	0.269	**Non-Irrigated**
102.942	103.051	0.109	**Riparian**
103.051	103.565	0.514	**Non-Irrigated**
103.565	103.576	0.011	**ROW**
103.576	104.665	1.089	**Non-Irrigated**
104.665	104.672	0.007	**ROW**
104.672	108.203	3.530	**Non-Irrigated**
108.203	108.213	0.010	**ROW**
108.213	110.405	2.192	**Non-Irrigated**
110.405	110.434	0.029	**Riparian**
110.434	110.716	0.282	**Non-Irrigated**
110.716	110.735	0.019	**ROW**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
110.735	111.698	0.963	**Non-Irrigated**
111.698	111.836	0.138	**Rangeland/Native**
111.836	111.858	0.021	**ROW**
111.858	112.900	1.042	**Rangeland/Native**
112.900	113.374	0.474	**Non-Irrigated**
113.374	113.400	0.026	**ROW**
113.400	114.031	0.631	**Non-Irrigated**
114.031	114.082	0.051	**Rangeland/Native**
114.082	114.641	0.559	**Non-Irrigated**
114.641	114.898	0.257	**Rangeland/Native**
114.898	114.907	0.009	**ROW**
114.907	116.412	1.505	**Non-Irrigated**
116.412	116.417	0.004	**ROW**
116.417	117.304	0.888	**Non-Irrigated**
117.304	117.321	0.017	**Riparian**
117.321	117.643	0.321	**Non-Irrigated**
117.643	117.779	0.136	**Riparian**
117.779	117.904	0.125	**Rangeland/Native**
117.904	117.919	0.015	**ROW**
117.919	118.334	0.415	**Non-Irrigated**
118.334	118.676	0.342	**Rangeland/Native**
118.676	118.914	0.238	**Non-Irrigated**
118.914	118.917	0.003	**ROW**
118.917	120.155	1.238	**Non-Irrigated**
120.155	120.172	0.017	**ROW**
120.172	120.715	0.543	**Non-Irrigated**
120.715	120.748	0.033	**Riparian**
120.748	121.663	0.915	**Non-Irrigated**
121.663	124.585	2.923	**Rangeland/Native**
124.585	125.515	0.929	**Non-Irrigated**
125.515	125.532	0.018	**ROW**
125.532	127.454	1.922	**Non-Irrigated**
127.454	127.491	0.037	**Rangeland/Native**
127.491	127.833	0.342	**Non-Irrigated**
127.833	127.852	0.020	**Riparian**
127.852	127.868	0.016	**Non-Irrigated**
127.868	127.904	0.036	**Riparian**
127.904	128.020	0.116	**Non-Irrigated**
128.020	128.030	0.011	**ROW**
128.030	128.145	0.115	**Non-Irrigated**
128.145	128.166	0.020	**Rangeland/Native**
128.166	128.226	0.060	**Riparian**
128.226	128.303	0.077	**Rangeland/Native**
128.303	128.355	0.052	**Riparian**

TABLE H- 1 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 2			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
128.355	128.383	0.029	**Rangeland/Native**
128.383	129.349	0.966	**Non-Irrigated**
129.349	129.363	0.014	**Rangeland/Native**
129.363	129.883	0.520	**Non-Irrigated**
0.000	129.883	129.883	**Total**

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

DEQ has developed alternative alignments for Alternative 2 to reduce some of the effects on farming. Table H-2 through Table H-12 indicate the mileposts in Alternative 2 and the land use associated with the potential realignment.

TABLE H- 2
DIAMOND VALLEY MIDDLE
(REPLACES ALTERNATIVE 2 MILEPOST 30.519 TO 36.734)

Mile Post Begin	Mile Post End	Distance (Miles)[1]	Land Use
0.000	0.037	0.037	**Rangeland/Native**
0.037	0.919	0.882	**Non-Irrigated**
0.919	0.952	0.033	**Rangeland/Native**
0.952	0.963	0.011	**Riparian**
0.963	1.000	0.037	**Rangeland/Native**
1.000	1.195	0.194	**Non-Irrigated**
1.195	1.205	0.010	**ROW**
1.205	1.215	0.011	**Non-Irrigated**
1.215	1.231	0.016	**ROW**
1.231	4.220	2.989	**Non-Irrigated**
4.220	4.303	0.084	**Riparian**
4.303	5.186	0.883	**Non-Irrigated**
5.186	5.193	0.006	**ROW**
5.193	6.101	0.909	**Non-Irrigated**
6.101	6.518	0.416	**Rangeland/Native**
6.518	7.177	0.659	**Non-Irrigated**
7.177	7.399	0.222	**Rangeland/Native**
7.399	7.571	0.172	**Non-Irrigated**
0.000	7.571	7.571	**Total**

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 3 DIAMOND VALLEY NORTH (REPLACES ALTERNATIVE 2 MILEPOST 30.519 TO 36.734)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.040	0.040	Rangeland/Native
0.040	0.922	0.882	Non-Irrigated
0.922	0.957	0.034	Rangeland/Native
0.957	0.967	0.010	Riparian
0.967	1.006	0.039	Rangeland/Native
1.006	1.200	0.194	Non-Irrigated
1.200	1.213	0.013	ROW
1.213	1.441	0.228	Non-Irrigated
1.441	1.485	0.044	Rangeland/Native
1.485	2.215	0.729	Non-Irrigated
2.215	2.221	0.007	ROW
2.221	3.209	0.988	Non-Irrigated
3.209	3.224	0.015	ROW
3.224	3.764	0.540	Non-Irrigated
3.764	3.842	0.077	Rangeland/Native
3.842	3.847	0.005	ROW
3.847	3.990	0.143	Non-Irrigated
3.990	4.088	0.099	Rangeland/Native
4.088	5.746	1.658	Non-Irrigated
5.746	5.753	0.006	Rangeland/Native
5.753	5.764	0.011	ROW
5.764	6.324	0.560	Non-Irrigated
6.324	6.681	0.358	Rangeland/Native
6.681	6.687	0.006	Riparian
6.687	6.839	0.151	Rangeland/Native
6.839	7.317	0.478	Non-Irrigated
7.317	7.321	0.005	ROW
7.321	7.387	0.065	Non-Irrigated
7.387	7.680	0.294	Rangeland/Native
7.680	7.875	0.194	Non-Irrigated
0	7.875	7.875	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 4 DIAMOND VALLEY SOUTH (REPLACES ALTERNATIVE 2 MILEPOST 30.519 TO 36.734)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.025	0.025	Rangeland/Native
0.025	0.333	0.309	Non-Irrigated
0.333	0.428	0.095	Rangeland/Native
0.428	0.448	0.020	Riparian
0.448	0.616	0.168	Rangeland/Native
0.616	2.381	1.765	Non-Irrigated
2.381	2.482	0.101	Rangeland/Native
2.482	2.577	0.217	Non-Irrigated
2.577	2.699	0.217	Rangeland/Native
2.699	2.737	0.037	Non-Irrigated
2.737	2.746	0.010	Riparian
2.746	2.761	0.015	Non-Irrigated
2.761	3.070	0.309	Rangeland/Native
3.070	3.081	0.010	ROW
3.081	3.577	0.496	Rangeland/Native
3.577	5.032	1.455	Non-Irrigated
5.032	5.045	0.013	ROW
5.045	5.882	0.837	Non-Irrigated
5.882	6.199	0.317	Rangeland/Native
6.199	6.282	0.083	Non-Irrigated
6.282	6.292	0.010	Rangeland/Native
6.292	6.297	0.005	Riparian
6.297	6.322	0.025	Rangeland/Native
6.322	7.041	0.719	Non-Irrigated
7.041	7.044	0.003	ROW
7.044	7.178	0.134	Non-Irrigated
7.178	7.266	0.087	Rangeland/Native
7.266	7.269	0.004	Riparian
7.269	7.543	0.273	Rangeland/Native
7.543	7.686	0.144	Non-Irrigated
7.686	7.890	0.204	Rangeland/Native
7.890	8.028	0.138	Non-Irrigated
0.000	8.028	8.245	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 5 TETON RIVER CROSSING (REPLACES ALTERNATIVE 2 MILEPOST 37.240 TO 37.984)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.170	0.170	Non-Irrigated
0.170	0.179	0.009	Rangeland/Native
0.179	0.190	0.011	Forest Total
0.190	0.263	0.073	Riparian
0.263	0.275	0.012	Water
0.275	0.285	0.010	Riparian
0.285	0.892	0.606	Rangeland/Native
0.000	0.892	0.892	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 6 SOUTHEAST OF CONRAD (REPLACES ALTERNATIVE 2 MILEPOST 53.723 TO 56.629)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.054	0.054	Non-Irrigated
0.054	0.077	0.023	Rangeland/Native
0.077	0.168	0.091	Non-Irrigated
0.168	0.181	0.013	Rangeland/Native
0.181	0.250	0.069	Non-Irrigated
0.250	0.275	0.025	Riparian
0.275	0.637	0.362	Non-Irrigated
0.637	0.671	0.035	Rangeland/Native
0.671	0.687	0.015	Non-Irrigated
0.687	0.738	0.051	Rangeland/Native
0.738	0.746	0.008	Non-Irrigated
0.746	1.062	0.316	Rangeland/Native
1.062	1.096	0.034	ROW
1.096	1.312	0.216	Rangeland/Native
1.312	1.525	0.214	Non-Irrigated
1.525	2.010	0.484	Rangeland/Native
2.010	2.073	0.063	Non-Irrigated
2.073	2.645	0.572	Rangeland/Native
2.645	2.693	0.048	ROW
2.693	2.893	0.201	Non-Irrigated
2.893	2.987	0.093	Rangeland/Native
0.000	2.987	2.987	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 7 WEST OF CONRAD (REPLACES ALTERNATIVE 2 MILEPOST 62.307 TO 63.755)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.638	0.638	Rangeland/Native
0.638	0.641	0.004	ROW
0.641	1.210	0.568	Non-Irrigated
1.210	1.225	0.015	ROW
1.225	1.954	0.729	Non-Irrigated
0.000	1.954	1.954	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 8 NORTHWEST OF CONRAD (REPLACES ALTERNATIVE 2 MILEPOST 66.735 TO 69.505)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.283	0.283	Rangeland/Native
0.283	0.763	0.481	Non-Irrigated
0.763	0.774	0.010	ROW
0.774	1.147	0.374	Non-Irrigated
1.147	1.452	0.305	Rangeland/Native
1.452	1.465	0.012	ROW
1.465	1.536	0.071	Rangeland/Native
1.536	1.786	0.250	Non-Irrigated
1.786	2.540	0.754	Rangeland/Native
2.540	2.891	0.350	Non-Irrigated
0	2.891	2.891	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 9 BELGIAN HILL (REPLACES ALTERNATIVE 2 MILEPOST 71.237 TO 73.661)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.432	0.432	Non-Irrigated
0.432	0.444	0.012	ROW
0.444	0.740	0.296	Non-Irrigated
0.740	0.749	0.009	Water
0.749	0.767	0.018	Rangeland/Native
0.767	1.401	0.634	Non-Irrigated
1.401	1.422	0.021	Riparian
1.422	1.470	0.048	Non-Irrigated
1.470	1.480	0.010	ROW
1.480	1.573	0.093	Non-Irrigated
1.573	1.693	0.120	Rangeland/Native
1.693	1.932	0.239	Non-Irrigated
1.932	2.130	0.198	Irrigation Total
2.130	2.236	0.106	Rangeland/Native
2.236	2.244	0.009	Water
2.244	2.548	0.303	Rangeland/Native
0.000	2.548	2.548	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 10 BULLHEAD COULEE SOUTH (REPLACES ALTERNATIVE 2 MILEPOST 76.374 TO 77.740)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.185	0.185	Non-Irrigated
0.185	0.415	0.230	Rangeland/Native
0.415	1.138	0.724	Non-Irrigated
1.138	1.652	0.514	Rangeland/Native
1.652	1.714	0.062	Non-Irrigated
0.000	1.714	1.714	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 11 BULLHEAD COULEE NORTH (REPLACES ALTERNATIVE 2 MILEPOST 82.089 TO 83.709)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.998	0.998	Non-Irrigated
0.998	1.004	0.006	ROW
1.004	1.646	0.643	Non-Irrigated
0.000	1.646	1.646	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 12 SOUTH OF CUT BANK (REPLACES ALTERNATIVE 2 MILEPOST 97.227 TO 99.532)			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.739	0.739	Rangeland/Native
0.739	0.745	0.006	ROW
0.745	1.513	0.768	Rangeland/Native
1.513	1.519	0.006	ROW
1.519	2.405	0.886	Rangeland/Native
2.405	2.411	0.006	ROW
2.411	2.447	0.036	Rangeland/Native
2.447	2.455	0.008	ROW
0.000	2.455	2.455	Total

[1] Subtracting the beginning miles from the ending miles does not necessarily equal the total miles displayed due to rounding.

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.040	0.040	Non-Irrigated
0.040	0.568	0.527	Rangeland/Native
0.568	0.586	0.019	Riparian
0.586	0.650	0.064	Rangeland/Native
0.650	0.654	0.004	Riparian
0.654	0.670	0.016	Rangeland/Native
0.670	0.673	0.002	ROW
0.673	0.694	0.021	Rangeland/Native
0.694	0.697	0.003	ROW
0.697	0.733	0.037	Rangeland/Native
0.733	0.739	0.006	ROW
0.739	0.755	0.016	Rangeland/Native
0.755	0.774	0.018	Non-Irrigated
0.774	0.783	0.009	Rangeland/Native
0.783	0.925	0.142	ROW
0.925	2.312	1.387	Non-Irrigated
2.312	2.339	0.027	ROW
2.339	3.310	0.971	Non-Irrigated
3.310	3.338	0.028	ROW
3.338	3.465	0.128	Rangeland/Native
3.465	4.008	0.543	Non-Irrigated
4.008	4.540	0.532	Rangeland/Native
4.540	4.583	0.043	ROW
4.583	5.029	0.446	Rangeland/Native
5.029	5.042	0.014	ROW
5.042	5.186	0.144	Rangeland/Native
5.186	5.193	0.007	ROW

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
5.193	5.296	0.102	Rangeland/Native
5.296	5.308	0.013	ROW
5.308	5.677	0.369	Rangeland/Native
5.677	5.989	0.312	Non-Irrigated
5.989	6.464	0.475	Rangeland/Native
6.464	10.741	4.278	Non-Irrigated
10.741	10.762	0.020	ROW
10.762	14.869	4.107	Non-Irrigated
14.869	14.888	0.019	ROW
14.888	19.022	4.134	Non-Irrigated
19.022	19.102	0.080	Rangeland/Native
19.102	19.256	0.155	Non-Irrigated
19.256	19.268	0.012	ROW
19.268	19.481	0.213	Non-Irrigated
19.481	19.510	0.028	Rangeland/Native
19.510	20.914	1.405	Non-Irrigated
20.914	20.980	0.066	Rangeland/Native
20.980	21.060	0.080	Riparian
21.060	21.119	0.058	Rangeland/Native
21.119	21.772	0.653	Non-Irrigated
21.772	21.837	0.066	Rangeland/Native
21.837	21.885	0.048	Riparian
21.885	22.159	0.274	Rangeland/Native
22.159	22.801	0.642	Non-Irrigated
22.801	22.807	0.006	ROW
22.807	23.362	0.555	Non-Irrigated
23.362	23.379	0.017	Rangeland/Native
23.379	23.664	0.285	Non-Irrigated
23.664	23.678	0.014	ROW
23.678	23.733	0.055	Rangeland/Native
23.733	23.769	0.035	Riparian
23.769	23.883	0.115	Rangeland/Native
23.883	24.511	0.627	Non-Irrigated
24.511	24.542	0.031	ROW
24.542	24.819	0.277	Non-Irrigated
24.819	24.864	0.046	Riparian
24.864	25.128	0.264	Non-Irrigated
25.128	25.140	0.011	ROW
25.140	26.315	1.175	Non-Irrigated
26.315	26.383	0.068	Rangeland/Native
26.383	26.398	0.015	Riparian
26.398	26.410	0.012	Rangeland/Native
26.410	26.770	0.360	Non-Irrigated
26.770	26.777	0.007	ROW

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
26.777	27.620	0.843	Non-Irrigated
27.620	27.638	0.018	ROW
27.638	27.820	0.182	Non-Irrigated
27.820	27.827	0.007	ROW
27.827	28.365	0.538	Non-Irrigated
28.365	28.389	0.024	Riparian
28.389	28.725	0.336	Non-Irrigated
28.725	28.742	0.017	Riparian
28.742	28.986	0.244	Non-Irrigated
28.986	28.997	0.011	ROW
28.997	30.349	1.352	Non-Irrigated
30.349	30.363	0.014	ROW
30.363	30.834	0.472	Non-Irrigated
30.834	30.869	0.035	Riparian
30.869	31.699	0.830	Non-Irrigated
31.699	31.711	0.012	ROW
31.711	32.241	0.529	Non-Irrigated
32.241	32.266	0.026	Rangeland/Native
32.266	32.304	0.038	Non-Irrigated
32.304	32.454	0.150	Rangeland/Native
32.454	32.470	0.015	Riparian
32.470	32.717	0.248	Rangeland/Native
32.717	33.010	0.292	Non-Irrigated
33.010	33.021	0.011	ROW
33.021	33.093	0.072	Non-Irrigated
33.093	33.723	0.630	Rangeland/Native
33.723	33.828	0.105	Riparian
33.828	33.862	0.034	Forest
33.862	34.097	0.235	Rangeland/Native
34.097	36.462	2.366	Non-Irrigated
36.462	36.473	0.010	ROW
36.473	36.890	0.417	Non-Irrigated
36.890	36.903	0.014	ROW
36.903	38.477	1.574	Non-Irrigated
38.477	38.492	0.015	ROW
38.492	41.334	2.841	Non-Irrigated
41.334	41.355	0.022	ROW
41.355	42.421	1.066	Non-Irrigated
42.421	42.436	0.015	ROW
42.436	44.327	1.891	Non-Irrigated
44.327	44.344	0.017	Riparian
44.344	44.627	0.284	Non-Irrigated
44.627	44.663	0.035	Rangeland/Native
44.663	44.759	0.096	Non-Irrigated

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
44.759	44.770	0.011	ROW
44.770	45.017	0.247	Non-Irrigated
45.017	45.032	0.015	ROW
45.032	45.188	0.156	Non-Irrigated
45.188	45.199	0.010	ROW
45.199	45.953	0.754	Non-Irrigated
45.953	45.968	0.015	ROW
45.968	47.526	1.558	Non-Irrigated
47.526	47.543	0.017	ROW
47.543	47.785	0.242	Non-Irrigated
47.785	47.865	0.079	Rangeland/Native
47.865	47.905	0.040	Riparian
47.905	47.929	0.024	Water
47.929	48.144	0.216	Non-Irrigated
48.144	48.362	0.217	Agriculture
48.362	48.513	0.151	Rangeland/Native
48.513	48.533	0.020	Riparian
48.533	48.994	0.461	Non-Irrigated
48.994	49.015	0.021	ROW
49.015	49.321	0.307	Non-Irrigated
49.321	49.505	0.184	Rangeland/Native
49.505	49.542	0.037	Riparian
49.542	49.690	0.147	Rangeland/Native
49.690	49.724	0.035	Riparian
49.724	49.755	0.031	Rangeland/Native
49.755	49.773	0.017	Riparian
49.773	50.053	0.280	Non-Irrigated
50.053	50.173	0.120	ROW
50.173	50.222	0.049	Non-Irrigated
50.222	50.238	0.016	Rangeland/Native
50.238	50.288	0.050	Non-Irrigated
50.288	50.335	0.046	Rangeland/Native
50.335	50.434	0.099	Non-Irrigated
50.434	50.463	0.029	Rangeland/Native
50.463	50.733	0.270	Non-Irrigated
50.733	50.811	0.078	Rangeland/Native
50.811	51.996	1.186	Non-Irrigated
51.996	52.018	0.022	ROW
52.018	52.522	0.504	Non-Irrigated
52.522	52.531	0.009	Rangeland/Native
52.531	52.536	0.006	ROW
52.536	52.871	0.335	Rangeland/Native
52.871	52.906	0.035	ROW
52.906	53.081	0.175	Non-Irrigated

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
53.081	53.394	0.313	Rangeland/Native
53.394	53.534	0.139	Non-Irrigated
53.534	53.574	0.040	Rangeland/Native
53.574	53.920	0.346	Non-Irrigated
53.920	53.932	0.012	ROW
53.932	54.045	0.112	Rangeland/Native
54.045	54.162	0.118	Non-Irrigated
54.162	54.209	0.047	Rangeland/Native
54.209	54.216	0.007	ROW
54.216	54.236	0.020	Rangeland/Native
54.236	54.290	0.054	Non-Irrigated
54.290	54.376	0.087	Rangeland/Native
54.376	55.640	1.264	Non-Irrigated
55.640	55.657	0.017	ROW
55.657	56.997	1.340	Non-Irrigated
56.997	57.016	0.019	ROW
57.016	57.170	0.154	Non-Irrigated
57.170	57.179	0.010	ROW
57.179	57.224	0.044	Non-Irrigated
57.224	57.262	0.038	Residential
57.262	57.332	0.070	ROW
57.332	58.006	0.674	Non-Irrigated
58.006	58.097	0.091	Rangeland/Native
58.097	58.122	0.024	Riparian
58.122	58.151	0.029	Water
58.151	58.181	0.031	Riparian
58.181	58.310	0.129	Non-Irrigated
58.310	58.393	0.083	Rangeland/Native
58.393	58.478	0.085	Riparian
58.478	58.516	0.038	Rangeland/Native
58.516	58.686	0.170	Non-Irrigated
58.686	58.689	0.003	Water
58.689	58.954	0.264	Irrigated
58.954	58.962	0.008	ROW
58.962	59.925	0.963	Irrigated
59.925	59.936	0.011	ROW
59.936	59.981	0.044	Non-Irrigated
59.981	59.992	0.012	ROW
59.992	60.843	0.850	Non-Irrigated
60.843	61.611	0.768	Rangeland/Native
61.611	62.234	0.624	Non-Irrigated
62.234	62.243	0.008	ROW
62.243	62.393	0.150	Rangeland/Native
62.393	62.408	0.015	Riparian

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
62.408	62.454	0.046	Rangeland/Native
62.454	62.563	0.109	Riparian
62.563	62.631	0.068	Rangeland/Native
62.631	62.988	0.357	Irrigated
62.988	63.016	0.027	Riparian
63.016	63.126	0.111	Non-Irrigated
63.126	63.132	0.006	ROW
63.132	63.382	0.250	Non-Irrigated
63.382	63.390	0.008	ROW
63.390	63.722	0.332	Non-Irrigated
63.722	63.739	0.016	Rangeland/Native
63.739	64.004	0.266	Non-Irrigated
64.004	64.013	0.009	ROW
64.013	65.169	1.156	Non-Irrigated
65.169	65.272	0.104	Rangeland/Native
65.272	65.613	0.341	Non-Irrigated
65.613	65.650	0.037	Rangeland/Native
65.650	65.900	0.251	Non-Irrigated
65.900	66.144	0.244	Rangeland/Native
66.144	66.157	0.012	Riparian
66.157	66.208	0.051	Rangeland/Native
66.208	66.404	0.196	Irrigated
66.404	66.470	0.066	Non-Irrigated
66.470	66.486	0.016	Riparian
66.486	66.512	0.026	Rangeland/Native
66.512	66.523	0.011	ROW
66.523	66.940	0.417	Non-Irrigated
66.940	67.000	0.060	Rangeland/Native
67.000	67.085	0.086	Non-Irrigated
67.085	67.121	0.036	Rangeland/Native
67.121	67.285	0.164	Riparian
67.285	67.317	0.032	Rangeland/Native
67.317	67.353	0.037	Riparian
67.353	67.548	0.194	Rangeland/Native
67.548	67.562	0.014	Riparian
67.562	67.697	0.135	Rangeland/Native
67.697	67.716	0.019	ROW
67.716	67.775	0.058	Riparian
67.775	67.893	0.119	Rangeland/Native
67.893	68.639	0.746	Non-Irrigated
68.639	68.652	0.013	ROW
68.652	68.688	0.036	Residential
68.688	68.767	0.079	Non-Irrigated
68.767	68.792	0.025	Riparian

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
68.792	68.848	0.055	Non-Irrigated
68.848	68.871	0.023	Riparian
68.871	68.889	0.018	Non-Irrigated
68.889	68.910	0.021	Riparian
68.910	69.104	0.194	Non-Irrigated
69.104	69.115	0.010	ROW
69.115	69.379	0.265	Non-Irrigated
69.379	69.407	0.028	Riparian
69.407	69.498	0.090	Non-Irrigated
69.498	69.652	0.155	Rangeland/Native
69.652	70.519	0.867	Non-Irrigated
70.519	70.533	0.014	Riparian
70.533	70.568	0.035	Rangeland/Native
70.568	70.876	0.308	Irrigated
70.876	70.890	0.014	Rangeland/Native
70.890	70.907	0.017	ROW
70.907	70.928	0.022	Rangeland/Native
70.928	71.352	0.424	Irrigated
71.352	71.384	0.032	ROW
71.384	71.628	0.244	Irrigated
71.628	71.672	0.043	Riparian
71.672	71.990	0.318	Non-Irrigated
71.990	71.997	0.007	ROW
71.997	72.270	0.273	Non-Irrigated
72.270	72.395	0.125	Irrigated
72.395	72.585	0.189	Non-Irrigated
72.585	72.599	0.015	Riparian
72.599	73.077	0.477	Non-Irrigated
73.077	73.082	0.005	ROW
73.082	73.491	0.409	Non-Irrigated
73.491	73.500	0.009	Riparian
73.500	73.993	0.493	Non-Irrigated
73.993	74.017	0.024	ROW
74.017	74.160	0.143	Non-Irrigated
74.160	74.170	0.010	ROW
74.170	74.440	0.270	Non-Irrigated
74.440	74.668	0.228	Rangeland/Native
74.668	75.189	0.521	Non-Irrigated
75.189	75.215	0.026	Riparian
75.215	75.459	0.245	Irrigated
75.459	75.467	0.008	ROW
75.467	75.705	0.238	Non-Irrigated
75.705	75.777	0.072	Rangeland/Native
75.777	75.801	0.025	Riparian

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
75.801	75.876	0.074	Rangeland/Native
75.876	75.897	0.021	Riparian
75.897	76.026	0.129	Rangeland/Native
76.026	76.190	0.165	Non-Irrigated
76.190	76.202	0.011	ROW
76.202	76.356	0.155	Non-Irrigated
76.356	76.362	0.006	Water
76.362	77.235	0.873	Non-Irrigated
77.235	77.247	0.012	ROW
77.247	77.521	0.274	Non-Irrigated
77.521	77.532	0.011	Rangeland/Native
77.532	77.666	0.134	Non-Irrigated
77.666	77.670	0.003	Rangeland/Native
77.670	77.679	0.009	ROW
77.679	78.712	1.033	Non-Irrigated
78.712	78.737	0.025	ROW
78.737	78.908	0.171	Rangeland/Native
78.908	79.324	0.416	Non-Irrigated
79.324	79.330	0.005	Rangeland/Native
79.330	79.637	0.307	Non-Irrigated
79.637	79.645	0.008	Water
79.645	79.707	0.062	Rangeland/Native
79.707	79.884	0.177	Non-Irrigated
79.884	79.904	0.021	Riparian
79.904	79.973	0.068	Non-Irrigated
79.973	79.991	0.018	ROW
79.991	80.417	0.426	Non-Irrigated
80.417	80.646	0.228	Irrigated
80.646	82.121	1.476	Non-Irrigated
82.121	82.149	0.028	ROW
82.149	82.188	0.039	Non-Irrigated
82.188	82.192	0.004	ROW
82.192	83.429	1.237	Non-Irrigated
83.429	83.703	0.274	Rangeland/Native
83.703	83.712	0.009	ROW
83.712	84.350	0.639	Rangeland/Native
84.350	84.376	0.026	Non-Irrigated
84.376	84.425	0.048	Rangeland/Native
84.425	84.509	0.084	Forest
84.509	84.572	0.063	Water
84.572	84.728	0.156	Rangeland/Native
84.728	85.425	0.697	Non-Irrigated
85.425	85.458	0.033	Rangeland/Native
85.458	85.937	0.479	Non-Irrigated

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
85.937	85.948	0.011	ROW
85.948	86.508	0.560	Non-Irrigated
86.508	86.512	0.004	ROW
86.512	86.798	0.286	Non-Irrigated
86.798	87.075	0.277	Rangeland/Native
87.075	87.570	0.495	Non-Irrigated
87.570	87.588	0.017	Rangeland/Native
87.588	87.595	0.007	ROW
87.595	87.622	0.027	Non-Irrigated
87.622	87.625	0.003	Rangeland/Native
87.625	87.630	0.004	ROW
87.630	88.753	1.123	Rangeland/Native
88.753	88.769	0.016	ROW
88.769	88.981	0.212	Rangeland/Native
88.981	88.985	0.004	ROW
88.985	89.060	0.075	Rangeland/Native
89.060	89.096	0.037	ROW
89.096	89.119	0.023	Rangeland/Native
89.119	89.123	0.005	ROW
89.123	89.157	0.033	Rangeland/Native
89.157	89.172	0.015	Riparian
89.172	89.195	0.023	Rangeland/Native
89.195	89.222	0.027	ROW
89.222	89.470	0.248	Rangeland/Native
89.470	89.523	0.053	ROW
89.523	90.569	1.046	Rangeland/Native
90.569	90.575	0.006	Riparian
90.575	90.886	0.311	Rangeland/Native
90.886	90.903	0.017	Riparian
90.903	93.693	2.789	Rangeland/Native
93.693	93.698	0.006	ROW
93.698	94.386	0.687	Rangeland/Native
94.386	94.390	0.004	ROW
94.390	94.749	0.359	Non-Irrigated
94.749	94.833	0.084	ROW
94.833	95.017	0.184	Non-Irrigated
95.017	95.021	0.004	ROW
95.021	95.961	0.940	Non-Irrigated
95.961	95.968	0.007	ROW
95.968	97.205	1.237	Non-Irrigated
97.205	97.211	0.006	ROW
97.211	97.327	0.117	Non-Irrigated
97.327	97.375	0.048	Agriculture
97.375	97.532	0.157	Riparian

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
97.532	97.796	0.264	Non-Irrigated
97.796	97.909	0.112	Riparian
97.909	98.424	0.515	Non-Irrigated
98.424	98.435	0.011	ROW
98.435	99.522	1.087	Non-Irrigated
99.522	99.529	0.007	ROW
99.529	102.368	2.839	Non-Irrigated
102.368	102.390	0.022	Rangeland/Native
102.390	103.023	0.633	Non-Irrigated
103.023	103.038	0.016	ROW
103.038	105.525	2.486	Non-Irrigated
105.525	105.539	0.015	ROW
105.539	106.282	0.743	Non-Irrigated
106.282	106.950	0.668	Rangeland/Native
106.950	106.971	0.021	Riparian
106.971	107.536	0.565	Rangeland/Native
107.536	107.539	0.003	ROW
107.539	108.554	1.015	Non-Irrigated
108.554	108.558	0.004	ROW
108.558	109.550	0.991	Non-Irrigated
109.550	109.564	0.015	ROW
109.564	109.993	0.429	Non-Irrigated
109.993	109.997	0.004	ROW
109.997	110.631	0.634	Non-Irrigated
110.631	110.680	0.049	Rangeland/Native
110.680	110.843	0.163	Non-Irrigated
110.843	110.847	0.004	ROW
110.847	111.645	0.798	Non-Irrigated
111.645	111.910	0.265	Rangeland/Native
111.910	112.067	0.156	Non-Irrigated
112.067	113.597	1.530	Rangeland/Native
113.597	114.088	0.492	Non-Irrigated
114.088	114.339	0.251	Rangeland/Native
114.339	115.431	1.092	Non-Irrigated
115.431	115.491	0.060	Rangeland/Native
115.491	115.539	0.048	ROW
115.539	115.670	0.130	Rangeland/Native
115.670	117.245	1.575	Non-Irrigated
117.245	117.308	0.063	Rangeland/Native
117.308	117.325	0.017	Riparian
117.325	117.514	0.189	Rangeland/Native
117.514	118.198	0.684	Non-Irrigated
118.198	118.230	0.033	Riparian
118.230	118.762	0.532	Rangeland/Native

TABLE H- 13 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 3			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
118.762	118.777	0.015	ROW
118.777	119.750	0.974	Non-Irrigated
119.750	119.766	0.015	ROW
119.766	119.957	0.192	Non-Irrigated
119.957	119.975	0.018	Rangeland/Native
119.975	120.080	0.105	Non-Irrigated
120.080	120.109	0.029	Rangeland/Native
120.109	120.268	0.159	Non-Irrigated
120.268	120.272	0.003	ROW
120.272	121.594	1.322	Non-Irrigated
121.594	121.621	0.027	Rangeland/Native
0	121.621	121.621	Total

[1] Subtracting the beginning Distance (Miles)1 from the ending Distance (Miles)1 does not necessarily equal the total Distance (Miles)1 displayed due to rounding.

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
0.000	0.126	0.126	Non-Irrigated
0.126	0.734	0.608	Rangeland/Native
0.734	0.782	0.048	Riparian
0.782	0.817	0.035	Rangeland/Native
0.817	0.823	0.006	ROW
0.823	0.872	0.049	Rangeland/Native
0.872	2.552	1.680	Non-Irrigated
2.552	2.566	0.014	ROW
2.566	2.692	0.125	Non-Irrigated
2.692	2.706	0.014	ROW
2.706	3.153	0.447	Non-Irrigated
3.153	3.662	0.509	Rangeland/Native
3.662	3.685	0.024	ROW
3.685	4.044	0.359	Non-Irrigated
4.044	4.854	0.810	Rangeland/Native
4.854	5.090	0.236	Non-Irrigated
5.090	5.468	0.378	Rangeland/Native
5.468	5.521	0.054	Non-Irrigated
5.521	5.802	0.280	Rangeland/Native
5.802	5.817	0.015	Riparian
5.817	6.016	0.199	Non-Irrigated
6.016	6.330	0.314	Rangeland/Native
6.330	6.337	0.007	ROW
6.337	6.833	0.496	Rangeland/Native
6.833	6.838	0.005	ROW
6.838	7.281	0.443	Rangeland/Native
7.281	7.450	0.169	Non-Irrigated
7.450	8.052	0.602	Rangeland/Native
8.052	8.061	0.009	Riparian
8.061	9.941	1.880	Rangeland/Native
9.941	9.955	0.014	ROW
9.955	10.097	0.142	Rangeland/Native
10.097	10.250	0.153	Non-Irrigated
10.250	10.569	0.319	Rangeland/Native
10.569	10.575	0.006	Riparian
10.575	11.714	1.138	Rangeland/Native
11.714	11.722	0.008	Riparian
11.722	11.991	0.269	Rangeland/Native
11.991	12.411	0.421	Non-Irrigated
12.411	12.770	0.359	Rangeland/Native
12.770	12.969	0.199	Non-Irrigated
12.969	14.662	1.693	Rangeland/Native
14.662	15.130	0.467	Non-Irrigated

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
15.130	15.216	0.086	Rangeland/Native
15.216	15.730	0.515	Non-Irrigated
15.730	15.770	0.040	ROW
15.770	16.769	0.999	Non-Irrigated
16.769	16.778	0.008	ROW
16.778	18.781	2.004	Non-Irrigated
18.781	18.799	0.018	ROW
18.799	19.732	0.933	Non-Irrigated
19.732	21.548	1.816	Rangeland/Native
21.548	21.858	0.310	Non-Irrigated
21.858	21.867	0.009	ROW
21.867	21.942	0.075	Rangeland/Native
21.942	21.959	0.017	Riparian
21.959	22.790	0.831	Rangeland/Native
22.790	22.835	0.045	Riparian
22.835	23.316	0.480	Rangeland/Native
23.316	23.328	0.012	Riparian
23.328	23.403	0.076	Rangeland/Native
23.403	23.769	0.365	Non-Irrigated
23.769	23.802	0.034	Riparian
23.802	24.102	0.300	Non-Irrigated
24.102	24.112	0.010	ROW
24.112	24.934	0.823	Non-Irrigated
24.934	24.945	0.010	ROW
24.945	25.122	0.177	Non-Irrigated
25.122	25.179	0.057	Rangeland/Native
25.179	25.188	0.009	ROW
25.188	26.157	0.969	Rangeland/Native
26.157	26.182	0.025	Riparian
26.182	26.288	0.106	Rangeland/Native
26.288	26.724	0.437	Non-Irrigated
26.724	26.837	0.113	Rangeland/Native
26.837	28.266	1.430	Non-Irrigated
28.266	28.290	0.024	ROW
28.290	29.226	0.936	Non-Irrigated
29.226	29.254	0.028	Riparian
29.254	30.172	0.918	Non-Irrigated
30.172	30.219	0.047	Rangeland/Native
30.219	30.268	0.048	Non-Irrigated
30.268	30.278	0.010	Rangeland/Native
30.278	30.295	0.018	ROW
30.295	30.305	0.010	Rangeland/Native
30.305	30.491	0.186	Non-Irrigated
30.491	30.588	0.097	Rangeland/Native

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
30.588	31.014	0.427	Non-Irrigated
31.014	31.077	0.063	Rangeland/Native
31.077	31.958	0.881	Non-Irrigated
31.958	31.992	0.034	Rangeland/Native
31.992	32.008	0.016	Riparian
32.008	32.044	0.037	Rangeland/Native
32.044	32.235	0.191	Non-Irrigated
32.235	32.248	0.013	ROW
32.248	32.476	0.229	Non-Irrigated
32.476	32.525	0.049	Riparian
32.525	34.659	2.134	Non-Irrigated
34.659	34.726	0.066	Rangeland/Native
34.726	35.524	0.799	Non-Irrigated
35.524	35.538	0.014	ROW
35.538	36.177	0.639	Non-Irrigated
36.177	36.414	0.237	Rangeland/Native
36.414	36.425	0.012	Riparian
36.425	36.439	0.013	Rangeland/Native
36.439	36.466	0.027	Riparian
36.466	36.692	0.226	Rangeland/Native
36.692	37.175	0.483	Non-Irrigated
37.175	37.179	0.004	ROW
37.179	37.270	0.091	Non-Irrigated
37.270	37.389	0.119	Rangeland/Native
37.389	37.400	0.011	Riparian
37.400	37.529	0.129	Rangeland/Native
37.529	38.019	0.490	Non-Irrigated
38.019	38.231	0.212	Riparian
38.231	38.390	0.160	Non-Irrigated
38.390	38.432	0.042	Forest
38.432	38.514	0.082	Riparian
38.514	38.563	0.049	Non-Irrigated
38.563	38.908	0.346	Rangeland/Native
38.908	39.097	0.189	Non-Irrigated
39.097	39.447	0.350	Rangeland/Native
39.447	39.733	0.286	Non-Irrigated
39.733	40.166	0.432	Rangeland/Native
40.166	40.198	0.032	Non-Irrigated
40.198	40.219	0.021	Rangeland/Native
40.219	40.321	0.102	Non-Irrigated
40.321	40.391	0.071	Rangeland/Native
40.391	40.634	0.243	Non-Irrigated
40.634	41.136	0.502	Rangeland/Native
41.136	41.264	0.127	Non-Irrigated

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
41.264	41.369	0.106	Rangeland/Native
41.369	41.650	0.280	Non-Irrigated
41.650	41.715	0.066	Rangeland/Native
41.715	41.726	0.011	ROW
41.726	43.160	1.434	Non-Irrigated
43.160	43.165	0.004	ROW
43.165	43.716	0.551	Non-Irrigated
43.716	43.720	0.004	ROW
43.720	45.067	1.348	Non-Irrigated
45.067	45.076	0.009	ROW
45.076	48.161	3.084	Non-Irrigated
48.161	48.176	0.015	ROW
48.176	49.887	1.712	Non-Irrigated
49.887	49.918	0.030	Riparian
49.918	50.665	0.747	Non-Irrigated
50.665	50.680	0.015	ROW
50.680	52.180	1.500	Non-Irrigated
52.180	52.184	0.004	ROW
52.184	54.210	2.026	Non-Irrigated
54.210	54.220	0.009	ROW
54.220	54.712	0.493	Non-Irrigated
54.712	54.716	0.004	ROW
54.716	55.213	0.497	Non-Irrigated
55.213	55.219	0.006	ROW
55.219	55.815	0.596	Non-Irrigated
55.815	55.851	0.036	Rangeland/Native
55.851	57.273	1.422	Non-Irrigated
57.273	57.284	0.011	ROW
57.284	58.282	0.998	Non-Irrigated
58.282	58.287	0.006	ROW
58.287	59.042	0.754	Non-Irrigated
59.042	59.302	0.261	Rangeland/Native
59.302	59.801	0.498	Non-Irrigated
59.801	59.806	0.005	ROW
59.806	60.299	0.493	Non-Irrigated
60.299	60.319	0.020	ROW
60.319	60.451	0.132	Non-Irrigated
60.451	60.509	0.058	Rangeland/Native
60.509	60.518	0.009	Riparian
60.518	60.559	0.041	Rangeland/Native
60.559	60.586	0.027	Riparian
60.586	60.675	0.089	Rangeland/Native
60.675	61.257	0.582	Non-Irrigated
61.257	61.307	0.050	Rangeland/Native

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
61.307	61.333	0.026	Non-Irrigated
61.333	62.333	1.001	Irrigated
62.333	62.345	0.011	ROW
62.345	62.841	0.496	Non-Irrigated
62.841	62.938	0.097	Rangeland/Native
62.938	63.041	0.104	Riparian
63.041	63.098	0.056	Rangeland/Native
63.098	63.288	0.190	Irrigated
63.288	63.442	0.154	Rangeland/Native
63.442	63.883	0.441	Irrigated
63.883	63.893	0.010	Rangeland/Native
63.893	63.916	0.023	ROW
63.916	64.794	0.878	Non-Irrigated
64.794	64.921	0.128	Rangeland/Native
64.921	65.399	0.478	Non-Irrigated
65.399	65.468	0.069	Rangeland/Native
65.468	65.501	0.033	Non-Irrigated
65.501	65.654	0.153	Rangeland/Native
65.654	65.728	0.074	Non-Irrigated
65.728	65.732	0.004	Rangeland/Native
65.732	65.993	0.260	Non-Irrigated
65.993	66.009	0.016	ROW
66.009	66.689	0.680	Non-Irrigated
66.689	66.789	0.099	Rangeland/Native
66.789	66.919	0.130	Non-Irrigated
66.919	67.025	0.106	Rangeland/Native
67.025	67.479	0.454	Non-Irrigated
67.479	67.484	0.005	ROW
67.484	68.240	0.756	Non-Irrigated
68.240	68.246	0.006	ROW
68.246	69.661	1.415	Non-Irrigated
69.661	69.663	0.002	ROW
69.663	69.842	0.179	Non-Irrigated
69.842	69.961	0.119	Rangeland/Native
69.961	70.025	0.063	Non-Irrigated
70.025	70.157	0.132	Rangeland/Native
70.157	70.165	0.008	ROW
70.165	70.451	0.286	Non-Irrigated
70.451	70.488	0.037	Rangeland/Native
70.488	70.492	0.005	Riparian
70.492	71.987	1.495	Rangeland/Native
71.987	72.000	0.012	ROW
72.000	72.553	0.553	Rangeland/Native
72.553	72.639	0.087	ROW

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
72.639	72.799	0.160	Rangeland/Native
72.799	72.819	0.020	ROW
72.819	72.899	0.080	Non-Irrigated
72.899	72.918	0.020	Rangeland/Native
72.918	72.949	0.031	Riparian
72.949	73.411	0.462	Rangeland/Native
73.411	73.489	0.077	Non-Irrigated
73.489	73.523	0.034	Rangeland/Native
73.523	73.534	0.011	ROW
73.534	73.555	0.021	Rangeland/Native
73.555	73.605	0.050	Non-Irrigated
73.605	73.635	0.030	Rangeland/Native
73.635	73.641	0.006	Riparian
73.641	73.704	0.063	Rangeland/Native
73.704	73.713	0.009	ROW
73.713	73.938	0.226	Rangeland/Native
73.938	74.005	0.066	Riparian
74.005	74.528	0.523	Rangeland/Native
74.528	74.542	0.015	ROW
74.542	75.262	0.720	Rangeland/Native
75.262	75.272	0.011	ROW
75.272	75.645	0.373	Rangeland/Native
75.645	75.648	0.003	Riparian
75.648	75.660	0.011	Rangeland/Native
75.660	75.664	0.005	Riparian
75.664	75.691	0.027	Rangeland/Native
75.691	75.695	0.004	Riparian
75.695	75.744	0.049	Rangeland/Native
75.744	75.817	0.073	Non-Irrigated
75.817	75.999	0.182	Rangeland/Native
75.999	76.338	0.340	Non-Irrigated
76.338	76.384	0.046	Rangeland/Native
76.384	76.434	0.051	Riparian
76.434	76.628	0.194	Rangeland/Native
76.628	76.871	0.242	Non-Irrigated
76.871	77.630	0.760	Rangeland/Native
77.630	77.640	0.009	ROW
77.640	77.844	0.204	Rangeland/Native
77.844	77.854	0.010	Agriculture
77.854	78.490	0.636	Rangeland/Native
78.490	78.642	0.153	Non-Irrigated
78.642	78.693	0.051	Rangeland/Native
78.693	78.700	0.007	Riparian
78.700	79.150	0.450	Rangeland/Native

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
79.150	79.391	0.241	Non-Irrigated
79.391	79.485	0.094	Rangeland/Native
79.485	79.785	0.300	Non-Irrigated
79.785	79.957	0.171	Rangeland/Native
79.957	80.171	0.214	Non-Irrigated
80.171	80.496	0.325	Rangeland/Native
80.496	80.506	0.010	Riparian
80.506	81.028	0.522	Rangeland/Native
81.028	81.047	0.020	Riparian
81.047	81.518	0.471	Rangeland/Native
81.518	81.525	0.006	ROW
81.525	81.670	0.146	Rangeland/Native
81.670	81.708	0.038	Riparian
81.708	81.750	0.042	Rangeland/Native
81.750	81.766	0.016	Riparian
81.766	81.807	0.041	Rangeland/Native
81.807	82.029	0.222	ROW
82.029	82.762	0.733	Non-Irrigated
82.762	82.773	0.011	Water
82.773	83.279	0.506	Rangeland/Native
83.279	83.301	0.021	ROW
83.301	83.484	0.184	Rangeland/Native
83.484	83.536	0.051	Non-Irrigated
83.536	83.624	0.088	Rangeland/Native
83.624	83.661	0.037	Non-Irrigated
83.661	83.695	0.035	Rangeland/Native
83.695	83.708	0.012	Non-Irrigated
83.708	83.822	0.114	Rangeland/Native
83.822	84.517	0.695	Non-Irrigated
84.517	84.531	0.013	Rangeland/Native
84.531	85.390	0.859	Non-Irrigated
85.390	85.445	0.056	Rangeland/Native
85.445	86.190	0.745	Non-Irrigated
86.190	86.266	0.076	Rangeland/Native
86.266	86.469	0.203	Non-Irrigated
86.469	86.616	0.147	Rangeland/Native
86.616	86.646	0.030	Non-Irrigated
86.646	86.796	0.150	Rangeland/Native
86.796	86.915	0.119	Non-Irrigated
86.915	87.265	0.350	Rangeland/Native
87.265	87.340	0.075	Non-Irrigated
87.340	87.406	0.065	Rangeland/Native
87.406	87.467	0.061	Non-Irrigated
87.467	87.537	0.069	Rangeland/Native

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
87.537	87.580	0.043	Non-Irrigated
87.580	87.601	0.021	Rangeland/Native
87.601	87.666	0.065	Non-Irrigated
87.666	87.859	0.193	Rangeland/Native
87.859	87.972	0.113	Non-Irrigated
87.972	89.106	1.134	Rangeland/Native
89.106	89.346	0.240	Non-Irrigated
89.346	89.387	0.041	Rangeland/Native
89.387	89.395	0.008	Riparian
89.395	89.800	0.405	Non-Irrigated
89.800	90.190	0.389	Rangeland/Native
90.190	90.203	0.014	Riparian
90.203	90.495	0.292	Rangeland/Native
90.495	90.511	0.017	ROW
90.511	90.564	0.052	Rangeland/Native
90.564	90.570	0.006	Riparian
90.570	90.653	0.083	Rangeland/Native
90.653	90.662	0.009	ROW
90.662	90.791	0.129	Rangeland/Native
90.791	90.802	0.011	Riparian
90.802	90.946	0.144	Rangeland/Native
90.946	91.112	0.166	Non-Irrigated
91.112	91.125	0.013	ROW
91.125	91.217	0.092	Non-Irrigated
91.217	91.226	0.009	Water
91.226	92.003	0.777	Non-Irrigated
92.003	92.025	0.022	Rangeland/Native
92.025	92.338	0.313	Non-Irrigated
92.338	92.409	0.071	Rangeland/Native
92.409	92.690	0.281	Non-Irrigated
92.690	92.695	0.005	ROW
92.695	93.889	1.194	Non-Irrigated
93.889	94.048	0.159	Rangeland/Native
94.048	94.069	0.021	Non-Irrigated
94.069	94.250	0.181	Rangeland/Native
94.250	94.403	0.154	Non-Irrigated
94.403	94.470	0.067	Rangeland/Native
94.470	94.488	0.018	Riparian
94.488	94.563	0.075	Rangeland/Native
94.563	94.819	0.256	Non-Irrigated
94.819	94.827	0.008	ROW
94.827	94.922	0.095	Non-Irrigated
94.922	95.061	0.138	Irrigated
95.061	95.424	0.364	Rangeland/Native

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
95.424	96.504	1.079	Non-Irrigated
96.504	96.510	0.006	ROW
96.510	97.109	0.599	Non-Irrigated
97.109	97.113	0.004	ROW
97.113	97.783	0.670	Non-Irrigated
97.783	97.827	0.044	Rangeland/Native
97.827	98.017	0.190	Non-Irrigated
98.017	98.781	0.764	Rangeland/Native
98.781	98.791	0.010	ROW
98.791	98.962	0.171	Rangeland/Native
98.962	98.972	0.010	ROW
98.972	99.346	0.374	Rangeland/Native
99.346	99.372	0.026	Riparian
99.372	99.406	0.034	Water
99.406	99.422	0.016	Riparian
99.422	99.593	0.170	Rangeland/Native
99.593	99.766	0.173	Non-Irrigated
99.766	99.819	0.054	Rangeland/Native
99.819	99.967	0.148	Non-Irrigated
99.967	100.340	0.372	Rangeland/Native
100.340	100.726	0.386	Non-Irrigated
100.726	100.737	0.011	ROW
100.737	101.293	0.556	Non-Irrigated
101.293	101.298	0.005	ROW
101.298	101.536	0.239	Non-Irrigated
101.536	101.798	0.262	Rangeland/Native
101.798	102.176	0.377	Non-Irrigated
102.176	102.181	0.005	ROW
102.181	102.409	0.228	Non-Irrigated
102.409	102.414	0.006	ROW
102.414	103.516	1.101	Rangeland/Native
103.516	103.531	0.015	ROW
103.531	103.700	0.169	Rangeland/Native
103.700	103.739	0.039	ROW
103.739	104.520	0.781	Rangeland/Native
104.520	104.658	0.139	Non-Irrigated
104.658	105.428	0.770	Rangeland/Native
105.428	105.438	0.010	Riparian
105.438	105.651	0.213	Rangeland/Native
105.651	105.680	0.029	Riparian
105.680	106.625	0.945	Rangeland/Native
106.625	106.638	0.013	Riparian
106.638	107.567	0.929	Rangeland/Native
107.567	107.573	0.006	ROW

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
107.573	108.341	0.768	Rangeland/Native
108.341	108.347	0.006	ROW
108.347	109.233	0.886	Rangeland/Native
109.233	109.239	0.006	ROW
109.239	109.275	0.035	Rangeland/Native
109.275	109.284	0.009	ROW
109.284	109.615	0.331	Non-Irrigated
109.615	109.644	0.029	Agriculture
109.644	109.725	0.081	ROW
109.725	109.910	0.186	Non-Irrigated
109.910	109.914	0.004	ROW
109.914	110.855	0.941	Non-Irrigated
110.855	110.862	0.007	ROW
110.862	112.099	1.237	Non-Irrigated
112.099	112.104	0.005	ROW
112.104	112.219	0.115	Non-Irrigated
112.219	112.269	0.050	Agriculture
112.269	112.424	0.155	Riparian
112.424	112.693	0.269	Non-Irrigated
112.693	112.802	0.109	Riparian
112.802	113.318	0.515	Non-Irrigated
113.318	113.325	0.008	ROW
113.325	114.416	1.091	Non-Irrigated
114.416	114.423	0.007	ROW
114.423	117.955	3.532	Non-Irrigated
117.955	117.964	0.009	ROW
117.964	120.156	2.192	Non-Irrigated
120.156	120.185	0.029	Riparian
120.185	120.472	0.288	Non-Irrigated
120.472	120.477	0.005	ROW
120.477	121.449	0.972	Non-Irrigated
121.449	121.590	0.141	Rangeland/Native
121.590	121.609	0.019	ROW
121.609	122.651	1.042	Rangeland/Native
122.651	123.126	0.476	Non-Irrigated
123.126	123.148	0.022	ROW
123.148	123.782	0.634	Non-Irrigated
123.782	123.833	0.051	Rangeland/Native
123.833	124.392	0.559	Non-Irrigated
124.392	124.648	0.256	Rangeland/Native
124.648	124.658	0.009	ROW
124.658	126.163	1.506	Non-Irrigated
126.163	126.167	0.004	ROW
126.167	127.055	0.888	Non-Irrigated

TABLE H- 14 LAND USES CATEGORIES CROSSED BY ALTERNATIVE 4			
Mile Post Begin	**Mile Post End**	**Distance (Miles)[1]**	**Land Use**
127.055	127.072	0.017	Riparian
127.072	127.394	0.321	Non-Irrigated
127.394	127.530	0.136	Riparian
127.530	127.657	0.126	Rangeland/Native
127.657	127.671	0.015	ROW
127.671	128.085	0.414	Non-Irrigated
128.085	128.427	0.342	Rangeland/Native
128.427	128.665	0.238	Non-Irrigated
128.665	128.667	0.002	ROW
128.667	129.908	1.241	Non-Irrigated
129.908	129.922	0.013	ROW
129.922	130.466	0.544	Non-Irrigated
130.466	130.498	0.033	Riparian
130.498	131.414	0.915	Non-Irrigated
131.414	134.329	2.915	Rangeland/Native
134.329	135.265	0.937	Non-Irrigated
135.265	135.283	0.018	ROW
135.283	137.583	2.300	Non-Irrigated
137.583	137.603	0.020	Riparian
137.603	137.619	0.016	Non-Irrigated
137.619	137.655	0.036	Riparian
137.655	137.770	0.116	Non-Irrigated
137.770	137.781	0.011	ROW
137.781	137.896	0.115	Non-Irrigated
137.896	137.917	0.020	Rangeland/Native
137.917	137.977	0.060	Riparian
137.977	138.054	0.077	Rangeland/Native
138.054	138.106	0.052	Riparian
138.106	138.131	0.026	Rangeland/Native
138.131	139.100	0.969	Non-Irrigated
139.100	139.116	0.016	Rangeland/Native
139.116	139.634	0.517	Non-Irrigated
0	139.634	139.634	Total

[1] Subtracting the beginning Distance (Miles)1 from the ending Distance (Miles)1 does not necessarily equal the total Distance (Miles)1 displayed due to rounding.

APPENDIX L:
PHOTOGRAPHIC SIMULATIONS

APPENDIX L

Photographic Simulations

Technical information on the generation of photographic simulations is provided here. Computer Aided Design (CAD), Geographic Information System (GIS), and 3-dimensional (3-D) modeling and design software, Global Positioning Systems (GPS) equipment, a Digital Single Lens Reflex (dSLR) camera, and direct conversations with individuals responsible for transmission line pole design were used to prepare the photograph simulations. Photographs were taken in the field at the defined viewpoint locations and used as backgrounds in the computer generated images. Several 3-D models were constructed of the topography and transmission line poles. Pole placement was performed using GIS software. The computer camera placed the poles in the 3-D model at the appropriate location and the images were generated.

On-site GPS data were obtained using the Pharos GPS Pocket Navigator package for a hand-held Dell Axim 51 PDA. Data recorded included date, time of day, latitude, longitude, elevation, and heading. Heading was verified with a hand-held compass. On-site photographs were acquired using a Canon 350D dSLR (1.6 crop factor) and a Canon 18-55 mm zoom lens. Camera information recorded and verified from photograph EXIF information included: film speed, focal length, aperture, and shutter speed. Photographs were saved as both unprocessed data from the image sensor and in a compressed format.

Montana Digital Elevation Model (DEM) data were obtained from the National Elevation Dataset (NED) as of April 2002 for each of the viewpoints. The data used included 30-meter X-Y resolution and one foot resolution in the Z-plane. Horizontal datum is North American Datum of 1927 (NAD27) with a transverse mercator projection, and National Geodetic Vertical Datum (NGVD) 1929 vertical datum.

The proposed transmission line route was presented in the MFSA application (MATL 2006b). The transmission line map datum was converted to NAD27, so that the line could be exported and then re-imported into the 3-D modeling software and aligned with the NAD27 based DEMs. Transmission line and proposed pole specifications and details were obtained from SNC-Lavalin ATP Inc. (2006). Scaled 3-D models were constructed for each of the proposed power pole types and placed into the 3-D model along the proposed transmission line alignment using specified or recommended span distances between poles. Typical conductor and ground cable sag specifications were used unless otherwise specified by SNC-Lavalin.

For each simulation, the photograph taken in the field was imported into the 3-D modeling software package and loaded as a background environment within which the view of the 3-D model is generated. To generate the correct view relative to the actual photograph, a software camera was placed at a location identical to where the photograph was taken relating the field location to the DEM location. Using the JEEEP.com coordinate translation applet, GPS recorded camera locations were converted to Universal Transverse Projection (UTM) northing and easting locations to facilitate placement of the software camera.

APPENDIX M:
MATL SYSTEM IMPACT STUDY AND WECC LETTER

Brian Silverstein
Chair, Planning Coordination Committee
Bonneville Power Administration

(360) 418-2122
blsilverstein@bpa.gov

August 28, 2007

PLANNING COORDINATION COMMITTEE
OPERATING COMMITTEE
TECHNICAL STUDIES SUBCOMMITTEE

Subject: Montana Alberta Tie Ltd. Achieves Phase 3 Status

The MATL project initiated the WECC planning process on September 20, 2005. The Project is a 346 kM, 230/240kV transmission line designed for continuous bidirectional power transfers of over 300 MW. The project consists of a new substation in Alberta that ties into the existing 240 kV Alberta Interconnected Electric System (AIES) system. A phase shifting transformer will be installed to control flows both north and south and to step the voltage down from the Alberta nominal system voltage of 240 kV to the transmission line voltage of 230 kV. A mid-point substation named Marias will be built south of the town of Cut Bank, Montana. The Marias Substation will contain voltage support and be a connection point for proposed wind generation projects in the area. At the south end, the MATL transmission line will terminate at the existing Great Falls, Montana, 230 kV substation.

On February 2, 2006, the Project received Phase II status. A Project Review Group (PRG) was formed and was comprised of representatives from Bonneville Power Administration, Northwestern Energy, Western Area Power Administration, Avista Corporation, AESO, British Columbia Transmission Corporation, TransCanada – Northern Lights Transmission, PacifiCorp, Powerex, and ENMAX Power Corporation.

A Final Draft of the Phase 2 Report was submitted to the MATL Project Review Group (PRG) on June 11, 2007. All comments received have been addressed to the satisfaction of each party providing comments.

On July 25, 2007, MATL sent a request to the PCC to enter Phase 3, along with the PRG Report. No additional comments were received during the 30-day review process. Therefore, in accordance with the WECC Three Phase Project Rating Process, the MATL Project is hereby granted Phase III status with an Accepted Rating of +/- 300 MW.

Sincerely,
Brian Silverstein

Brian Silverstein

cc: Kent Bolton, WECC
Peter Mackin, USE

MONTANA ALBERTA TIE LTD

MONTANA-ALBERTA TIE LTD.
PROJECT REVIEW GROUP

PHASE 2 STUDY REPORT

PROJECT REVIEW GROUP ACCEPTED
JULY 24, 2007

REGISTERED PROFESSIONAL ENGINEER
R. PETER MACKIN
No. 12018
EXP. 9/30/07
ELECTRICAL
STATE OF CALIFORNIA

	Name	Signature	Date
Prepared	Peter Mackin, P.E. Utility Systems Efficiencies, Inc.	R. Peter Mackin	07/24/07
Approved	Mark Abraham, P.Eng. Montana Alberta Tie Ltd.		July 24, 2007

I. EXECUTIVE SUMMARY

Project Overview

Montana Alberta Tie, Ltd. (MATL), a wholly owned subsidiary of Tonbridge Power Inc., is proposing to build a 240/230 kV merchant transmission line from the Lethbridge area in southern Alberta to Great Falls in west-central Montana. This project is Alberta's first direct interconnection to the United States and Montana's first direct interconnection with Alberta. The Project will provide import/export opportunities for power markets in Montana and Alberta and enable wind development opportunities in southern Alberta and northern Montana since the transmission route traverses a region of substantial wind development potential.

The MATL project is a 240/230kV, 330 MVA transmission line designed for continuous bi-directional power transfers of over 300 MW. The project consists of a new substation, named MATL 120S, located approximately 15 km north of the City of Lethbridge, Alberta that ties into the existing 240 kV Alberta Interconnected Electric System (AIES) system. A phase shifting transformer will be installed in the MATL 120S substation to control flows both north and south and to step the voltage down from the Alberta nominal system voltage of 240 kV to transmission line voltage of 230 kV. A mid-point substation named Marias will be built approximately 10 km south of the town of Cut Bank, Montana. The Marias Substation will contain shunt and series capacitance for voltage support and the substation will be a connection point for proposed wind generation projects in the area. At the south end, the MATL transmission line will terminate at the existing Great Falls, Montana, 230 kV substation. The Great Falls Substation is owned and operated by NorthWestern Energy Inc. The transmission line is approximately 346 km long, uses single Falcon 1590 kcmil conductor, and will be built of a combination of monopole and H-frame structures.

Phase 2 Path Rating Process

On August 19, 2005, MATL initiated the WECC Regional Planning Process for the MATL project through an invitation letter to WECC Planning Coordination Committee (PCC) and Technical Studies Subcommittee (TSS) to form a Regional Planning Review group. A project review group was formed and on December 7, 2005, MATL submitted a Regional Planning Project Report to the PCC. No comments were received during the 30 day comment period. Accordingly, on January 23, 2007, the PCC notified MATL that the Regional Planning Project Review had been completed.

On September 20, 2005, MATL initiated the WECC Path Rating Process for the MATL Project through the submittal of a Comprehensive Progress Report to the PCC and TSS as well as an invitation to form a Path Rating Project Review Group (PRG). During the 60-day comment period, MATL received requests from WECC members to participate in the PRG. On February 2, 2006, the TSS confirmed the MATL Project had achieved Phase 2 status.

As a result of a combination of regulatory, commercial and technical factors, MATL made scope changes to the project and notified the PCC and the TSS of these changes on August 30, 2006. The most notable changes were the addition of series compensation to the transmission line at the Marias Substation in order to increase the emergency rating of the MATL project and the inclusion of a 120MW of wind generation connection to the Marias Substation. Because of these major changes, MATL re-opened the PRG to new WECC members. Two new members subsequently joined.

Study Plan

The MATL PRG developed a study plan to analyze the impact of the MATL system on neighboring systems. The Phase 2 study is based on a planned in service date of the MATL project of 2008. The MATL Rating Study Scope included the MATL proposed path rating flows defined as -300 MW power transfers into the connection point in Alberta (MATL 120S) from Montana (north flows) and +325 MW power transfers (metered at MATL 120S) from Alberta toward NorthWestern Energy system in Montana (south flows) under the WECC 2007 Heavy Summer and 2007 Light Spring base cases. These flows are effectively 300 MW delivered at the interface ends of the line as MATL line losses at rated flow are approximately 25 MW. Sensitivities include Great Falls, Montana generation, a wind generation connection at the Marias Substation and wind generation in southern Alberta. The wind generation sensitivity at Marias was subsequently removed from the study scope by MATL (with the concurrence of the MATL PRG) in order to expedite the submittal of the Phase 2 Project Rating Report. The TSS was notified of the removal of the Marias wind generation sensitivity on June 11, 2007.

The MATL PRG has performed and reviewed Phase 2 Rating studies according to the guidelines in the WECC "Procedures for Regional Planning Project Review and Rating Transmission Facilities". The purpose of these studies is to demonstrate that the MATL project conforms, or will be able to conform to, all applicable Reliability Criteria. In addition, these studies:

- identify the planned non-simultaneous transfer capability and the planned simultaneous path transfer capability limits for the proposed project configuration,
- address the mitigation of simultaneous transfer capability issues relative to the existing system, and
- resolve comments from BPA, NWE, and BCTC on the MATL Comprehensive Progress Report.

No changes to the current existing WECC path ratings are contemplated or implied in this report.

Conclusion

In conclusion, the non-simultaneous study demonstrates the MATL project meets NERC/WECC Planning and reliability standards for the proposed path rating of 300 MW northbound and 325 MW southbound, as defined at the MATL 120S metering point, under certain conditions stipulated in this Report.

The conditions identified that require remedial action schemes (RAS) are:

1. Loss of Langdon - Cranbrook,

2. Loss of Cranbrook - Selkirk,
3. Loss of Selkirk - Ashton Creek and Selkirk - Vaseux Lake,
4. Loss of both Ingledow - Custer lines (when BC would separate from the US), and
5. Loss of both Custer - Monroe lines (when BC would separate from the US).

These five contingencies will require a RAS to trip MATL to prevent voltage collapse or transient instability from occurring. The RAS is intended to be armed at all times that the MATL project is in service. If the RAS is out of service for any reason, it is expected that the MATL line will need to be taken out of service to preserve system reliability. Future operating studies may look at possibly defining a lower boundary for RAS arming. If system flows are below the boundary levels defined in the studies, then the RAS may not need to be armed.

In addition to the above RAS, other conditions identified that require mitigation are:

1. Loss of the MATL tie when Nelway - Boundary flow is at or near its limits and the MATL flow is in the same direction as the Nelway - Boundary flow will require either a RAS to trip Nelway - Boundary or an operating procedure to issue a tap changer adjustment order for the Nelway phase shifting transformer.

2. Loss of large amounts of generation in Montana due to operation of the Colstrip ATR can cause a large increase in flows on the MATL project. In order to mitigate these overloads, the MATL phase shifting transformer will need to be adjusted or the MATL line will need to be tripped.

This study also identified simultaneous transfer capability of MATL versus Path 1, Path 3 and Path 8. Nomograms were developed for these simultaneous relationships for the cases studied. In all nomograms, the metering point on MATL is assumed to be the MATL 120S Substation. For the cases studied, MATL and either Path 1 or Path 3 cannot both simultaneously achieve rated transfers due to constraints outside the MATL line and Path 1 or Path 3. Under these operating conditions, simultaneous operating limits (nomograms) or other mitigation methods are required to meet NERC/WECC Planning Standards. Studies for Path 8 indicate there is potential for interaction between MATL and Path 8 transfers. Further operational studies are required to confirm impacts, if any, and corresponding mitigation. These simultaneous conditions are:

1. High simultaneous transfers on Path 1 and MATL,

2. High simultaneous transfers on Path 3 and MATL,

3. High simultaneous transfers on Path 8 and MATL (not confirmed)

Further details regarding the magnitude of the required curtailments and the contingencies that create the need for these curtailments are provided in the Results sections of this report. This report identified limits of simultaneous interactions for specific system conditions defined for MATL path rating purposes. Further studies for a variety of system conditions are needed to establish actual operating limits.

A thorough investigation of flowgates in the Great Falls area has uncovered the existence of five potential flowgates that can limit export from Great Falls in the north-to-south direction.

The first four of these flowgates have limits that allow anywhere from 245 MW to 675 MW of additional power to be injected into the Great Falls 230 kV bus under heavy summer conditions and anywhere from 510 MW to 640 MW of additional power to be injected into the Great Falls 230 kV bus under light spring conditions[1].

The last flowgate (the Great Falls - Landers Fork - Ovando 230 kV flowgate) is constrained by voltage deviations on NWE's 100 kV system in the vicinity of Townsend. Because this constraint is based on voltage deviations, it is difficult to quantify this limit as a function of MW flows through a flowgate. While studies have shown that the other four flowgate limits are usually reached first, there is a possibility that the Great Falls - Landers Fork - Ovando 230 kV flowgate could be limiting. For this reason, either system reinforcements or a RAS may be needed to mitigate the impacts of the Great Falls - Landers Fork - Ovando 230 kV line outage.

The conclusions are based on a comparative analysis between pre-project base case conditions and the base case with the proposed MATL project under the same conditions. This study did not investigate conditions that could not meet WECC/NERC reliability in the pre-project case. In particular, Path 1 flows used in this study were well below the 1000 MW east to west and 1200 MW west to east path rating limit because of limitations in the AIES system.

Mitigation Plan

Also required as part of the Phase 2 process is the mitigation plan. MATL's mitigation plan is to:

- develop a mitigation implementation and responsibility plan
- design and implement protection, control and remedial action schemes to meet the mitigation objectives identified in this report or that may be identified through the operating study process,
- comply with WECC Procedures for Project Rating Review subject to the requirements or orders from the connecting Transmission Service Providers or Path Operators.
- operate within transfer capabilities identified in this report or that may be identified through operational studies,
- design and operate to NERC/WECC Planning Standards,
- develop operating procedures or operate to procedures of respective connecting electrical system operators to maintain WECC reliability, and
- negotiate agreements to resolve conflicts as a means to formulate a mitigation strategy with impacted parties where applicable.

For impacts to Path 3 flows as identified in the MATL vs. Path 3 nomogram, MATL's mitigation plan is to:

[1] Note that these additional power injections are subject to the conditions defined in the base cases and were used for the PRG's analysis of the MATL project. Actual allowable power transfer limits will be determined by the area electrical system operator(s).

A. Develop, fund and implement a RAS mutually acceptable to BCTC and/or AESO as appropriate which will reduce or eliminate the MATL impact

B. If the RAS cannot be implemented prior to MATL being energized, MATL, BCTC and other affected transmission operators will develop operating procedures to keep the amount of power that Path 3 can transfer protected from being diminished due to MATL flows. This operating procedure may include curtailing MATL.

C. If a RAS cannot be implemented to fully protect Path 3 transfers from being diminished due to MATL flows, operating procedures to protect Path 3 transfers will be in place along with the RAS.

The details of the mitigation plan will be developed in coordination with impacted electrical system operators and other impacted parties. MATL proposes to execute this plan in Phase 3.

Next Steps

Completion of Phase 2 (acceptance of this report by WECC) is one step towards the construction and ultimate operation of the proposed Montana – Alberta 240/230 kV merchant transmission line. More operational study work including development of operational procedures and tools as well as the detailed design and implementation of remedial action schemes (RAS) is required to fully define definitely the envelope of operation for this project. The time to study, design and implement the special protection schemes in addition to the necessary review by the WECC Remedial Action Scheme Reliability Subcommittee (RASRS) could be upwards of one year or more, which may restrict the operational capability of the proposed merchant transmission line until final design, review and implementation of the remedial action schemes are complete.

MONTANA ALBERTA TIE LTD

April 2, 2007

Tom Ring
Senior Environmental Specialist
Facility Siting Program
Montana Department of Environmental Quality
1520 East Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901
U.S.A.

COPY

Dear Mr. Ring:

Subject: Appendix M of the Draft EIS for Public Comment re: MATL Project

Attached is the NorthWestern Energy (NWE) system impact study that is required for Appendix M of the Environmental Impact Statement (EIS) prepared by the DEQ. MATL requests that the DEQ also include the attached interim progress report on the Western Electricity Coordinating Council (WECC) in Appendix M of the EIS.

MATL would like to address the purpose of the NWE Impact Study (Impact Study) and the WECC Path Rating Study (Path Rating Study). The purpose of both the Impact Study and Path Rating Study is to assess impact of the MATL project on the reliability of the electric transmission grid. The Impact Study addresses the impact on the reliability of the NorthWestern transmission grid, whereas the Path Rating Study addresses the impact on the reliability of the greater western interconnected transmission grid, including NorthWestern Energy's grid and that controlled by the Alberta Electric System Operator.

The key steps conducted for both Impact and Path Rating Studies are:

1. Determine which operating conditions (Base Cases) will be studied to assess the reliability of the transmission grid;
2. Determine how the Base Cases are affected under different operating scenarios (Contingencies);
3. Compare the study results to reliability criteria, set by WECC to assess whether the study results meet reliability criteria or not;
4. In the event that a Base Case does not meet reliability criteria under certain Contingencies, determine an appropriate mitigation plan to ensure such Base Cases do meet the applicable reliability criteria. Typical mitigation plans include the setting operational limits, or implementing remediation control schemes.

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NWE System Impact Study

Currently, MATL and NWE are working together on the facility design and the Interconnection Agreement for the 300MW bi-directional tie at the Great Falls 230 kV Substation. MATL would now like to address the conditions identified in the NWE Impact Study that may limit the transfer capability under certain conditions:

1. The two existing 100 MVA 230/100 kV autotransformers are limiting the power transfer out of the Great Falls 230 kV substation to zero MW.

   MATL's interconnect agreement with NorthWestern stipulates that MATL will pay the cost to replace the two existing 100 MVA autotransformers with two 200 MVA autotransformers, thereby mitigating autotransformer overloads identified in the contingency analysis. As stated in the NWE Impact Study, the existing autotransformers would also need to be replaced to interconnect other projects that are senior to the MATL project in NorthWestern's queue.

2. NorthWestern has requested that MATL consider the operation and voltage set points of the switched shunt capacitors at MATL's Marias substation to prevent high voltage situations.

   MATL will ensure that it's facilities are designed to be operated in accordance with WECC requirements. NorthWestern, in its role as the control area operator of the MATL line in Montana, will have the authority to determine the appropriate set points for the switched shunt capacitors at the Marias substation.

3. Under certain conditions, the south bound flows over the MATL line are constrained in the year 2010LA (light autumn) and year 2012HS (heavy summer) cases to 170-190MW range by the 79 degree angle limit of the phase shifting transformer (PST).

MATL does not consider the PST angle limit as an impediment to commercial operations of the line because the system conditions that create the south bound phase angle limit are typically when south bound flows would be un-economical in any event. The conditions where south bound phase limit occur is when there is heavy power flow east from British Columbia (BC) into Alberta through path #1 and heavy power flow west from Montana into the Pacific North West through Path #8. Short term opportunity power flow would be scheduled in these directions when the market price of electricity was higher in Alberta and the Pacific North West than in BC or Montana and under those same pricing conditions the market would normally want to move power northbound over the MATL line as opposed to southbound.

WECC Path Rating Studies

The enclosed letter from Mr. Peter Mackin, Vice President, Reliability Services & Principal Power System Analyst, Utilities System Efficiencies, confirms that the conclusions of his report dated 16 January 2007 are still valid, that is to say that a path rating of 300 MW, both north to south and south to north, is anticipated at the conclusion of the WECC Path Rating process.

Respectfully,

Robert L. Williams

Bob Williams
Vice President, Regulatory
Enclosures (3)

NorthWestern™
Energy

Montana Alberta Tie Line (MATL)

Third Revision

System Impact Study

Stand-Alone & Co-Existing

September 26, 2006

Electric Transmission Planning

Table of Contents

Executive Summary

NorthWestern Energy (NWE) has completed the System Impact Study (SIS) for the Montana Alberta Tie Line (MATL) Project on December 22, 2005. As per the request of MATL to reword the conclusions in the original SIS report, NWE made required wording changes and submitted a revised SIS on February 9, 2006. Upon completion of the SIS, the Facilities Study is to commence. At the beginning of the Facilities Study, it is NWE's practice to confirm the SIS results and mitigation requirements. However, MATL made changes to the line design, interconnection point in Alberta and increased the length of the line. As a result of these modifications, another SIS is necessary to identify the problems and mitigation before the Facilities Study commences. Also, the new Great Falls - Ovando 230 kV line included in the original SIS as a fix for a senior queue project is not needed anymore and hence it is removed in the base case for this study. The study results and the necessary mitigation changed with all these modifications.

This System Impact Study examines the physical interconnection to the Great Falls 230 kV Switchyard and does not constitute a request for transmission service. These studies examine the physics of the electrical system and do not imply that the users of the transmission line will receive any transmission required to deliver the output to load beyond the Great Falls 230 kV Switchyard. The users of the MATL transmission line must follow the procedures described in the transmission tariff available on NWE's OASIS site to request and/or reserve Transmission Service or a Generation Interconnection.

The goal of the System Impact Study is to identify improvements or changes needed in NWE's electric transmission system to reliably *interconnect* your project to NWE's transmission system only. This study does not make any specific presumptions or recommendations regarding NWE's system improvements that will be required to move power away from NWE's 230 kV Switchyard. NWE's transmission system mitigation requirements will be fully defined for the specific Transmission Service Requests to move power away from (or to) NWE's Great Falls 230 kV Switchyard once NWE has received the requests. NWE has not received a Transmission Service Request (TSR) or a Generation Interconnect Application (GIA) that will be associated with (or connected to) the MATL line.

This study was designed to answer two questions:

(I) What is the available unused capability of the Great Falls 230 kV Switchyard with the MATL line interconnected?

Stand-Alone and Co-Existing:

- The existing unused capability of the Great Falls 230 kV Switchyard without any system or network upgrades is 0 MW.

(II) What transmission system upgrades are necessary to allow your line to be interconnected.

Stand-Alone and Co-Existing:

- The overload of the two Great Falls 230/100 kV autotransformers must be mitigated. The mitigation required must be coordinated with senior queue N-1 mitigation requirements. With the autotransformer upgrades, the MATL line will be able to connect its 230 kV line to the GF 230 kV Switchyard without further mitigation in the switchyard based on the information provided and analyzed in this study.

- MATL needs to consider the voltage set points of the switched shunts to prevent high voltages during all conditions (N-0, N-1 and N-2). Also, the high voltages at the proposed Marias and MATL 230 kV buses are present for other contingency conditions.

The above mitigation will be required before the MATL project can be connected to NWE's transmission system. The study results may change if there are changes to MATL's queue position or to the line design and interconnection specifications provided by you to NWE. Any variation in the line or interconnect specifications must be reported to NWE, so a thorough review and/or study can be conducted by NWE. Such review and/or study may yield results different from this analysis, and different mitigation requirements may be required.

The following tables are a summary of the high-level non-binding cost estimates. The cost estimates will be finalized in the Facilities Study. (All estimates are denominated in 2006 US dollars).

Table 1. Cost Estimates for MATL to interconnect

Interconnection Cost Estimate	$M *Cost*
230 kV Switchyard Upgrades	5.605*
Transmission Provider Interconnection Facilities	0.145
Total Cost Estimate	5.750

This study examined the physical performance of the electrical transmission system and does not imply: 1) that transmission service will be received, or 2) entitlement to transmission service that is required to deliver the generation output to load. Conducting a Transmission Service Request Study will be required and may identify additional electric transmission system improvements required on NWE's or other electric transmission provider's transmission systems. It must be noted that upgrades to transmission paths that interconnect NWE with other transmission systems may be identified and required as a result of the Transmission Service Request Study. This may make it necessary to enter into a WECC Regional Planning Process and/or a Three Phase Rating Process. It is possible that fulfilling these WECC requirements may take considerable time.

Definitions

Stand-Alone Study

A stand-alone (SA) study is designed to identify changes in the reliability of the local and regional electric transmission system by comparing the performance of the system with and without the addition of the MATL facility. The Stand-Alone Study and associated results represent the transmission system with existing resources and without senior queue generation projects and associated system mitigation that will come online at a later date than the MATL. The mitigation identified for the Stand-Alone Study must be implemented before the MATL facility can interconnect.

Co-Existing Study

A co-existing (CE) study identifies and evaluates the MATL facility's impact to the transmission system when all relevant generators are also interconnected to NWE's system. The relevant generators include all existing generators and potential new generators that are senior to MATL's queue position. MATL must implement mitigation for problems caused by its interconnection as identified in the Co-Existing System Impact Study. Implementation of some of the MATL mitigation requirements may be appropriately timed, and be completed before the commercial operation of senior queued generation that has a commercial operation date later than MATL.

* This cost might be less, as the mitigation listed for the autotransformers (approximately $3.6M) is to be coordinated with the N-1 senior queue mitigation.

Project Description

The following data is used for the Third Revision SIS of the MATL project. The impedance data used in this project are as shown in the Table 1 below.

Table 2. Line Impedance data

	FROM	TO	Length (Mi)	R (pu)	X (pu)	B (pu)
PST Data	N LETH 240 kV	MATL 240 kV	NA	0	0.04697	0
Transformer Data	MATL 240 kV	MATL 230 kV	NA	0	0.01904	0
Line Data	MATL 230 kV	MATL SC1 230 kV	126.56	0.01529	0.17927	0.38589
Series Cap Data	MATL SC1 230 kV	Marias 230 kV	NA	0	-0.11652	0
Series Cap Data	Marias 230 kV	MATL SC2 230 kV	NA	0	-0.06536	0
Line Data	MATL SC2 230 kV	GT Falls 230 kV	91.82	0.01109	0.13072	0.27736

The Phase shifting transformer rating is 330 MVA and the Impedance is 15% on 330 MVA base, with an angle of ±79 degrees. There are two switched shunts, rated 50 MVAr of 2 blocks and 40 MVAr of 4 blocks at the new MATL 240kV and 230 kV substations respectively.

Study Parameters

Senior Queue Network Generators

In modeling the appropriate parameters for the Co-Existing System Impact Study it was necessary to include the following relevant, potential new network generators that are senior to your project's queue position.

1. 188 MW at Judith gap (existing plant)
2. 109 MW at Hardin (existing plant)
3. 12 MW at Thompson Falls (existing plant)
4. 280 MW at Great Falls[1]
5. 48 MW at South Butte (existing plant)
6. 396 MW at Reed Point (in study process)
7. 268 MW at Great Falls (in study process)

[1] NWE has recently received a cancellation request from this project, but the request is not approved until the FERC accepts the request. Removing this resource will not eliminate the overload on the 230/100 kV autotransformers discussed within this report.

8. 500 MW at Colstrip (in study process)

The dispatch of existing network generators and these new network generators were varied as needed to stress the transmission system and meet network load. Both the 2010 Light Autumn (2010LA) and 2012 Heavy Summer (2012HS) cases are studied with Great Falls generation at minimum as well as maximum as they reflect different scenarios. For the Stand-Alone Study, generation and fixes of 268 MW at Great Falls and 500 MW at Colstrip are removed from the base case.

Assumptions

The following network system upgrades required for the senior queued projects were included in the system models for the 2010LA and the 2012HS cases.

1. An Overload Mitigation Scheme (OMS) for the Judith Gap Wind Energy facility to mitigate for the Broadview - Judith Gap South 230 kV line outage.
2. A Remedial Action Scheme (RAS) for the Rocky Mountain Power Plant to mitigate for stability issues for the loss of both Broadview - Garrison 500 kV lines.
3. Replace the existing Great Falls 230/100 kV autotransformers to fix the senior queue project problems.
4. A RAS in service for the 268 MW generator at Great Falls to trip for the Facility - Great Falls 230 kV N-2 contingency.
5. Reconductor the Judith Gap to Judith Gap Tap and Judith Gap Tap to Harlowton 100 kV lines.
6. Replace the existing Judith Gap 100 MVA, 230/100 kV autotransformer with 200 MVA, 230/100 kV transformer.
7. An additional 500 MVA, 500/230 kV autotransformer at Colstrip.
8. An OMS for the loss of one of the three 500/230 kV autotransformers at Colstrip.
9. Increase of the ampere rating of the series capacitors and all related equipment to 3000 Amps in the Colstrip - Broadview, Broadview - Garrison, Garrison - Taft, Taft - Bell, and Taft - Dworshak 500 kV lines.
10. A large (up to 450 MVAr) fast responding switched capacitor bank at the Broadview 230 kV bus. This device is necessary to support the steady-state voltage in the Broadview local area during the Colstrip - Broadview 500 kV single line outage.
11. Increase of the percent compensation of the series capacitors and all related equipment to 70% in the Colstrip - Broadview, Broadview - Garrison, Garrison - Taft, Taft - Bell, and Taft - Dworshak 500 kV lines.
12. A dynamic VAr device (up to 100 MVAr) located at the Garrison 230 kV bus. This device is necessary for voltage support during 500 kV N-1 stability contingencies.
13. A dynamic VAr device (up to 50 MVAr) located at the Broadview 230 kV bus. This device is necessary for voltage support during 500 kV N-1 stability contingencies.

14. A RAS for the new Colstrip facility to mitigate for all 500 kV N-2 contingencies.

Steady-State Power Flow Analysis

The Steady-State Power Flow Analysis examines steady-state system normal operating conditions with no lines out of service (i.e., N-0 conditions) and with one or more lines out of service (i.e., N-1 and N-2 conditions).

Stand-Alone Study Findings

Table 3. 2012HS Thermal Overloads, Great Falls Generation Maximum

Outage	Monitored element	Overload %	Prebc %
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	110.5	None
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	106.4	None
GT Falls 230/100 kV transformer ckt 2	GT Falls 230/100 kV transformer ckt 1	118.6	None
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	104.1	None
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	101.5	None

Table 4. 2012HS Thermal Overloads, Great Falls Generation Minimum

Outage	Monitored element	Overload %	Prebc %
N-0 conditions	GT Falls 230/100 kV transformer ckt 1	114.4	None
N-0 conditions	GT Falls 230/100 kV transformer ckt 2	110.2	None
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	144.5	117.4
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	139.2	113.1
GT Falls 230/100 kV transformer ckt 2	GT Falls 230/100 kV transformer ckt 1	184.6	152.4
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	117.2	None
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	112.8	None
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	115.9	None
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	111.6	None

- When the MATL flows were northbound, a flow of 301.3 MW was achieved at a phase shifting angle of +43.8 degrees in the 2010LA case and a flow of 300.7 was achieved at an angle of +44.9 degrees in the 2012HS case.

- Great Falls 230/100 kV autotransformers are overloaded with the addition of MATL facility under N-0 and N-1 conditions (Tables 5 and 6). These overloads must be mitigated by MATL.

Stand-Alone Study Mitigation

Completing the following can mitigate the above stand-alone problems:

- MATL needs to consider the voltage set points of the switched shunts to prevent high voltages during all conditions (N-0, N-1 and N-2). Also, the high voltages at the proposed Marias and MATL 230 kV buses are present for all the other contingency conditions. Please see the limit checking reports in Attachment B for more details.

- The mitigation required for the overload of the two Great Falls 230/100 kV autotransformers must be completed by MATL. This mitigation will be coordinated with senior queue N-1 mitigation requirements.

Because the MATL project is scheduled to be in-service before the senior queue projects, the above mitigation requirements must be completed by MATL before the project goes commercial.

Co-Existing Study Findings

Co-Existing Simulated Events

The outages studied for the Co-Existing Study are as follows.

Great Falls - Ovando 230 kV line

Great Falls 230/100 kV autotransformer ckt 1

Great Falls - Great Falls 268 generator 230 kV line ckt 1

Great Falls - Judith Gap 230 kV line

Broadview - Judith Gap South 230 kV line (Judith Gap RAS is implemented for this outage)

The Co-Existing Study found the following system problems. The addition of this project and all senior queued Generation Interconnection projects will require system mitigation.

Table 5. 2010LA Thermal Overloads, Great Falls Generation Minimum

Outage	Monitored element	Overload %	Prebc %
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	144.5	125.3
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	139.1	120.6
GT Falls 230/100 kV transformer ckt 2	GT Falls 230/100 kV transformer ckt 1	151.3	112.5
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer	103.7	None
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	121.3	None
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	116.8	None

Table 6. 2010LA Thermal Overloads, Great Falls Generation Maximum

Outage	Monitored element	Overload %	Prebc %
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	113.5	102.5
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	109.3	None

Table 7. 2012HS Thermal Overloads, Great Falls Generation Minimum

Outage	Monitored element	Overload %	Prebc %
N-0 conditions	GT Falls 230/100 kV transformer ckt 1	141.8	116.7
N-0 conditions	GT Falls 230/100 kV transformer ckt 2	136.6	112.4
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	182	156.4
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	175.3	150.6
GT Falls 230/100 kV transformer ckt 2	GT Falls 230/100 kV transformer ckt 1	228.9	186.9
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	150.4	126.4

Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	144.8	121.7
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	165.4	125.4
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	159.3	120.8
GT Falls – GT Falls 268 generator 230 kV line ckt 1	GT Falls 230/100 kV transformer ckt 1	141.4	115.8
GT Falls - Great Falls 268 generator 230 kV line ckt 1	GT Falls 230/100 kV transformer ckt 2	136.1	111.5

Table 8. 2012HS Thermal Overloads, Great Falls Generation Maximum

Outage	Monitored element	Overload %	Prebc %
N-0 conditions	GT Falls 230/100 kV transformer ckt 1	102.3	None
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 1	146.6	137.1
GT Falls – Ovando 230 kV line	GT Falls 230/100 kV transformer ckt 2	141.2	132
GT Falls 230/100 kV transformer ckt 2	GT Falls 230/100 kV transformer ckt 1	161.5	145.2
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	112.7	104.4
Broadview - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	108.5	100.5
Broadview - JGap South 230 kV line	Threeriv 161/100 kV transformer	109.5	None
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 1	130.3	106
GT Falls - JGap South 230 kV line	GT Falls 230/100 kV transformer ckt 2	125.5	102
GT Falls - Great Falls 268 generator 230 kV line ckt 1	GT Falls 230/100 kV transformer ckt 1	101.5	None

Following conclusions can be drawn from the co-existing findings:

- When the MATL flows were northbound, a flow of 300.3 MW was achieved at a phase shifting angle of +41.7 degrees in the 2010LA case and a flow of 300.8 MW was achieved at an angle of +42.4 degrees in the 2012HS case.

- Great falls 230/100 kV autotransformers are overloaded with the addition of MATL facility in 2010LA case under several N-1 conditions. Mitigation must be completed to fix problems when the overload in the Prebc column is "none", MATL will also be responsible for mitigating the difference in percent overload when the autotransformers are overloaded as identified in the Prebc column.

- Great Falls 230/100 kV autotransformers are overloaded with the addition of MATL facility in 2012HS case under several N-1 conditions. Mitigation must be completed to fix problems when the overload in the Prebc column is "none", MATL will also be responsible for mitigating the difference in percent overload when the autotransformers are overloaded as identified in the Prebc column.

Co-Existing Study Mitigation

Completing the following can mitigate the above stand-alone problems:

- MATL needs to consider the voltage set points of the switched shunts to prevent high voltages during all conditions (N-0, N-1 and N-2). Also, the high voltages at the proposed Marias and MATL 230 kV buses are present for all the other contingency conditions. Please see the limit checking reports in Attachment C for more details.

- The over load of the two Great Falls 230/100 kV autotransformers must be mitigated. The mitigation required must be coordinated with senior queue N-1 mitigation requirements. This is also a stand-alone problem.

Transient Stability Analysis

The Transient Stability Analysis examines the system performance after the loss of one or more transmission line(s), before the system settles to steady state operation.

Stand-Alone Study Findings

Stand-Alone Simulated Events

In each event description below, the term "fault" refers to a short-circuit between either a single-phase conductor and ground, or all three phases. The events simulated were:

1. A three-phase fault at the Great Falls 230 kV bus with the loss of Great Falls - Ovando 230 kV line.

2. A three-phase fault at the Broadview 230 kV bus with the loss of Broadview - Judith Gap South 230 kV line.

3. A three-phase fault at the Great Falls 230 kV bus with the loss of Great Falls - Judith Gap South 230 kV line.

The Stand-Alone Study did not find any stability problems associated with connecting the MATL 230 kV line to the Great Falls 230 kV Switchyard.

Co-Existing Study Findings

Co-Existing Simulated Events

1. A three-phase fault at the Great Falls 230 kV bus with the loss of Great Falls - Ovando 230 kV line.

2. A three-phase fault at the Broadview 230 kV bus with the loss of Broadview - Judith Gap South 230 kV line.

3. A three-phase fault at the Great Falls 230 kV bus with the loss of Great Falls - Judith Gap South 230 kV line.

4. A three-phase fault at the Great Falls 268 generator 230 kV bus with the loss of two Great Falls 268 generator - Great Falls 230 kV lines.

5. A three-phase fault at the Great Falls 268 generator 230 kV bus with the loss of two Great Falls 268 generator - Great Falls 230 kV lines with generator tripping at Great Falls 268 generator.

The Co-Existing Study did not find any stability problems associated with connecting the MATL 230 kV line to the Great Falls 230 kV Switchyard.

Fault Duty Analysis

When a fault or short circuit occurs on a power line, the protective relay equipment detects the increased current (i.e., fault current) flowing in the line and signals the line's circuit breakers to open. When the circuit breakers open they must be capable of interrupting the full fault current. The worst-case fault current is commonly referred to as the "fault-duty". If the circuit breakers cannot interrupt the fault-duty, the line that is faulted may not be switched out of service and voltages could collapse in the surrounding transmission grid. This event could lead to a wide spread outage.

The results from the Fault Duty Analysis identifies whether or not NWE's existing circuit breakers are capable of interrupting the additional fault-duty created by the addition of the proposed facility.

The events that were examined are listed below. In each event description, the term "fault" refers to a short-circuit between either a single-phase conductor and ground, or all three phases.

Stand-Alone Fault Duty Results

1. A three-phase fault at the Great Falls 230 kV bus.

2. A single-phase fault at the Great Falls 230 kV bus.

The breakers in the area have a sufficient interrupt rating to withstand the maximum short circuit current available with the addition of the MATL project. This project does not require improvements to NWE's existing circuit breakers for fault duty.

Co-Existing Fault Duty Results

The same two faults were examined in the Co-Existing Fault Duty Study. The addition of this project does not require improvements to NWE's existing circuit breakers.

Cost Estimates

Table 9 is a summary of the high-level non-binding cost estimates for the MATL Transmission Line Interconnect Project. The detailed cost estimates are listed below the table.

Table 9. Cost Estimates for MATL to interconnect

Interconnection Cost Estimate	$M *Cost*
230 kV Switchyard Upgrades	5.605*
Transmission Provider Interconnection Facilities	0.145
Total Cost Estimate	5.750

Upgrades

Great Falls 230 kV switchyard:

Replace the 2 - 100 MVA, 230/100 kV autotransformers with

2 - 200 MVA, 230/100 kV autotransformers	2@1.80M = $ 3.60* M
Add 2- 230 kV breakers	2@0.25M = $ 0.50 M
4 230 kV Air Brake switches	4@0.02M =$ 0.08 M
Bus work	=$ 0.125 M
Steel	=$ 0.250 M
Foundation	=$ 0.400 M
Relaying	=$ 0.300 M
Land	=$ 0.35 M
Total Cost	$ 5.605 M

In addition to the above costs, there are Transmission Provider Interconnection Facility (TPIF) costs that MATL will be responsible for. These TPIF cost estimates are the same as those presented in the previous SIS report assuming no changes have been made.

* This cost might be less, as the mitigation listed for the autotransformers (approximately $3.6M) is to be coordinated with the N-1 senior queue mitigation.

Transmission Provider Interconnection Facility Cost Estimate

Substation work	= $ 0.12 M
Metering	= $ 0.010 M
SOCC EMS	= $ 0.015 M
Total cost	= $ 0.145 M

Conclusions

This System Impact Study is an evaluation of the MATL projects interconnection to the Great Falls 230 kV Switchyard and does not constitute a request for transmission service. This study does not provide any definitive mitigation, that will be required to move power out of the Great Falls 230 kV Switchyard because NWE has not received a Transmission Service or Generation Interconnection Request. The users of the proposed MATL line must follow the procedures described in the transmission tariff available on NWE's OASIS site to request and/or reserve Transmission Service or a Generation Interconnection. The following conclusions can be made about the MATL projects interconnection to the Great Falls 230 kV Switchyard:

- The unused capability of the Great Falls 230 kV Switchyard without any system or network upgrades is 0 MW.

- The over load of the Great Falls 230/100 kV autotransformers must be mitigated. With the autotransformer upgrades, the MATL line will be able to connect its 230 kV line to the GF 230 kV Switchyard without further mitigation in the switchyard based on the information provided and analyzed in this study. The mitigation required must be coordinated with senior queue mitigation requirements.

- MATL needs to consider the voltage set points of the switched shunts to prevent high voltages during all conditions (N-0, N-1 and N-2). The high voltages at the new Marias and MATL 230 kV buses are present for the other contingency conditions too.

The above mitigation will be required before the MATL project can be connected to NWE's transmission system. The study results may change if there are changes to MATL's queue position or to the line design and interconnection specifications provided by you to NWE. Any variation in the line or interconnect specifications must be reported to NWE, so a thorough review and/or study can be conducted by NWE. Such review and/or study may yield results different from this analysis, and different mitigation requirements may be required.

A summary of the high-level non-binding cost estimates for the MATL Transmission Line Interconnect Project are shown below.

Cost Estimates for MATL to interconnect

Interconnection Cost Estimate	$M *Cost*
230 kV Switchyard Upgrades	5.605*
Transmission Provider Interconnection Facilities	0.145
Total Cost Estimate	5.750

* This cost might be less, as the mitigation listed for the autotransformers (approximately $3.6M) is to be coordinated with the N-1 senior queue mitigation.

APPENDIX N:
FARM COST REVIEW FOR MATL PROJECT

Farming Cost Review (Final)

Montana-Alberta Tie Ltd.

Submitted to:

Environmental Management Bureau
Montana Department of Environmental Quality

Prepared Under:

State of Montana Environmental Services Term Contract
(SPB06-81195O)
Task Order #01-CII

Prepared by:

HydroSolutions Inc

1537 Avenue D
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PO Box 80866
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406-655-9555

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and

Fehringer Agricultural Consulting, Inc.

7033 Highway 312
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406-373-5985

July 12, 2007

July 12, 2007

Mr. Tom Ring
Environmental Management Bureau
Montana Department of Environmental Quality
PO Box 200901
1520 East Sixth Avenue
Helena, Montana 59620-0901

RE: Farming Cost Review Montana-Alberta Tie Ltd. (Final)
DEQ Contract #SPB06-81195O
Task Order #01-CII

Dear Mr. Ring:

HydroSolutions Inc and Fehringer Agricultural Consulting, Inc., is pleased to provide this Farming Cost Review Report for the Montana-Alberta Tie Ltd. presented under the State of Montana Environmental Services Term Contract (SPB06-81195O) for Task Order #01-CII to the Montana Department of Environmental Quality (MDEQ).

A report outlining objective and results of this review are attached. The report presents the findings of a detailed and critical review and a range of reasonable values for the annual cost to farming of transmission structures in their crop fields. The review was based on the use of most recent data available and realistic assumptions with respect to the extra work, inputs, yields and time needed by farmers, and was representative of farming in the Great Falls to Cut Bank, Montana area. Please refer to the attached report for specific details.

It has been a pleasure completing this review and look forward to working with you again in the future. If you have any questions, please contact us at (406) 655-9555.

Sincerely,
HydroSolutions Inc

Shane A. Bofto
Senior Chemical/Environmental Engineer

Attachment: Farming Cost Review – Montana-Alberta Tie Ltd.

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Executive Summary

This report presents a detailed and critical review of three existing studies that estimate costs of farming around transmission line structures to a ‘representative farmer’ in the Conrad, Montana area. As a result of the review, estimated ranges of reasonable values for the annual cost to farmers of transmission structures in their crop fields were made.

The studies reviewed included two from farmers in area of the proposed Montana Alberta Tie power line path, and one study conducted by researchers at North Dakota State University. The studies either over or under estimated the size of the footprint of land which would be taken out of production due to the obstruction. This was mainly due to either the lack of an implement transition area to navigate around the obstruction or the use of a large safety buffer.

The alternative analysis presented used likely transition areas and safety buffers around the pole(s) for the proposed structure types, orientation to the field and location in the field. A representative farmer was chosen to be either dryland or irrigated, where the dryland farmer grew spring wheat in fallow rotations as well as continuous crop spring wheat. Spring wheat was used because it had the highest value and expenses of crops grown in the in the proposed area. The irrigated farmer would also grow spring wheat for the same reasons listed above.

The results indicated that long-span 6.5-foot diameter mono-poles at the field edges would cost the least to farm around on an overall basis which considers multiple structures within the field. The long-span mono-pole layout would have a larger footprint than the short-span, but would have fewer structures to farm around per mile. On an individual structure basis, the 3.5-foot diameter mono-pole structure at the field edge would be the least cost to farm around.

A. Introduction

HydroSolutions Inc (HydroSolutions) is pleased to present this report in accordance with the Scope of Service for the Limited Solicitation for Farming Cost Review, Environmental Permit Preparation, Analysis and Assistance Services Term Contract, Contract # SPB06-81195O, Task Order # 01-CII, approved by the Montana Department of Environmental Quality (MDEQ) on June 4, 2007.

On April 27, 2007 the Montana Department of Environmental Quality issued a limited solicitation for a firm to complete the scope of Services described therein. The MDEQ has completed a Draft Environmental Impact Statement for the Montana-Alberta Tie Ltd. (MATL) 230-kV Transmission Line and is currently addressing comments on the Draft Environmental Impact Statement (DEIS). The scope included the review of three existing studies that estimated the cost of transmission line structures to a ‘representative farmer’ in Conrad, Montana area.

This scope of service was completed by HydroSolutions and Fehringer Agricultural Consulting, Inc. (Fehringer), an agronomic consulting firm.

B. Background

The MDEQ received comments on the DEIS indicating that locating H-Frame poles on diagonal crossing of cultivated fields has greater costs to farmers than locating the proposed line along field boundaries and section lines. Comments also indicated that the use of single pole structures along field boundaries would result in lower impacts to farming costs. The information in this review would be used with other information in the decision process whether to grant, deny or grant with conditions a certificate of compliance under Montana’s Major Facility Siting Act.

C. Scope and Methods

The scope of service included the critical review of three studies that estimate the cost of transmission line structures to a 'representative farmer' in the Conrad, Montana area. Each study was reviewed for assumptions, cost inputs and total area taken out of production. A reasonable range of annual estimated costs to farmers were made due to the structures in their crop fields. The analysis and report was conservative in favor of farmers and used most recent date, realistic assumptions and was to be representative of farmers in the Great Falls to Cut Bank, Montana area.

HydroSolutions and Fehringer reviewed the three referenced studies for approach, applicability, scope, cost basis, timeliness of pricing, and practice. The most representative information was compiled and provided alternative sources of information to estimate cost impacts to farmers as a result of power line structures placed in agricultural fields located from Great Falls to Cut Bank, Montana. Farming expenses reflect 2007 costs and included the following: prices for fuel, maintenance and repair, fertilizer, pesticides, time and labor cost. The estimates were tailored in a conservative direction towards the farmers.

Two 'representative farmer' scenarios were created to accurately represent dry land and irrigated farming practices in the Great Falls to Cut Bank, Montana area. Items of focus included farming practices, size of machinery used, typical acreages farmed, typical crops and yields, and other regional characteristics.

The cost values developed were applied to the chosen "representative farmer' to develop a range of reasonable values for the annual cost to farmers per transmission structure for each of the structures that will be possibly used in their crop fields. The presence of these structures may result in both lost crop production from the structure footprint and overlapping of tillage and inputs as well as increased labor costs.

Several scenarios were addressed including two configurations, Mono-pole (both short-span and long-span) and H-frame, along with location of the power poles, to include edge or interior. As required in the solicitation, farming techniques using auto steer and GPS were of particular consideration.

D. Summary of Comments

D.1. MATL DEIS Analysis

A brief review of the MATL DEIS was made to determine its basis and assumptions. The DEIS Land Use analysis assumed a 5 foot buffer around each pole structure in any direction. The H-pole base area (1.5 feet by 23.5 feet) with 5 feet added to all sides was 0.0088 acre (385.25 square feet) removed from production per structure. The short-span mono-pole structure (1.75 foot pole radius plus 5 feet) would remove 0.0027 acre (143.14 square feet) per structure. Long-span mono-poles would remove more acreage from production because of their 6.5-foot-wide concrete foundations, but there would be fewer of them in comparison to the short-span design (DEQ, 2007).

The analysis also stated that farmers have to divert their equipment around structures, make additional passes, take additional time to maneuver equipment, skip areas, or retreat areas, production cost would increase. In addition, efficiency of some large, GPS-guided equipment would be adversely affected in fields with diagonal crossing. (DEQ, 2007).

The DEIS analysis reports (Table 2.3-1) that mono-poles were to be set on an average of 790 feet apart (about 6.6 structures per mile) for long-span, 490 feet apart (about 10.8 structures per mile) for short-span (regular). H-frame structures were to be set on an average of 790 feet apart (about 6.6 structures per mile).

Alternative 2 had no mono-pole structures but 6 acres removed from production. There were 742 H-pole structures spanning a total of 92.7 miles and removing 6.53 acres of production.

Alternative 3 had no mono-pole structures but 6.3 acres removed from production. There were 782 H-pole structures over 97.7 miles with 6.88 acres removed from production.

Alternative 4 had 588 long-span mono-poles or 947 short-span mono-poles over 87.9 miles. There was 3.7 acres removed for production for the long-span, and 1.4 acres for the short-span. There were no H-pole structures in Alternative 4.

As presented in the MATL DEIS analysis, total acreage removed from production for Alternatives 2 and 3 was 12.53 and 13.18 acres, respectively.

Total acreage removed from production for Alternative 4 was 3.7 acres for long-span mono-pole structures and 1.4 acres for short-span for mono-pole structures as there were no H-pole structures used in Alternative 4 (DEQ, 2007).

D.2. Public Comments and Studies

There were three cost analysis studies reviewed for this report. The first was prepared by Allen Denzer of Conrad, Montana, the second was prepared by Brent MacDonald of Brent MacDonald, Inc. of Floweree, Montana, and the third was a spreadsheet model prepared by Dr. Eric A. DeVuyst, Dean A. Bangsund, and Dr. F. Larry Leistritz. Copies of the comments and studies are included in Appendix A.

Each study was critically reviewed for assumptions, inputs such as costs and acreage taken out of production, and formulas. The results of each study review is detailed below.

D.2.a. Denzer Study:

The Denzer study had concerns regarding farming operation around H-frame and Single-pole structures. Also, there were some concerns regarding the use of Global Positioning System (GPS), yield mapping, and variable rate fertilizing around poles. The Denzer study also had concern with the North Dakota study not addressing GPS auto steering around poles and the model was incomplete and used custom farming rates which did not apply.

This study assumed that the lead implement would always be the first to encounter the structure, Also, that the equipment would to be working in unison so one or two pieces of equipment would have to wait for the lead implement to make a lap around an interior pole(s).

If pole(s) are in the middle of the field, it would take alternative planning so that implements are not standing by as another implement is detouring around the pole structure. This could be accomplished by increasing the separation of the implements or work from two sides of a field.

The entire field still required spreading a wildoat herbicide (“Fargo”), spraying, seeding, harvesting, etc., but it will take longer.

Input costs are high or inadequately defined. Crop loss would not be 50% as stated in the study, but likely no more that 20% as used in the alternative analysis.

In regard to yield mapping, GPS and auto-steer, manufacturers have procedures for obstruction avoidance in fields. These obstructions would not be the first ones that this technology has had to encounter.

Structures at field edges would create less of a footprint and cost to farm around. The direction of farming would not matter with edge structures because one to two passes are typically made parallel to all field edges when beginning or ending a field. This creates an area for turning around when approaching field edges at an angle or perpendicular.

For structures placed in the interior of a field, it would not matter what direction the structures are oriented, it is still the same sized obstruction. If they are parallel to the direction of a farming operation, they would all be encountered in the same pass. If they are perpendicular or diagonal to the direction of the operation, they would be encountered in multiple passes – one at a time. There certainly will be more per section on a diagonal direction. However, not all fields run east and west or north and south.

The number and type of operations; as well as, size of equipment used were helpful in creating the alternative analysis. All necessary operations for a cropping cycle were not listed. Please refer to the alternative analysis for specific cropping cycles. No consideration for loss of crop quantity and/or quality was listed.

D.2.b. MacDonald Study:

The major concerns of the MacDonald study appeared to be related primarily to the farming operation around the towers associated with GPS auto steer and diagonal lines. Also, concern was raised regarding the increase of specific farming costs since the original analysis was performed.

The safety buffer was figured at 20 feet instead of five feet. This added considerable area to the total outage from each pole(s) and was not necessary. Most farmers will farm closer than five feet. By using the 20 foot safety buffer, overlap area has been over estimated.

The MacDonald study figured a required minimum of 1.5 revolutions around a pole. Farming around an interior structures merely adds one revolution (merely 360 degrees), not 1.5. If 1.5 revolutions (540 degrees) were made, the farmer would be headed the opposite direction as to the approach of the structure. It will not take an additional revolution to “get the GPS back on track”. Tracking would be instantaneous. Auto-steer can be turned off and on at obstructions and at the ends of a field. Again, overlap area has been over estimated by Mr. MacDonald.

Glyphosate (“Roundup”) cost listed in this study was double that of current actual costs. Application expense was listed at $3.75 per acre, and typical farming cost may be consistent with that value, although custom application would be closer to $5.00 per acre.

Aerial applicators have to consider a number of obstacles – regular power lines, trees, towers. They do not charge more for spraying field with obstructions, but they may leave small untreated areas to avoid the obstructions.

The number and type of operations as well as size of equipment was helpful in creating the alternative analysis. Not all necessary operations for a cropping cycle were listed. No consideration for loss of crop quantity and/or quality was listed.

D.2.c. DeVuyst Study:

The DeVuyst study estimated cost based on footprint of the towers using various assumptions such as; operations are not discontinued when overlap begins, custom application rates were adequate to cover individual farmer's cost of application, easement settlement covers lost production from the tower footprint and existing crops without irrigation is continued in the foreseeable future.

The study was comprehensive, compared to the other studies reviewed, as it considered more pole scenarios. It considered all crops that could be grown in the area of this power line. Footprint diagrams do not depict actual farming patterns around poles. It assumes that the crop is 100% destroyed by the sprayer's tire tracks. That is not the case unless the crop is being sprayed at the wrong growth stage. More damage is done by doubling the rate of seed, fertilizer (on dryland), and herbicides. Costs for farming around poles were more accurate and more agronomically complete than the previous two studies.

E. Alternative Analysis

Based on the review of the above referenced comments and studies, and the MATL DEIS, an alternative analysis is presented below.

E.1. Pole Layouts

A range of most frequently encountered specific pole layouts were evaluated and are presented on Figure 1, Pole Configuration Footprint Layouts. These areas represent the portion of land adjacent to the pole(s) that would not be farmed due to impedance to the farming implements resulting in the portion of land that is taken out of production. Power poles were in two structure types, Mono-pole and H-pole. Mono-poles consisted of a 3.5-foot diameter pole (short-span) or

6.5-foot (long-span) wide concrete foundation, and an H-hole, which consisted of two 3-foot diameter poles spaced 20 feet apart at the centers or 23 feet apart at each outside diameter.

Mono-poles were either located at the edge of the field (Layouts A & B) or in the interior (Layouts C & D). H-poles were oriented either perpendicular with, and at the edge of the field Layout E), perpendicular with, and at the edge of the field and straddling the fence line (Layout F), parallel with, and at the edge of the field (Layout G), and interior (Layout H).

A safety buffer of 5 feet was used around the outside diameters of each pole to assess footprint areas around each structure, location and orientation using conventional farming techniques. The safety buffer is generally dependent upon the specific field, equipment and operator experience, but in this case a 5-foot safety buffer should be adequate to safely clear the pole(s) using typical equipment while still optimizing farmed area.

These footprint areas also consider transition lengths used to navigate farming equipment around the structure located along the edge to maintain the 5-foot safety buffer and return to the previously established row track. These transition lengths include an approximate 1.3:1 (transition length to diversion) transition length for the edge pole(s) diversion (A, B, E, F). These transition lengths are used for pole(s) locations on field edges. For H-poles located parallel and adjacent to the property line (G), a 1:1 transition length was used due to its longer parallel section and flatter transition along the parallel poles adjacent to the property line. This transition does not require the implement to swing out as far as the other edge layouts. Please refer to Table 1 for estimated footprint areas.

E.2. Representative Farmer

This analysis is based on the ‘representative farmer’ scenarios which represent dry land and irrigated farming practices in the Great Falls to Cut Bank, Montana area. Costs used in the analysis reflect up-to-date information by using current 2007 prices. Fertilizer prices were obtained from Farmer’s Union, (Personal Communications, Farmer’s Union, June 2007).

Herbicide costs were taken from Wilbur-Ellis' 2007 Price List and reflect highest retail cost (Wilbur-Ellis 2007).

A typical dry land field was chosen to grow spring wheat in fallow rotation as well as continuous crop spring wheat. Spring wheat is used because it has the highest value of crops grown in the proposed area. Currently, spring wheat is trading at near $6.00 per bushel. Winter wheat is worth about $5.50 per bushel, and it will generally yield more than spring wheat but the gross per acre will be more with spring wheat. Winter wheat is not a crop that survives winters consistently in the Cut Bank, Montana area. Malt barley is approximately $4.40 per bushel and will yield more than spring wheat but spring wheat will still gross more per acre. In addition, spring wheat requires more fertilizer per acre, particularly nitrogen, than winter wheat, durum, canola, and malt barley. In summary, spring wheat was used because it is the highest valued per acre crop, has the highest inputs per acre, and can be grown in all parts of the proposed area. If a farmer chooses to plant something other than spring wheat, the cost of farming around the poles will be less. Spring wheat provides the worst case scenario from the farmer's perspective.

For dry land crop production, both wheat-fallow rotation and continuous crop farming were evaluated because both practices are used in this area. Many farmers will flex crop, which is recropping a field when enough stored soil moisture is present at planting time to assure a profitable yield. If stored soil moisture is below average, the farmer then chooses to fallow.

A typical irrigated field was chosen to also grow spring wheat for the same reasons listed in the dry land section above. Irrigated malt barley generally has been a more profitable crop than spring, winter wheat, canola, etc., but at the time of this writing, spring wheat has surpassed malt barley. Again, using spring wheat for the irrigated crop provides the worst case scenario.

E.3. Row Layout

The row layout was applicable to farming equipment with GPS and auto-steer. Please refer to Figure 1 for specific pole layouts.

E.3.a. Layouts A, B, E, F and G:

These layouts represent pole(s) locations at the edge of a field. It was assumed that the farmer would not be able to use auto-steer on the initial pass on the field edge containing poles. In this analysis, ample transition space was created to easily farm around the pole. On the second pass, the farmer would establish the AB line for auto-steer or GPS light bar guidance. The transition varied with the type of structure, location and orientation, but always included a 5-foot safety buffer.

E.3.b. Layouts C, D, and H:

Interior Mono-pole or H-poles orientation assumed that the farmer would approach the pole(s), turn off the auto-steer, and divert either left or right while maintaining the 5-foot safety buffer. Upon reaching the other side of the pole(s), the tractor and implement would continue around the pole(s) to make an additional 360 degrees and then return to using auto-steer and following the previously established row track. Farming around the pole(s) involves only one lap around the pole not 1.5 to 2.5 extra revolutions as listed in the Denzer and MacDonald studies.

E.4. Overlap

Using the footprint areas, overlaps of farming rows were calculated using standard implement widths for harrowing, discing, toolbarring, chemical spraying, “Fargo” (wild oat control) application , fertilizer application, seeding, and combining. Implement widths are presented in Table 1. These implement widths were typical of those used in the Great Falls to Cut Bank, Montana farming area, as indicated by the Denzer and MacDonald studies referenced above. Using the footprint areas and implement widths, overlaps were calculated for each pole configuration and orientation using the selected implements for each specific process.

The overlap areas were calculated by adding the footprint areas for the pole(s) at the edge of the field to the implement width chosen. This would account for the implement moving out and around the pole(s) footprint on the first pass, moving into the adjacent row path and overlapping the width of the footprint. The overlap for the interior structures assumed a 360 degree path around the pole(s) footprint, which includes the 5-foot safety buffer, with the selected implement width added.

E.5. Estimated Costs

Cost for labor, materials, and equipment were estimated from various sources including custom farming and application rates (University of Wyoming "Custom Rates for Wyoming Farm and Ranch Operations, 2004-2006" and Personal Communications, Farmer's Union, June 2007, respectively) site specific vendor information, and personal communications with regional farmers. Provided below is a brief description of the various farming operations anticipated for the Great Falls to Cut Bank area. The information is reflected on Attachments DL-1 to 16 and IRR-1 to 8 found in Appendix B and C, respectively.

Many dry land farmers heavy harrow to incorporate seeds after harvest so that they germinate more uniformly, especially in drier years. Harrowing also distributes crop residue if it did not get uniformly spread behind the combine. Heavy residue rows can cause disease problem, especially when continuous cropping.

Irrigated farmers will most likely disc their fields one to two times after harvest and toolbar it one to two times before planting. For these analysis, two of each of these operations have been included.

Fallow and preplanting sprayings listed represents the highest number of applications needed per year. A farmer may have fewer applications than listed. Herbicide rates are typical for this type of spraying. In addition to the "Roundup" for first fallow application, dicamba ("Banvel") was added to the mix as this would be the ideal mixture but would cost more per acre than if "Roundup" only was applied. The addition of dicamba would provide extended broadleaf weed control and is a prudent practice to reduce the risk of creating "Roundup" resistance in the weeds. For preplant spraying, only "Roundup" was applied for both dry land and irrigated fields.

In regard to wild oat control, "Fargo" application at 15 pounds per acre was used because this is the most expensive method of controlling this weed. It requires a separate application and possibly a harrow incorporation. If a grower uses a post-emergent herbicide that can be tank mixed with the broadleaf weed herbicides, then there is only one application of herbicides to the field, not two and no incorporation with a harrow. Lastly, 15 pounds per acre of "Fargo" was the rate used for barley and winter wheat. Ten to twelve and one-half pounds per acre is the labeled rate on spring wheat. Again, all inputs were designed to be a worst case scenario.

Prices used for fertilizer reflects the cost spike that has occurred in 2007, $450 per ton for 46-0-0, 11-52-0, and 18-46-0. For dry land crops, fertilizer banded with the seed would be 60 pounds per acre of 11-52-0 or 18-46-0. Topdress nitrogen was 55 actual units (pounds) of nitrogen per acre for a total of 61 pounds of nitrogen per acre since six pounds are applied via the 11-52-0 banded with the seed. These amounts of nutrients would be adequate for a spring wheat-fallow rotation yield goal of 50 bushels per acre. For continuous crop dry land spring wheat, 69 pounds of actual nitrogen was topdressed for a total of 75 pounds per acres (including fertilizer banded with the seed) for a yield goal of 35 bushels per acre. For irrigated spring wheat, 80 pounds of 11-52-0 was banded with the seed. Nitrogen applied for a 90 bushel per acre yield goal was a total of 210 pounds per acre. Crop yields listed are from Fehringer's personal knowledge from production in the area and Montana Agricultural Statistics website (USDA 2007).

Seeding rate was figured at 70 pounds per acre for dry land and 100 pounds per acre for irrigated land. The price used is for certified seed that has been cleaned and treated.

Herbicides listed for in-crop spraying to control broadleaf weeds are the more expensive ones available. Herbicides used have only a 60 day plant back restriction so any crop can be planted the next growing season.

Harvesting expense was calculated at custom rates. Overlap was figured for combining even though custom harvesters charge by the acre and what the crop is yielding. They do not have a surcharge for cutting around obstructions.

Crop loss due to overlap was figured at 20% of the yield goal. Yield loss would be from reduced yield and/or quality (test weight, protein, etc.). Yield loss for edge poles would be only the footprint area shown for Layouts A, B, E, F, and G. Yield loss for poles in the field interior was much larger because of having to overlap for one revolution around the pole(s) (Figures C, D, H). The amount of area used was figured by taking the largest implements listed in Table 1, which are sprayer and "Fargo" applicator.

Harrowing, toolbarring, discing, fertilizer application, seeding, and harvesting are all smaller equipment, but again, the worst case situation was used. Crop spraying and "Fargo" application would result in the largest yield loss due to double applying herbicides. Double application would cause the most crop stress. In addition to the reduced yields from overlap, farmers would not have the area of the structure footprint in crop any longer. The foot print areas for each pole situation are shown in Table 1.

Weed control in the pole footprint was also addressed. The best option would be to establish grass in the footprint area. However, this might present a fire danger that MATL does not want to have. In lieu of having grass established, total vegetation control would be the next best option. This could be accomplished each fall by an application rate of up to five quarts of diuron, three pints "Arsenal", and "Roundup" per acre to each footprint area. Winter moisture would incorporate the herbicides into the soil so that vegetation is controlled all season long. Cost for these herbicides was approximately $150 per acre. Two hundred dollars per acre had been allotted in the cost analyses to cover any other herbicides selected.

Farming Cost Sheets for each dry land and irrigated scenario are included in Appendix B and C, respectively.

E.6. Results

The alternatives analysis included dry land with a spring wheat-fallow two year crop rotation and continuous cropping spring wheat. Irrigated land included raising continuous spring wheat. Each layout was considered in the evaluation. Results of the Alternative Analysis for dry land and irrigated farming are summarized in Tables 2 and 3, respectively. For MATL and the growers, structures at field edges would cost less to farm around than interior poles.

The results indicated that long-span 6.5-foot diameter mono-poles at the field edges would cost the least to farm around on an overall basis which considers multiple structures within the field. The long-span mono-pole layout would have a larger footprint than the short-span, but would have fewer structures to farm around per mile. On an individual structure basis, the 3.5-foot diameter mono-pole structure at the field edge would be the least to farm around.

All care should be taken to not place structures in a sprinkler irrigated field; due to the additional costs of having to break apart a wheel line to move it past a pole(s) and the cost of disrupting a pivot from making a complete revolution. Those costs have not been addressed in the alternate analysis because each field will have a unique situation to calculate. Pole(s) in flood irrigated fields will have additional costs beyond overlap costs. Again, cost depends upon its location in the field, top, middle, or bottom of field. Structures at the top of the field will result in less crop watered down slope than crop located in the in the middle or bottom of the field. Cost of interior pole(s) will be also influenced by the length the water has to travel.

F. Standard of Care

Services performed by HSI personnel for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession, currently practicing in this area under similar budget and time restraints. No warranty, expressed or implied, is made.

G. References

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Figure

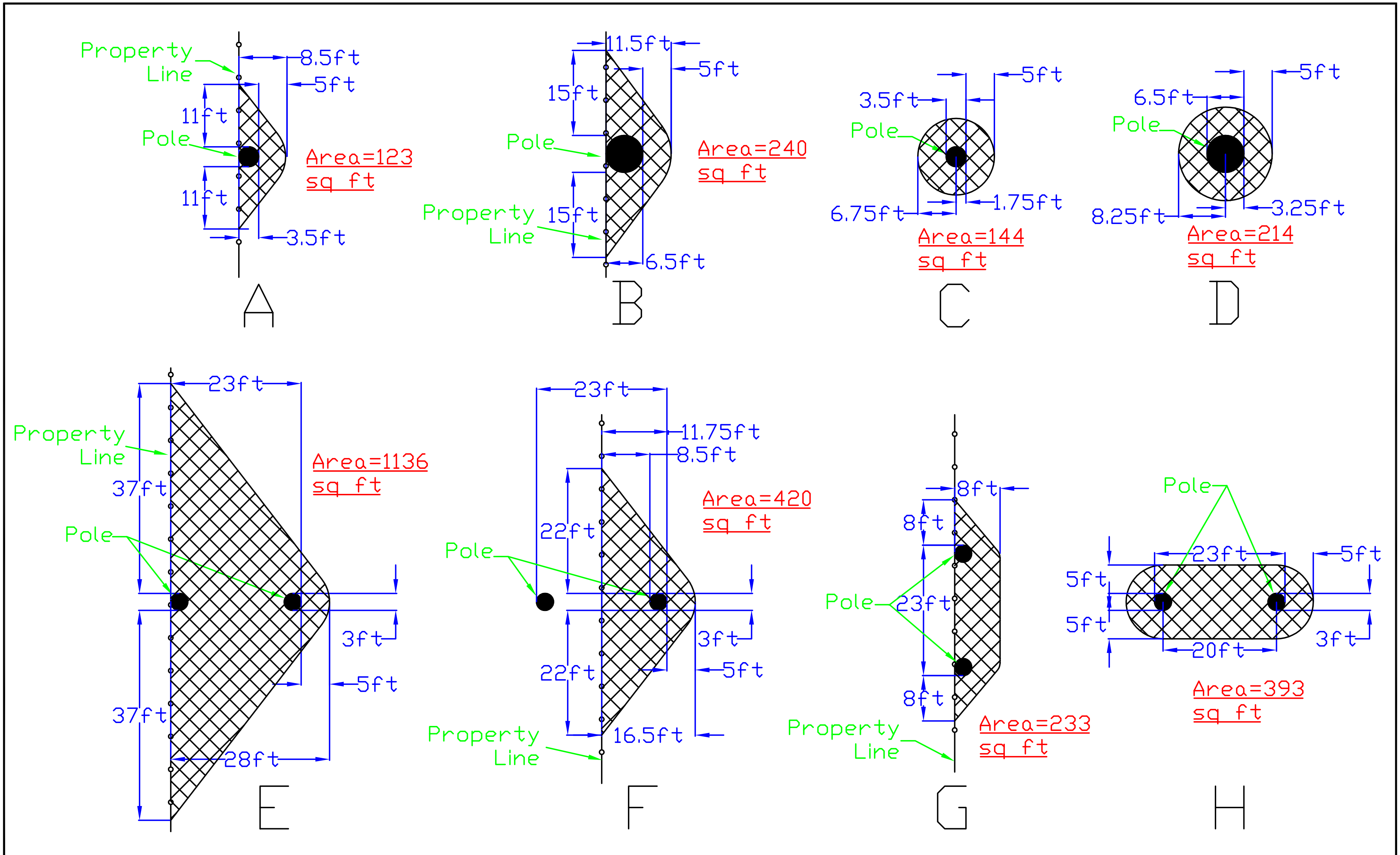

FIGURE # 1	INT	DATE
	DRAWN BY: sab	07/12/07
	APP'D BY: sab	07/12/07
	JOB No. DEQ Farming	
	DWG. No. Figure 1	SHEET OF
	SCALE NA	

Pole Configuration Footprint Layouts
MATL Farming Cost Review

Montana Department Of Environmental Quality

Tables

Table 1. Footprint and Overlap

Layout[1]	Structure	Pole Diam. (ft)	Location	Orientation	Minimum Buffer Distance From Center of Pole (ft)	Footprint (square feet)	Implement Width (feet)			
							70	120	36	60
							Overlap (square feet)			
							Harrow	"Fargo" & Spraying	Disc & Combine	Fertilizing, Toolbar & Seeding
A	Mono-pole	3.5	Edge		1.75	123	123	123	117	123
B	Mono-pole	6.5	Edge		3.25	240	240	240	207	240
C	Mono-pole	3.5	Interior		1.75	144	18,362	50,328	5,597	13,854
D	Mono-pole	6.5	Interior		3.25	214	19,022	51,459	5,937	14,420
E	H-pole	3.0	Edge	Perpendicular	1.5	1136	1,136	1,136	1,136	1,136
F	H-pole	3.0	Edge	Straddling	1.5	420	420	420	420	420
G	H-pole	3.0	Edge	Parallel	1.5	233	233	233	233	233
H	H-pole	3.0	Interior		1.5	393	21,052	54,490	6,982	16,160

Notes: [1]From Figure 1.
Mono-pole: Regular and long span are 3.5 and 6.5-ft diam, respectively.
H-Pole: 3-ft diam. each, 20-ft separation center to center, 23-ft from outside pole to outside pole.
Safety buffer: 5-ft.

Table compiled by Shane Bofto, Engineer & Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/12/07.

Table 2. Dryland Costs of Farming Around Pole(s).

Layout[1]	Structure	Pole Diam. (ft)	Location	Orientation	Farming Practice: Spring Wheat-Fallow — Information Source	Spring Wheat-Fallow — Annual Cost (per structure)[2]		Farming Practice: Continuous Crop — Information Source	Continuous Crop — Annual Cost (per structure)[2]
A	Mono-pole	3.5	Edge		Attachment DL-1	$13.81		Attachment DL-9	$14.22
B	Mono-pole	6.5	Edge		Attachment DL-2	15.06		Attachment DL-10	15.86
C	Mono-pole	3.5	Interior		Attachment DL-3	105.09		Attachment DL-11	156.01
D	Mono-pole	6.5	Interior		Attachment DL-4	107.98		Attachment DL-12	160.44
E	H-pole	3.0	Edge	Perpendicular	Attachment DL-5	37.13		Attachment DL-13	40.91
F	H-pole	3.0	Edge	Straddling	Attachment DL-6	20.98		Attachment DL-14	22.38
G	H-pole	3.0	Edge	Parallel	Attachment DL-7	14.99		Attachment DL-15	15.76
H	H-pole	3.0	Interior		Attachment DL-8	120.57		Attachment DL-16	177.74

Notes: [1]From Figure 1.
[2]Cost reflect 2007 prices.
Mono-pole: Regular and long span are 3.5 and 6.5-ft diam, respectively.
H-Pole: 3-ft diam. each, 20-ft separation center to center, 23-ft from outside pole to outside pole.
Safety buffer: 5-ft.

Table compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/21/07.

Table 3. Irrigated Costs of Farming Around Pole(s).

Layout[1]	Structure	Pole Diam. (ft)	Location	Orientation	Irrigated Cropping	
					Information Source	Annual Cost (per structure)[2]
A	Mono-pole	3.5	Edge		Attachment IRR-1	$15.60
B	Mono-pole	6.5	Edge		Attachment IRR-2	18.69
C	Mono-pole	3.5	Interior		Attachment IRR-3	258.67
D	Mono-pole	6.5	Interior		Attachment IRR-4	266.61
E	H-pole	3.0	Edge	Perpendicular	Attachment IRR-5	41.81
F	H-pole	3.0	Edge	Straddling	Attachment IRR-6	23.34
G	H-pole	3.0	Edge	Parallel	Attachment IRR-7	18.51
H	H-pole	3.0	Interior		Attachment IRR-8	290.41

Notes:
[1]From Figure 1.
[2]Cost reflect 2007 prices.
Mono-pole: Regular and long span are 3.5 and 6.5-ft diam, respectively.
H-Pole: 3-ft diam. each, 20-ft separation center to center, 23-ft from outside pole to outside pole.
Safety buffer: 5-ft.

Table compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/21/07.

Appendix A

Comments

I Allen Denzer, Terri Denzer, and Darlene Denzer appreciate the effort the DEQ put into the Draft Impact Study and statement.

Upon reading it I noted you took into account the following:

1. All the concerns raised by myself and the other farmers
2. Single poles.
3. Non diagonal.
4. Diagonally only on grass land.
5. Difficulty farming around 2 power lines in close proximity to each other.
6. Weed control around double poles.
7. Added liability with poles in the middle of fields.

Concerns we have that need to be addressed.

1. The difficulties our son will have operating around an H frame or a Single pole structure. Rick lost his arm 3 years ago. We have made many improvements to help him with this, by moving all unnecessary structure that are in his way. He is the 5^{th} generation on our family farm and wants to continue to farming. With his son we are looking at a 6^{th} generation of farming. Rick's capability has changed making him unable to use some of the old machinery, but is able to use modern guidance equipment. All consideration should be taken to help him continue farming. These diagonal poles will be one more obstacle he has to negotiate around for the rest of his working life adding a great burden on his other arm. Using Alternative 4, or moving the line south by ¼ mile would take it off our crop land giving Rick the opportunity to farm with less interference. This power line should be done right the first time, for the impact we will have to live with forever.
2. Modern GPS, auto steering, yield mapping, and variable rate fertilizing doesn't work in fields with poles in them. As you cut around and around these poles to clean up your skips the yield monitor records a very low yield, as it thinks the 36 ft. header is full not just cutting skips. The next year the variable rate fertilizer come to the pole and is told because of the low yield last year to dump on the fertilizer to make up for the pervious low year. You have just created a big problem as far as quality and yield of your crop, wasted fertilizer and possibility environmental concerns by going way beyond the recommended rate. The problem continues with chemical applications being doubled or tripled.

Modern farming has progressed very rapidly within a few years these guidance systems will not even need a human in the operating cab. John Deere has an unmanned tractor testing now that doesn't have an operator seat. We will see these in the near future except in fields with power poles, oil wells, and other obstacles.

Farmers make sacrifices for the good of the public, but we shouldn't have to sacrifice our progress of the future for the cheap way out now. Again you need to know the farmers expenses and try to figure out want they well be in 10 to 50 years. Once the power line is built, MATL will have little maintenance for years. (Northwest line has had no poles replaced on our farm since being built in the 60's). So MATL has basically a one time expense while the farmer will have continued expense.

3. On December 10, 2006, I met with MATL's people, and the North Dakota professors MATL haired to calculate the cost to farm around the poles. In the professors opening statement he stated GPS auto steering makes farming around the poles way easier, enabling you to get closer to the poles. I informed him that GPS and auto steering doesn't drive themselves around the poles and are incapable of sensing an object ahead of them. He agreed that he hadn't used it but his students told him they could. There model was very incomplete as it showed the impacted area of the pole on the boarder of a field being a perfect ½ circle which its not. Their model showed the impacted area around the poles in middle of the field as being a perfect circle the width of the implement which is again wrong. As it takes at least 2 circles around the poles to get all the corners and skips. Their model uses custom per acre rates which don't apply here. The custom rate is figured at doing a whole field or farm at a normal ground speed, not going slowly around and around poles. There is a lot of time and productivity lost with these poles in the middle of a crop field. There is no time lost with poles on the edges of fields.

We are again sending you our cost to farm around the poles:
Example:
What our yearly cost is on the existing H structure:

(1)-**Fargo application**
2-60 ft Fargo (wild oat spreaders), working together at 15 mph. 112 acres per machine.
One works around poles while to other one sits and waits.
$5.00 dollars an acre for each machine
$17.00 an acre of chemical
3 minutes lost per pole X 2 = $55.99 lost production.
17.00 dollars x 2 acres chemical overlap= $34.00 dollars.
$55.99
$ 34.00

$ 89.99

(2)- **Broad Cast Fertilizer**
60 ft. at 15 mph. = 112 acres per hour. Rate $5.00 acre around poles loss 3 Minutes=$27.99
Fertilizer doubled around poles = $52.49
$350 per ton at 150pounds an acre x 2 $ = 52.50
$52.49

$52.50

$80.49

(3) **Pre Plant Spray**

3 Sprayers:

90ft. at 12 mph at $5.00 per acre 116 acre per hour

90 ft at 12 mph at $5.00 per acre 116 acre per hour

60 ft at 12 mph at $5.00 per acre 87 acre per hour

One sprayer goes around poles while the other 2 wait at in line for the first to get back in the row. Time lost 9 minutes =$230.00

Chemical = $ 9.18

$248.43

(4) **Heavy Harrow**

60 ft. at 14 mph = 105 acres per hour

$5.00 per acre, 3 minutes lost =

$26.25

(5) **Seeding:**

57 ft. air drill at 6 mph. $42.75 acre per hour at $7.00 per acre

525 hp tractor

3 minutes lost $14.97

Seed and fertilizer $24.00 x 2 =$48.00

$14.96

$ 48.00

$62.96

(6) **Weed spraying same as #3 for time and machinery**

Time	$239.25
Chemical	
$15.00 x 2	$30.00

	$269.25

(7) **Harvest:**

3 combines; tractor and grain cart working together totals $1,000.00

Investment one cuts around poles while the others wait. Operating cost of

$160.00 an hour, for each combines. Loss 9 minutes
Loss $72.00

Summer fallow second year:

4 sprayers operation the same as # 3

248.43
X4

$ 993.72

Cost 2 seasons = $1843.09

Or $921.54 per year

Crop Loss:

75 bushels x $4.00 =$300.00 an acre x 2 acres x 50 % reduced production
$300.00 per crop
Or $150.00 per year

A senior loan officer from Northwest Farm Credit looked over our figures and said some were a little high and some were a little low but that our price came out the same as his.

Total cost per year is: $1071.54

These were 2005 production costs

Plus additional weed problems and liability.

The farmer should know exactly what the costs to farm around the poles are. They do it year after year. A computerized program is not capable of figuring out wasted time, double seeding, double spraying, compaction of the ground, loss in bushels per acre, loss of spray, etc, etc, etc. Why should we settle for less? What MATL is offering is nothing compared to our real costs. MATL is out to make a profit for the businessmen of Canada. MATL will recover the cost of alternative 4 in a mater of months while it takes farmers 20 to 30 years to pay for their land, shouldn't the farmers of the United States still be able to keep making the profit they were making before MATL decided to make another power line. This power will be sent out of state, used in Canada, not one bit in Montana.

We have Northwestern double diagonal poles in our fields that create a lot of problems and cost. We also have 5 miles of the WAPA line running down section lines and field boarders that create no problems or additional costs.

4. Alternative 4 seems to be a will thought out that covers all my concerns. Alternative 2 basically fallows MATL's route in being the cheapest for a

foreign company building in the United States. The state of Montana should only be worried about doing what's right for its citizens, and shouldn't concern itself about Bob Williams comment that they can't afford alternative 4. The draft should not take into consideration that MATL already has easements on some land. Farmers that signed did so under derris, they were told to sign or be condemned. MATL's right a way agents and lawyer, misled local farmers telling them they had to sign and they were the only ones that hadn't. We were even told we had 3 day to sign. That the line was decided. MALT went ahead and got some easement before the DEQ had made they decision where the line should go. I feel this put added pressure on you to decide on their route.

5. The DEQ worked very hard to figure the impact on the Canadian MATL Company, the water, antelope, birds, mule deer, and teepee rings, but seemed to leave out the financial impact on the Montana's farmers. We have paid our taxes and donated our land for roads, highways, power lines, missile lines and sights, fiber optic lines, petroleum lines, and oil wells. The state should recognize this and make sure when this power line is built that it is the best for everyone. I hear politicians stating this is so good and if they went through there land they'd give it to them. Words are cheap. I guess I would say that to, if they were not even near my land. This seems to me that the politicians always have ideas how to use farmers land. Like the wolf and bear introductions. Again the farmer and rancher have to take it and can't protect what's theirs. Why is this? I hope the DEQ decides on the right way to do this power line and not buckle to political pressure.

Allen Denzer

Terri Denzer

Darlene Denzer

P.O Box 936
Conrad, Montana
59425-0936

Phone: (406) 278-3341

Actual costs of farming around a double pole utility set:

16.5 feet x 2640 ft.(1/2 mile) = 1 acre or 43560 square ft.

Spraying with a 120 ft sprayer: 160 ft. diameter circle (leaving 20 ft around poles) 160 x 3.1416 = 502 ft. x 1.5 = 753.9 linear ft.

120 ft./ 16.5 = 7.272727 acres/ 2640 ft. = .002755 acres per ft. x 753.9 ft = 2.0768 acres per pole set.

application costs: $3.75/ acre
chemical costs: $6.00/ acre (Roundup)
$9.75 x 2.0768 x 4 = $81.00 (4 applications of Roundup)

Maverick costs: $11.00/ acre + $3.75 app. = 14.75 x 2.0768 acres = $30.63
Total cost of going around a pole 1.5 times = $101.63

If we have to go around a pole an additional time to keep the GPS on track, it will be a 280 ft dia. or an additional 2.42 acres.
$9.75 x 4 x 2.42 = $94.38 (Roundup cost)
$14.75 x 2.42 = $35.70 Total of second loop: $130.08
Total cost of 2.5 loops $231.71

Heavy harrowing with a 70 ft. tool: 90 ft. dia. (leaving 10 ft. around poles) 90 x 3.1416 = 282.75 ft. x 1.5 = 425 ft.
70/16.5 = 4.25 acres/ 2640 ft. = .001606978(acres per ft.) x 425 ft. = .683 acres at $ 10.00 = $ 6.83 per pole set.
An additional time around poles at 160 ft. dia = 502.66 ft. or .8 acres x $10.00 = $8.00
Total cost of 2.5 loops: $14.83

Seeding with a 60 ft air drill: 80 ft dia x 3.1416 = 251.328 x 1.5 = 377 linear ft.
60/16.5/2640 = .00137741 acre per ft. x 377 ft. = .52 acres
Fertilizer: $36.00/ acre
Seed $7.50 / acre
Application $12.00/ acre
total $ 55.50/ acre x .52 = $28.86 per pole set
An additional time around a pole set at 140 ft. dia. = .6058 acres x $55.50 = $33.62
Total cost of 2.5 loops: $62.48

Combining with a 36 ft. header: 82 ft. dia. x 3.1416 = 257.61 ft. x 1.5 = 386.42 ft.
36/16.5/2640 = .000826446 acres per ft. x 386.42 ft. = .32 acres
$20.00 per acre x .32 = $6.40
Additional costs will be incurred while other combines wait for 1 combine to clean up around a pole set. Also, combines need to be run at capacity and will lose grain out the back of the machine when it is not fully loaded or comes to a stop according to the grain loss monitor.

Approximately 2 acres around each pole set will have a reduction in yield due to over applied spray, fertilizer and compaction from the additional traffic from the equipment. If the reduction is 30% on a 58 bushel per acre proven yield, the results are 17.4 bushels per acre.
17.4 x 2 acres x $4.00 per acre = $139.20 per pole set.

Total out of pocket costs of going around a pole 1.5 times plus the yield reduction:**$282.92**

Total out of pocket costs of going around a pole set 2.5 times plus the yield reduction: **$454.62**

These costs will be spread over a two (2) year period so the above figures will be divided by 2 to get an annual cost
of farming around a double pole set.

Annual cost of going around a pole 1.5 times: **$141.46**
Annual cost of going around a pole 2.5 times: **$227.31**

I suspect that it will take 2.5 loops around each pole set so as to NOT leave skips and to give the equipment enough room to get
back on the preceding line and lock on the GPS and auto steer. I don't have a difinitive answer at this time as we have just installed the
auto steer recently. I'll have a better idea in about a month after we spray around some existing double pole sets.

There are other factors that enter into farming around an above gound power line such as unlocking and locking the GPS autosteer
(functions on the equipment when you come to a pole set). There is also difficulty getting back on the pass without the use of a foam marker.
Another will involve the option of arial (sp) spraying when there are two double poled power lines running in parrallel about 200 ft. apart.

I suspect Arial Applicators may not want to spray fields with (2) diagonal power lines running through it for obvious reasons.

I am certainly not against power lines **if they run North/South, East/West following section lines**. Diagonal lines just create too much expense in todays farming environment. I would be willing to sign an easement for a line **if it followed section lines** for a reasonable fee, but, the diagonal lines are simply unacceptable.

Sincerely,

Brent MacDonald
President
Brent MacDonald, Inc.
1250 Anderson Road
Floweree, MT 59440-9012

Fertilizer costs have increased by 30% since this analysis was done in the summer of 2006 - so the costs will increase accordingly.

Model Overview
The methodology of the spreadsheet is based on professional assessment by Dr. Eric A. DeVuyst, Dean. A. Bangsund, and Dr. F. Larry Leistritz on how to find a reasonable estimate of the additional expense of having to farm around electrical towers in a crop field. The formulas and approach used in the model were not found in existing academic literature, although we cannot assume that a similar approach has not been used in other studies. Our approach may not be unique or novel.

The intent of the model is to use site-specific values and inputs, if available, to estimate the highest reasonable expectation for the cost to farm around electrical towers and guy wires. Costs are expected to vary based on the location or placement of the structure in the field. Towers located in the interior of the field require farming around the entire structure and so will cost more than those located on the field edge. The estimates in the model are considered conservative since the maximum amount of overlap, based on machinery size, is used in all field operations (both machinery cost and overlapped inputs). Further, the model assumes that complete crop failure occurs under the tire tracks of the sprayer when the sprayer drives over standing crop. Again, scientific evidence suggesting the actual (likely) amount or the relationship to yield loss associated with those actions could not be found. To be consistent, a worst case scenario (complete yield loss) was used.

The methodology has a number of assumptions. These assumptions include

1) operations are not discontinued when overlap begins–for example, the farmer does not shut off part of the sprayer as he sprays over areas that are considered overlap;

2) custom application rates are adequate to cover individual farmer's cost of application, which include machinery depreciation, power requirements (tractor fuel, depreciation on tractor), and operator labor;

3) estimations of the loss of productivity stemming from the 'footprint' of the towers is adequately covered by the easement settlement;

4) the existing crops grown and the lack of irrigation are continued into the foreseeable future. In other words, a new, high value, crop is not raised on the affected fields in the next several years.

The spreadsheet model is a work in progress and will not cover all situations encountered in the field. However, it is intended to be useful in a wide number of situations. If significantly different situations are encountered, modifications will be necessary.

MATL Spreadsheet Instructions

The purpose of this spreadsheet is to compute 1) yield loss associated with additional tire tracks and 2) additional costs associated with the overlapping of crop inputs from farming operations that have to maneuver around electrical tower bases. Throughout the spreadsheet, a conservative approach is used by assuming the maximum amount of overlap possible according to the farmer's machinery size.

The spreadsheet is comprised of five sheets. The tabs in the lower left corner, labeled INPUTS, AREA CALCULATIONS, COST CALCULATIONS, REVENUE LOSSES and TOTAL LOSS, direct the user to each section. Cells shaded turquoise are input cells and cells shaded yellow are calculated or fixed.

INPUTS

Start with the INPUTS sheet. All information enter here is carried through to the other sheets. First, enter the landowner's name and the field identification (such as legal description).

TABLE A. Structure Measurements and Number by Location

In Table A, three different pole configurations (1 pole, 2 pole and 3 pole) and 2 different guy wire configurations (1 wire and 3 wire) are allowed. Only 1-pole and 2-poles structures are allowed on the EDGE of the field or in the INTERIOR of the field. (An EDGE structure is too close to the field boundary to allow farming on all sides of the structure. An INTERIOR structure is distant enough from the field boundaries to allow farming on all sides of the structure.) All pole configurations are allowed in field CORNERs. Both 1-wire and 2-wire configurations are assumed to be in field CORNERs. (A CORNER structure is too close to two field boundaries to allow farming on two sides of the structure.)

For EDGE configurations, enter the distance from the field boundary to the farthest (from the boundary) edge of the poles. See FIGUREs 1-POLE EDGE FOOTPRINT and 2-POLE EDGE FOOTPRINT. Enter a safety margin if the farmer states a need for one. Also, enter the number of each type of EDGE structure.

For INTERIOR configurations, the distance from the outside edges of the tower(s). For example, a 1-pole structure may measure three feet across and a 2-pole structure may measure 23 feet from outside edge to outside edge of the poles. See FIGUREs 1-POLE INTERIOR FOOTPRINTand 2-INTERIOR FOOTPRINT.

CORNER configurations require more input. To allow for reasonable estimation of overlapped areas and nonplantable areas, it is necessary to assume a rectangular footprint for each corner configuration. Enter the farther point into the field from each boundary. These are entered as "width" and "length". Also, enter a safety margin if requested. Then, enter the number of each type of corner configuration. Last, enter the easement area for each type of CORNER structure in the field. (The easement area may be different than the footprint.) See FIGUREs 1-POLE CORNER FOOTPRINT, 2-POLE CORNER FOOTPRINT, 3-POLE CORNER FOOTPRINT, 1-

WIRE CORNER FOOTPRINT AND 3-WIRE CORNER FOOTPRINT.

TABLE B. Machinery Size and Custom Rates

In Table B, enter the farm's tillage, seeding, harvest, pesticide application and other relevant equipment used in actual field operations for the crops grown. Also, enter the width of each implement. Default widths can be over-written. Enter a custom rate for each implement/field operation. Again, a default set of values is included but can be over-written. The default values are from western ND and were taken from a North Dakota State University publication. The western ND rates were inflated by 20% above the published rate to account for recent increases in fuel prices.

Also, in Table B, enter the wheel base of the farm's crop sprayer and the width of the sprayer's tires. The model assumes that spraying operations are done with a self-propelled sprayer–if the farmer uses a tractor and pull-type sprayer, the model will need to be modified.

TABLE C. Crops, Yields and Rotation

In Table C, enter the crops grown on this *field*. DO NOT INCLUDE ANY CROPS GROWN ON THE FARM BUT NOT IN THIS FIELD. Enter the average (last few years) yield for each crop in this field. It is recommended that the APH yield from the farm's crop insurance forms be used. An estimate of the crop rotation as percent is needed for this *field*. The cropping history from the insurance forms can be of help. The rotation is entered as a percent. For example, if durum is raised about one out of four years, enter "25". Note FALLOW is treated as a crop for this spreadsheet. Other crops can be added.

TABLE D. Pesticides

Enter all pesticides used on the field for any crop. These include herbicides, insecticides (if any), and fungicides (if any). Enter the rate, the price per unit (such as per quart) and the unit (such as quart). Multiple rates for the same pesticide can be entered on separate lines. It is assumed that sprayers are not shut off on overlap areas.

TABLE E. Fertilizers

For each crop, enter the fertilizer rate and price.

TABLE F. Seeding

For each crop, enter seeding rate and price.

AREA CALCULATIONS

This sheet computes the area of overlap for each field operation listed in Table B and for each structure listed in TABLE A..

Diagrams 1-Pole or Wire Structures, Diagrams 2-Pole Structures, and Diagrams 3-Pole Structures

These sheets contain the diagrams referenced in TABLE A and throughout this manual.

TABLE G. Estimates of Overlap by Field Operation

Using the data entered on the INPUTS sheet, the area overlapped by each field operation is computed. For all INTERIOR structures, circular formulas are used. The area of a circle is computed as pi times radius squared (πR^2). A circle around each structure (the inner orange circles in Figures 1-POLE INTERIOR FOOTPRINT and 2-POLE INTERIOR FOOTPRINT) is assumed to be lost to production and not overlapped.

The outer circular area (shaded in blue in INTERIOR figures) is the computed area of overlap. The area of overlap will vary across field operations due to the different widths of implements. The overlap areas for edge of field structures are given as one-half the area in INTERIOR figures and are given in Figures 1-POLE INTERIOR OVERLAP and 2-POLE INTERIOR OVERLAP.

For EDGE structures, one-half of a circle with a diameter equal to the sum of the width of the structure and the safety margin is assumed to be non-overlap. (See Figures 1-POLE EDGE FOOTPRINT and 2-POLE EDGE FOOTPRINT.) Overlap area estimates for EDGE structures are shown in Figure 1-POLE EDGE OVERLAP and 2-POLE EDGE OVERLAP.

For CORNER structures, the non-overlap areas are shown in Figures 1-POLE CORNER OVERLAP, 2-POLE CORNER OVERLAP, 3-POLE CORNER OVERLAP, 1-WIRE CORNER OVERLAP, and 2-WIRE CORNER OVERLAP. Rectangular formulas are used to estimate overlapped areas. Areas assumed to not be planted are given in figures 1-POLE CORNER NONPLANT, 2-POLE CORNER NONPLANT, 3-POLE CORNER NONPLANT, 1-WIRE CORNER NONPLANT, and 2-WIRE CORNER NONPLANT.

TABLE H. Change in Quality

Table H is not used to compute economic loss and is presented for demonstration purposes. In Table H the change in grain quality due to overlapping of inputs is computed. Input cells are total acres in the field, yields, test weights, and protein levels. The affected acres are computed from the width of the air seeder. The model assumes that fertilizer is applied through the air seeder. If the producer broadcasts fertilizer, contact Jose as changes will need to be made to the formulas.

Providing reasonable values are entered in Table H, the potential economic effects of a change in the quality of malting barley from the placement of electrical towers will be negligible.

COST CALCULATIONS

Using the previously entered data and the number of trips/applications for each field operation, this sheet computes the costs associated with overlapping inputs–including both material costs and custom work rates for field operations.

Each crop –including FALLOW– that was entered on the INPUTS sheet has a separate table. NOTE: If a 0% area was enter for a crop's rotation percent in TABLE C, NO TABLE FOR COST CALCULATIONS WILL BE VIEWABLE OF THIS SHEET. Only Table I is discussed below, since the input requirements for the other crops are the same.

TABLE I. First Crop, Estimates of the Cost of Overlap
SPRING WHEAT

For each field operation, enter the number of times the operation is completed. The formula then uses the overlap calculations from the AREA CALCULATIONS sheet, the input prices and rates and the custom work rates from the INPUTS sheet. The resulting overlap costs are given PER FIELD.

REVENUE LOSS

This sheet computes losses associated with additional tire tracks, which are considered to drive over standing crop and result in complete yield loss under the tires. All tracks are considered to be due to spraying operations, since that is the only operation assumed to drive over standing crop, and it is assumed that no tracks would have been made around/through the field where the structure is located..

TABLE P. Yield loss due to tire tracks around towers

It assumed that each tire on the sprayer makes a unique track in the standing crop and that no yield is realized in each tire track. The circumference of each tire track (depending on its location relative to the tower) is computed as $2\pi R$ for INTERIOR structures. The radius R is computed based on the distance to the center of the circle using the width of the sprayer and the sprayer's wheel base. The area covered by each tire is equal to the distance it travels (circumference) times the tire width. For EDGE structures, a half circle is assumed. For CORNER structures, straight lines parallel to the field edges are assumed.

The economic value of yield loss is equal to the area covered by the tires ×yield×price. Areas are computed in the top of Table P and the yields used were reported on the INPUTS sheet. Prices are computed as a 10-year average of real (2006$) prices. Historical marketing-year average prices for MT (taken from Montana Agricultural Statistics Service and National Agricultural Statistics Service online data bases) are inflated to 2006$ using Producer Price Indices for wheats (spring, winter and durum) and barley (taken from US Bureau of Labor Statistics). For other crops, contact Jose as alternative data will need to be used.

The remaining tables on this sheet are the supporting price data and indices.

TABLE Q. Yield loss due to unfarmable areas around towers and guy wires

Some areas may be difficult to farm because of tight turns. These areas are shown in the figures as NON PLANT.

TOTAL LOSS

TABLE R. Total Losses

This sheet aggregates the losses from overlap and tire tracks. Losses for each crop are weighted by the crop rotation percentages and summed. No inputs are allowed on this page. The results are AVERAGE ANNUAL (or per year) losses and reported per field and per total number poles plus wires.

Appendix B

Farming Cost Sheets
Attachments DL-1 to 16

Attachment DL-1

Dryland Wheat-Fallow Rotation

Regular Span Mono-Pole at Field Edge (Layout A)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	123	0.003	$0.02
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	123	0.003	0.10
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	123	0.003	0.08
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	123	0.003	0.13
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	123	0.003	0.07
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	123	0.003	0.03
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	123	0.003	0.06
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	123	0.003	0.17
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	123	0.003	0.85
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	123	0.003	1.13
Labor & Equipment	$50	hour	0.25	hour	2	$25.00	25.00			25.00
TOTAL COST OF 2 YEAR ROTATION										**$27.63**
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE AT FIELD EDGE										**$13.81**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-2

Dryland Wheat-Fallow Rotation

Long Span Mono-Pole at Field Edge (Layout B)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	240	0.006	$0.04
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	240	0.006	0.20
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	240	0.006	0.15
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	240	0.006	0.25
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	240	0.006	0.13
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	240	0.006	0.06
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	240	0.006	0.11
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	240	0.006	0.33
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	240	0.006	1.65
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	240	0.006	2.20
Labor & Equipment	$50	hour	0.25	hour	2	$25.00	25.00			25.00
TOTAL COST OF 2 YEAR ROTATION										**$30.13**
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE AT FIELD EDGE										**$15.06**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-3

Dryland Wheat-Fallow Rotation

Regular Span Mono-Pole in Field Interior (Layout C)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost/Ac	Overlap Ft²	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	18,362	0.422	$2.95
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	50,328	1.155	41.56
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	50,328	1.155	31.20
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	13,854	0.318	14.47
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	13,854	0.318	7.38
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	50,328	1.155	13.42
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	5,597	0.128	2.57
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	50,328	1.155	69.32
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	144	0.003	0.99
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	144	0.003	1.32
Labor & Equipment	$50	hour	0.25	hour	2	$25.00				25.00
TOTAL COST PER POLE DURING 2 YEAR ROTATION										**$210.18**
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE IN FIELD INTERIOR										**$105.09**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-4

Dryland Wheat-Fallow Rotation

Long Span Mono-Pole in Field Interior (Layout D)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost/Ac	Overlap Ft²	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	19,022	0.437	$3.06
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	51,459	1.181	42.49
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	51,459	1.181	31.90
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	14,420	0.331	15.06
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	14,420	0.331	7.68
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	51,459	1.181	13.72
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	5,937	0.136	2.73
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	51,459	1.181	70.88
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	214	0.005	1.47
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	214	0.005	1.97
Labor & Equipment	$50	hour	0.25	hour	2	$25.00	25.00	25.00		25.00
TOTAL COST PER POLE DURING 2 YEAR ROTATION										**$215.95**
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE IN FIELD INTERIOR										**$107.98**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-5

Dryland Wheat-Fallow Rotation

H-Poles Perpendicular to Field Edge (Layout E)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft²	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	1,136	0.026	$0.18
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	1,136	0.026	0.94
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	1,136	0.026	0.70
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	1,136	0.026	1.19
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	1,136	0.026	0.61
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	1,136	0.026	0.30
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	1,136	0.026	0.52
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	1,136	0.026	1.56
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	1,136	0.026	7.82
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	1136	0.026	10.43
Labor & Equipment	$50	hour	0.5	hour	2	$50.00	50.00			50.00
TOTAL COST OF 2 YEAR ROTATION										**$74.26**
ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE										**$37.13**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-6

Dryland Wheat-Fallow Rotation

H-Poles Perpendicular to Field Edge & Splitting Property Line (Layout F)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft[2]	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	420	0.010	$0.07
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	420	0.010	0.35
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	420	0.010	0.26
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	420	0.010	0.44
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	420	0.010	0.22
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	420	0.010	0.11
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	420	0.010	0.19
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	420	0.010	0.58
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	420	0.010	2.89
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	420	0.010	3.86
Labor & Equipment	$50	hour	0.33	hour	2	$33.00	33.00			33.00
TOTAL COST OF 2 YEAR ROTATION										**$41.97**

ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE & SPLITTING PROPERTY LINE **$20.98**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-7

Dryland Wheat-Fallow Rotation

H-Poles Parallel to Field Edge (Layout G)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft[2]	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	233	0.005	$0.04
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	233	0.005	0.19
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	233	0.005	0.14
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	233	0.005	0.24
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	233	0.005	0.12
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	233	0.005	0.06
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	233	0.005	0.11
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	233	0.005	0.32
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	233	0.005	1.60
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	233	0.005	2.14
Labor & Equipment	$50	hour	0.25	hour	2	$25.00	25.00			25.00
TOTAL COST OF 2 YEAR ROTATION										**$29.98**
ANNUAL COST OF FARMING AROUND H-POLES PARALLEL TO FIELD EDGE										**$14.99**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-8

Dryland Wheat-Fallow Rotation

H-Pole in Field Interior (Layout H)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost/Ac	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	21,052	0.483	$3.38
Chemical Fallow:										
Roundup (RT3)	$21.50	gallon	16	ounce	4	$10.75				
Dicamba	$71.00	gallon	4	ounce	1	2.22				
Ammonium sulfate	$6.00	gallon	16	ounce	4	3.00				
Application	$5.00	acre			4	20.00	35.97	54,940	1.261	45.37
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	54,940	1.261	34.05
Fertilizer:										
Banded w/ Seed	$450	ton	60	pound	1	$13.50				
Topdress N	$450	ton	120	pound	1	27.00				
Topdress App	$5.00	acre			1	5.00	45.50	16,160	0.371	16.88
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	16,160	0.371	8.61
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	54,940	1.261	14.65
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	6,982	0.160	3.21
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	50	bushel	20%	$60.00	60.00	54,940	1.261	75.67
Pole Footprint	$6.00	bushel	50	bushel		$300.00	300.00	393	0.009	2.71
Weed Control Around Pole:										
Herbicide	$200	acre			2	$400.00	400.00	393	0.009	3.61
Labor & Equipment	$50	hour	0.33	hour	2	$33.00	33.00			33.00
TOTAL COST PER POLE DURING 2 YEAR ROTATION										**$241.14**
ANNUAL COST OF FARMING AROUND H-POLE IN FIELD INTERIOR										**$120.57**

Estimated Spring Wheat Yield: 50 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 61 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-9

Dryland Continuous Crop Rotation

Regular Span Mono-Pole at Field Edge (Layout A)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	123	0.003	$0.02
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	123	0.003	0.05
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	123	0.003	0.08
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	123	0.003	0.15
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	123	0.003	0.07
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	123	0.003	0.03
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	123	0.003	0.06
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	123	0.003	0.12
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	123	0.003	0.59
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	123	0.003	0.56
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE AT FIELD EDGE										**$14.22**

Estimated Spring Wheat Yield: 35 bu/ac

[1] Banding 11-52-0 or 18-46-0 with seed.

[2] Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-10

Dryland Continuous Crop Rotation

Long Span Mono-Pole at Field Edge (Layout B)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	240	0.006	$0.04
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	240	0.006	0.09
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	240	0.006	0.15
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	240	0.006	0.29
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	240	0.006	0.13
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	240	0.006	0.06
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	240	0.006	0.11
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	240	0.006	0.23
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	240	0.006	1.16
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	240	0.006	1.10
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE AT FIELD EDGE										**$15.86**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-11

Dryland Continuous Crop Rotation

Regular Span Mono-Pole in Field Interior (Layout C)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	18,362	0.422	$2.95
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	50,328	1.155	19.50
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	50,328	1.155	31.20
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	13,854	0.318	16.62
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	13,854	0.318	7.38
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	50,328	1.155	13.42
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	5,597	0.128	2.57
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	50,328	1.155	48.53
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	144	0.003	0.69
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	144	0.003	0.66
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE IN FIELD INTERIOR										**$156.01**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-12

Dryland Continuous Crop Rotation

Long Span Mono-Pole in Field Interior (Layout D)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	19,022	0.437	$3.06
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	51,459	1.181	19.94
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	51,459	1.181	31.90
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	14,420	0.331	17.30
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	14,420	0.331	7.68
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	51,459	1.181	13.72
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	5,937	0.136	2.73
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	51,459	1.181	49.62
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	214	0.005	1.03
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	214	0.005	0.98
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE IN FIELD INTERIOR										**$160.44**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-13

Dryland Continuous Crop Rotation

H-Poles Perpendicular to Field Edge (Layout E)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	1,136	0.026	$0.18
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	1,136	0.026	0.44
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	1,136	0.026	0.70
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	1,136	0.026	1.36
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	1,136	0.026	0.61
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	1,136	0.026	0.30
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	1,136	0.026	0.52
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	1,136	0.026	1.10
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	1,136	0.026	5.48
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	1136	0.026	5.22
Labor & Equipment	$50	hour	0.5	hour	1	$25.00	25.00			25.00
ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE										**$40.91**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-14

Dryland Continuous Crop Rotation

H-Poles Perpendicular to Field Edge & Splitting Property Line (Layout F)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft[2]	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	420	0.010	$0.07
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	420	0.010	0.16
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	420	0.010	0.26
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	420	0.010	0.50
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	420	0.010	0.22
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	420	0.010	0.11
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	420	0.010	0.19
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	420	0.010	0.40
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	420	0.010	2.02
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	420	0.010	1.93
Labor & Equipment	$50	hour	0.33	hour	1	$16.50	16.50			16.50
ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE & SPLITTING PROPERTY LINE										**$22.38**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-15

Dryland Continuous Crop Rotation

H-Poles Parallel to Field Edge (Layout G)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	233	0.005	$0.04
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	233	0.005	0.09
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	233	0.005	0.14
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	233	0.005	0.28
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	233	0.005	0.12
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	233	0.005	0.06
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	233	0.005	0.11
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	233	0.005	0.22
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	233	0.005	1.12
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	233	0.005	1.07
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND H-POLES PARALLEL TO FIELD EDGE										**$15.76**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Attachment DL-16

Dryland Continuous Crop Rotation

H-Poles in Field Interior (Layout H)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Heavy Harrow	$7.00	acre			1	$7.00	$7.00	21,052	0.483	$3.38
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	2	$5.38				
Ammonium sulfate	$6.00	gallon	16	ounce	2	1.50				
Application	$5.00	acre			2	10.00	16.88	54,940	1.261	21.28
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	54,940	1.261	34.05
Fertilizer:										
Banded w/ Seed[1]	$450	ton	60	pound	1	$13.50				
Topdress N[2]	$450	ton	150	pound	1	33.75				
Topdress App	$5	acre			1	5.00	52.25	16,160	0.371	19.38
Planting:										
Seed	$16.00	cwt	70	pound	1	$11.20				
Seeding	$12.00	acre			1	12.00	23.20	16,160	0.371	8.61
In Crop Spraying:										
Affinity Broad Spectrum	$9.25	ounce	0.6	ounce	1	$5.55				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	11.62	54,940	1.261	14.65
Harvesting:										
Combine	$20.00	acre			1	$20.00	20.00	6,982	0.160	3.21
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	35	bushel	20%	$42.00	42.00	54,940	1.261	52.97
Pole Footprint	$6.00	bushel	35	bushel		$210.00	210.00	393	0.009	1.89
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	393	0.009	1.80
Labor & Equipment	$50	hour	0.33	hour	1	$16.50	16.50			16.50
ANNUAL COST OF FARMING AROUND H-POLES IN FIELD INTERIOR										**$177.74**

Estimated Spring Wheat Yield: 35 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 75 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/13/07.

Appendix C

Farming Cost Sheet
Attachments IRR-1 to 8

Attachment IRR-1

Irrigated Farming

Regular Span Mono-Pole at Field Edge (Layout A)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	123	0.003	$0.07
Toobar	$10.00	acre			2	20.00	20.00	123	0.003	0.06
Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	123	0.003	0.02
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	123	0.003	0.08
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	123	0.003	0.35
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	123	0.003	0.08
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	123	0.003	0.04
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	123	0.003	0.08
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	123	0.003	0.30
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	123	0.003	1.52
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	123	0.003	0.56
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE AT FIELD EDGE										**$15.60**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-2

Irrigated Farming

Long Span Mono-Pole at Field Edge (Layout B)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	240	0.006	$0.14
Toobar	$10.00	acre			2	20.00	20.00	240	0.006	0.11
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	240	0.006	0.05
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	240	0.006	0.15
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	240	0.006	0.67
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	240	0.006	0.17
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	240	0.006	0.08
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	240	0.006	0.15
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	240	0.006	0.60
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	240	0.006	2.98
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	240	0.006	1.10
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE AT FIELD EDGE										**$18.69**

Estimated Spring Wheat Yield: 90 bu/ac

[1] Banding 11-52-0 or 18-46-0 with seed.

[2] Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-3

Irrigated Farming

Regular Span Mono-Pole in Field Interior (Layout C)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	5,597	0.128	$3.34
Toobar	$10.00	acre			2	20.00	20.00	13,854	0.318	6.36
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	50,328	1.155	9.75
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	50,328	1.155	31.20
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	13,854	0.318	38.90
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	13,854	0.318	9.54
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	50,328	1.155	16.25
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	5,597	0.128	3.60
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	50,328	1.155	124.78
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	144	0.003	1.79
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	144	0.003	0.66
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND REGULAR SPAN MONO-POLE IN FIELD INTERIOR										**$258.67**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-4

Irrigated Farming

Long Span Mono-Pole in Field Interior (Layout D)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	5,937	0.136	$3.54
Toobar	$10.00	acre			2	20.00	20.00	14,420	0.331	6.62
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	51,459	1.181	9.97
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	51,459	1.181	31.90
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	14,420	0.331	40.49
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	14,420	0.331	9.93
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	51,459	1.181	16.62
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	5,937	0.136	3.82
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	51,459	1.181	127.58
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	214	0.005	2.65
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	214	0.005	0.98
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND LONG SPAN MONO-POLE IN FIELD INTERIOR										**$266.61**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-5

Irrigated Farming

H-Poles Perpendicular to Field Edge (Layout E)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	1,136	0.026	$0.68
Toobar	$10.00	acre			2	20.00	20.00	1,136	0.026	0.52
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	1,136	0.026	0.22
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	1,136	0.026	0.70
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	1,136	0.026	3.19
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	1,136	0.026	0.78
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	1,136	0.026	0.37
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	1,136	0.026	0.73
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	1,136	0.026	2.82
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	1,136	0.026	14.08
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	1136	0.026	5.22
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE										**$41.81**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-6

Irrigated Farming

H-Poles Perpendicular to Field Edge & Splitting Property Line (Layout F)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft^2	Overlap Acre	Overlap Cost
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	420	0.010	$0.25
Toobar	$10.00	acre			2	20.00	20.00	420	0.010	0.19
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	420	0.010	0.08
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	420	0.010	0.26
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	420	0.010	1.18
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	420	0.010	0.29
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	420	0.010	0.14
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	420	0.010	0.27
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	420	0.010	1.04
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	420	0.010	5.21
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	420	0.010	1.93
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND H-POLES PERPENDICULAR TO FIELD EDGE & SPLITTING PROPERTY LINE										**$23.34**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.

[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-7

Irrigated Farming

H-Poles Parallel to Field Edge (Layout G)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft²	Overlap Acre	Overlap Cost
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	233	0.005	$0.14
Toobar	$10.00	acre			2	20.00	20.00	233	0.005	0.11
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	233	0.005	0.05
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	233	0.005	0.14
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	233	0.005	0.65
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	233	0.005	0.16
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	233	0.005	0.08
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	233	0.005	0.15
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	233	0.005	0.58
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	233	0.005	2.89
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	233	0.005	1.07
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND H-POLES PARALLEL TO FIELD EDGE										**$18.51**

Estimated Spring Wheat Yield: 90 bu/ac

[1]Banding 11-52-0 or 18-46-0 with seed.
[2]Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

Attachment IRR-8

Irrigated Farming

H-Poles in Field Interior (Layout H)

Operation	Cost	Unit	Rate/ac	Unit	No. of App	Cost/Ac	Oper. Total Cost	Overlap Ft²	Overlap Acres	Overlap Cost/Pole
Post Harvest:										
Disc, Offset	$13.00	acre			2	$26.00	$26.00	6,982	0.160	$4.17
Toobar	$10.00	acre			2	20.00	20.00	16,160	0.371	7.42
Post Harvest/Preplant Spraying										
Roundup (RT3)	$21.50	gallon	16	ounce	1	$2.69				
Ammonium sulfate	$6.00	gallon	16	ounce	1	0.75				
Application	$5.00	acre			1	5.00	8.44	54,940	1.261	10.64
Wildoat Control:										
Fargo	$1.00	pound	15	pound	1	$15.00				
Application	$5.00	acre			1	5.00				
Incorp w/ Heavy Harrow	$7.00	acre			1	7.00	27.00	54,940	1.261	34.05
Fertilizer:										
Banded w/ Seed[1]	$450	ton	80	pound	1	$18.00				
Topdress N[2]	$450	ton	437	pound	1	98.33				
Topdress App	$6	acre			1	6.00	122.33	16,160	0.371	45.38
Planting:										
Seed	$16.00	cwt	100	pound	1	$16.00				
Seeding	$14.00	acre			1	14.00	30.00	16,160	0.371	11.13
In Crop Spraying:										
Harmony Extra	$16.00	ounce	0.5	ounce	1	$8.00				
LV-6 (2,4-D)	$20.00	gallon	6	ounce	1	0.94				
Surfactant	$16.50	gallon	1	ounce	1	0.13				
Application	$5.00	acre			1	5.00	14.07	54,940	1.261	17.74
Harvesting:										
Combine	$28.00	acre			1	$28.00	28.00	6,982	0.160	4.49
Crop Loss:										
Quality/Quanity in Overlap	$6.00	bushel	90	bushel	20%	$108.00	108.00	54,940	1.261	136.21
Pole Footprint	$6.00	bushel	90	bushel		$540.00	540.00	393	0.009	4.87
Weed Control Around Pole:										
Herbicide	$200	acre			1	$200.00	200.00	393	0.009	1.80
Labor & Equipment	$50	hour	0.25	hour	1	$12.50	12.50			12.50
ANNUAL COST OF FARMING AROUND H-POLES IN FIELD INTERIOR										**$290.41**

Estimated Spring Wheat Yield: 90 bu/ac

[1] Banding 11-52-0 or 18-46-0 with seed.

[2] Applying a total of 210 actual units of nitrogen per acre.

Compiled by Neal E. Fehringer, Certified Professional Agronomist, C.C.A. on 6/15/07.

APPENDIX O:
POTENTIAL WIND FARM MITIGATION MEASURES ADAPTED FROM PROGRAMMATIC EIS - BLM WIND ENERGY DEVELOPMENT ON BLM LANDS IN THE WESTERN U.S.

**Potential Wind Farm Mitigation Measures
Adapted from the BLM Programmatic EIS for
BLM Wind Energy Development on BLM Lands in the Western U.S.**

The previous evaluations identified a number of potential impacts that could occur during the construction, operation, and decommissioning of a wind energy facility. A variety of mitigation measures could be implemented at wind energy projects to reduce potential impacts, and these are described in the following sections. In addition, monitoring during the various phases of wind energy development could be utilized to identify potential concerns and actions to address those concerns. Monitoring data could be used to track the condition of resources, to identify the onset of impacts, and to direct responses to address those impacts. The following sections identify measures that may be appropriate for mitigating potential impacts associated with new wind energy projects.

The discussion of potential measures to reduce impacts is heavily adapted from the final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-administered lands in the Western United States located at http://windeis.anl.gov/documents/fpeis/. Potential measures have been refined to address conditions found in the vicinity of the MATL line. Because this discussion is general in nature due to the lack of detailed plans on the wind farms, site-specific and species-specific issues associated with individual wind energy development projects are not assessed in detail. Rather, the range of possible impacts on resources present in the study area is identified. This section considers only indirect cumulative impacts of the transmission line that could be associated with wind farm development.

1.0 Land Use and Infrastructure

A variety of mitigation measures could be implemented to reduce potential land use impacts. These measures include:

- Wind energy projects could be planned to mitigate or minimize impacts to other land uses.
- Federal and state agencies, properties owners, and other stakeholders could be contacted as early as possible in the planning process to identify potentially sensitive land uses and issues;
- The U.S. Department of Defense would be consulted regarding the potential impact of a proposed wind energy project on military operations in order to identify and address any concerns;
- The FAA required notice of proposed construction would be made as early as possible to identify any air safety measures that would be required;

- To plan for efficient land use, necessary infrastructure requirements could be consolidated whenever possible, and current transmission and market access could be evaluated;

- Restoration plans could be developed to ensure that all temporary use areas are restored.

- Wind farm developers could work with affected landowners to reduce interference with existing land uses.

1.1 Land Use and Infrastructure - Transportation

Potential impacts from transportation activities related to site monitoring and testing, construction, operation, and decommissioning of typical wind energy development projects are expected to be low, provided appropriate planning and implementation actions are taken. The following measures to mitigate transportation impacts address the expected major activities associated with future wind energy development projects and general safety standards.

- Generally, roads could be required to follow natural contours and be reclaimed. Roads could be designed to an appropriate standard no higher than necessary to accommodate their intended functions.

- Existing roads could be used to the maximum extent possible, but only if in safe and environmentally sound locations. If new access roads are necessary, they could be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed could be recontoured and revegetated.

- A transportation plan could be developed by project sponsors, particularly for the transport of turbine components, main assembly cranes, and other large pieces of equipment. The plan could consider specific object sizes, weights, origin, destination, and unique handling requirements and could evaluate alternative transportation approaches (e.g., barge or rail). In addition, the process to be used to comply with unique state requirements and to obtain all necessary permits could be clearly identified.

- A traffic management plan could be prepared by the project sponsors for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan could incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration. Signs could be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local commuters, consideration could be given to limiting construction vehicles traveling on public roadways during the morning and late afternoon commute time.

- Project personnel and contractors could be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow.

- During construction and operation, traffic could be restricted to the roads developed for the project. Use of other unimproved roads could be restricted to emergency situations.

2.0 Geology and Soils

The potential for impacts to geologic resources and soils would occur primarily during construction and decommissioning. The following mitigation measures could reduce impacts:

- The size of disturbed land could be minimized as much as possible. Existing roads and borrow pits could be used as much as possible.

- Topsoil removed during construction could be salvaged and reapplied during reclamation. Disturbed soils could be reclaimed as quickly as possible or protective covers could be applied.

- Erosion controls that comply with state standards could be applied. Practices such as jute netting, silt fences, and check dams could be applied near disturbed areas.

- On-site surface runoff control features could be designed to minimize the potential for increased localized soil erosion. Drainage ditches could be constructed where necessary but held to a minimum. Potential soil erosion could be controlled at culvert outlets with appropriate structures. Catch basins, drainage ditches, and culverts could be cleaned and maintained regularly.

- Operators could identify unstable slopes and local factors that can induce slope instability (such as groundwater conditions, precipitation, earthquake activities, slope angles, and dip angles of geologic strata). Operators also could avoid creating excessive slopes during excavation and blasting operations. Special construction techniques could be used where applicable in areas of steep slopes, erodible soil, and stream channel/wash crossings.

- Borrow material could be obtained only from authorized and permitted sites.

- Access roads could be located to follow natural contours of the topography and minimize side hill cuts.

- Foundations and trenches could be backfilled with originally excavated materials as much as possible. Excavation material could be disposed of only in approved areas to control soil erosion and to minimize leaching of hazardous constituents. If suitable, excess excavation materials may be stockpiled for use in reclamation activities.

3.0 Engineering and Hazardous Materials (Safety also)

The following mitigation measures could be used to deal with hazardous materials during all activities associated with a wind energy project:

- The project sponsor could keep a comprehensive listing of the hazardous materials that would be used, stored, transported, or disposed of during activities associated with site monitoring and testing, construction, operation, and decommissioning of a wind energy project.

- Project sponsors could develop a hazardous materials management plan addressing storage, use, transportation, and disposal of each hazardous material anticipated to be used at the site. The plan could identify all hazardous materials that would be used, stored, or transported at the site. It could establish inspection procedures, storage requirements, storage quantity limits, inventory control, nonhazardous product substitutes, and disposition of excess materials. The plan could also identify requirements for notices to federal and local emergency response authorities and include emergency response plans.

- Project sponsors could develop a waste management plan identifying the waste streams that are expected to be generated at the site and addressing hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements, inspection procedures, and waste minimization procedures. This plan could address all solid and liquid waste that may be generated at the site.

- Project sponsors could develop a spill prevention and response plan identifying where hazardous materials and wastes are stored on site, spill prevention measures to be implemented, training requirements, appropriate spill response actions for each material or waste, the locations of spill response kits on site, a procedure for ensuring that the spill response kits are adequately stocked at all times, and procedures for making timely notifications to authorities.

- Project sponsors must develop a storm water management plan under Montana DEQ regulation for the site to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion.

- If pesticides are to be used on the site, an integrated pest management plan could be developed to ensure that applications will be conducted in accordance with state and federal regulations. Pesticide use could be limited to nonpersistent, immobile pesticides and could only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

- Secondary containment could be provided for all on-site hazardous materials and waste storage, including fuel. In particular, fuel storage (for construction vehicles and equipment) could be a temporary activity occurring only for as long as is needed to support construction and decommissioning activities. Fuel storage facilities could be removed from the site after these activities are completed.

- Wastes could be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.

- In the event of an accidental release to the environment, the operator could document the event, including a root cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event could be provided to DEQ as required.

- Any wastewater generated in association with temporary, portable sanitary facilities could be periodically removed by a licensed hauler and introduced into an existing municipal sewage treatment facility. Temporary, portable sanitary facilities provided for construction crews could be adequate to support expected on-site personnel and could be removed at the completion of construction activities.

The following mitigation measures dealing with health and safety could be implemented where appropriate during all phases associated with a wind energy project:

- All construction, operation, and decommissioning activities could be conducted in compliance with applicable federal and state occupational safety and health standards (e.g., OSHA's Occupational Health and Safety Standards, 29 CFR Parts 1910 and 1926, respectively (DOL 2001, 2003).

- A safety assessment could be conducted to describe potential safety issues and the means that would be taken to mitigate them, including issues such as site access, construction, safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control.

- A health and safety program could be developed to protect workers during construction, operation, and decommissioning of a wind energy project. The program could identify all applicable federal and state occupational safety standards, establish safe work practices for each task (e.g., requirements for personal protective equipment and safety harnesses; OSHA standard practices for safe use of explosives and blasting agents; and measures for reducing occupational EMF exposures), establish fire safety evacuation procedures, and define safety performance standards (e.g., electrical system standards and lighting protection standards). The program could include a training program to identify hazard training requirements for workers for each task and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies could be established.

- Electrical systems could be designed to meet all applicable safety standards (e.g., National Electrical Code [NEC] and IEC and National Electric Safety Code).

- For the mitigation of explosive hazards, workers could be required to comply with the OSHA standard (1910.109) for the safe use of explosives and blasting agents (DOL 1998).

- Measures could be considered to reduce occupational EMF exposures, such as backing the generator with iron to block the electric field, shutting down the generator when working in the vicinity, and/or limiting exposure time while the generator is running (Robichaud 2004).

- The project health and safety program could also address protection of public health and safety during construction, operation, and decommissioning of a wind energy project. The program could establish a safety zone or setback for wind turbine generators from residences and occupied buildings, roads, ROWs, and other public access areas that is sufficient to prevent accidents resulting from hazards such as blade failure and ice throw during the operation of wind turbine generators. It could identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or decommissioning activities. It could also identify measures to be taken during the operations phase to limit public access to facilities (e.g., permanent fencing could be installed around electrical substations, and turbine tower access doors could be locked to limit public access).

- Operators could consult with local authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) could be identified and addressed in the traffic management plan.

- If operation of the wind turbines is expected to cause significant adverse impacts to nearby residences and occupied buildings from shadow flicker, low-frequency sound, or EMF, site-specific recommendations for addressing these concerns could be incorporated into the project design (e.g., establishing a sufficient setback from turbines).

- The project could be planned to minimize EMI (e.g., impacts to radar, microwave, television, and radio transmissions) and comply with FCC regulations. Signal strength studies could be conducted when proposed locations have the potential to impact transmissions. Potential interference with public safety communication systems (e.g., radio traffic related to emergency activities) could be avoided.

- In the event an installed wind energy development project results in EMI, the operator could work with the owner of the impacted communications system to resolve the problem. Potential mitigation may include realigning the existing antenna or installing relays to transmit the signal around the wind energy project. Additional warning information may also need to be conveyed to aircraft with onboard radar systems so that echoes from wind turbines can be quickly recognized.

- The project could be planned to comply with FAA regulations, including lighting requirements, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.

- Operators could develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.

4.0 Electric and Magnetic Fields – no measures.

5.0 Water Resources

Potential water resource impacts would mostly occur during the site construction and decommissioning phases. Mitigation measures that could reduce such impacts include:

- The amount of cleared and disturbed lands could be minimized as much as possible. Existing roads and borrow pits could be used as much as possible.

Topsoil removed during construction could be salvaged and reapplied during reclamation. Disturbed soils could be reclaimed as quickly as possible or protective covers could be applied.

- Operators could identify unstable slopes and local factors that can induce slope instability (such as groundwater conditions, precipitation, earthquakes, slope angles, and dip angles of geologic strata). Operators also could avoid creating excessive slopes during excavation and blasting operations. Special construction techniques could be used where applicable in areas of steep slopes, erodible soil, and stream channel/wash crossings.

- Erosion controls that comply with state standards could be applied. Controls such as jute netting, silt fences, and check dams could be applied near disturbed areas.

- Operators could gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies could be identified.

- Operators could avoid creating hydrologic conduits between two aquifers during foundation excavation and other activities.

- Proposed construction near aquifer recharge areas could be closely monitored to reduce the potential for contamination of the aquifer. This may require a study to determine localized aquifer recharge areas.

- Foundations and trenches could be backfilled with originally excavated material as much as possible. Excess excavated material could be disposed of only in approved areas.

- Existing drainage systems could not be altered, especially in sensitive areas such as erodible soils or steep slopes. When constructing stream or wash crossings, culverts or water conveyances for temporary and permanent roads could be designed to comply with county standards, or if there are no county standards, to accommodate the runoff of a 10-year storm. Potential soil erosion could be controlled at culvert outlets with appropriate structures. Catch basins, roadway ditches, and culverts could be cleaned and maintained regularly.

- On-site surface runoff control features could be designed to minimize the potential for increased localized soil erosion. Drainage ditches could be constructed where necessary but held to a minimum. Potential soil erosion could be controlled at culvert outlets with appropriate structures. Catch basins, drainage ditches, and culverts could be cleaned and maintained regularly.

- Pesticide use could be limited to nonpersistent, immobile pesticides and could only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

6.0 Wetlands and Floodplains

Wind energy development typically occurs on ridges and other elevated land where wetlands and surface bodies are not likely to occur; however, access roads and transmission lines may cross lands where these features may be more common. As a result, wetland and aquatic biota could be affected during construction of the wind energy project and its associated facilities.

- Construction activities may adversely affect wetlands and aquatic biota through (1) habitat disturbance, (2) mortality or injury of biota, (3) erosion and runoff, (4) exposure to contaminants, and (5) interference with migratory movements. Except for the construction of stream crossings for access routes or the unavoidable location of a transmission line support tower in a wetland, construction within wetlands or other aquatic habitats would be largely prohibited.

- The overall impact of construction activities on wetlands and aquatic resources would depend on the type and amount of aquatic habitat that would be disturbed, the nature of the disturbance (e.g., grading and filling, or erosion in construction support areas), and the aquatic biota that occupy the project site and surrounding areas.

- Avoid construction of stream crossings could directly impact aquatic habitat and biota within the crossing footprint.

7.0 Vegetation

The following measures could be implemented through weed control plans required by county weed boards to minimize the potential establishment of invasive vegetation at a wind energy development site and its associated facilities:

- Operators would develop a plan for control of noxious weeds and invasive plants acceptable to the county weed board, which could occur as a result of new surface disturbance activities at the site. The plan could address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching could be required.

- If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area could be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.

- Access roads and newly established power lines could be monitored regularly for invasive species establishment, and weed control measures could be initiated immediately upon evidence of invasive species introduction.

- Fill materials that originate from areas with known invasive vegetation problems could not be used.

- Certified weed-free mulch could be used when stabilizing areas of disturbed soil.

- Habitat restoration activities and invasive vegetation monitoring and control activities could be initiated as soon as possible after construction activities are completed.

- All areas of disturbed soil could be reclaimed using weed-free native shrubs, grasses, and forbs.

- Pesticide use could be limited to nonpersistent, immobile pesticides and could only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

- Access roads, utility and transmission line corridors, and tower site areas could be monitored regularly for invasive species establishment, and weed control measures could be initiated immediately upon evidence of invasive species introduction.

8.0 Wildlife

Mitigation measures that could minimize raptor fatalities at wind energy development projects include:

- Raptor use of the project area could be evaluated, and the project could be designed to minimize or mitigate the potential for raptor strikes. Scientifically rigorous raptor surveys could be conducted; the amount and extent of baseline data required could be determined on a project-specific basis.

- Areas with a high incidence of fog, mist, low cloud ceilings, and low visibility could be avoided.

- Turbine locations could be configured in order to avoid landscape features (including prairie dog colonies and other high-prey potential sites) known to attract raptors.

- Turbine arrays could be configured to minimize avian mortality (e.g., orient rows of turbines parallel to known bird movements).

- Underground or raptor-safe transmission lines could be used to reduce collision and electrocution potential.

- A habitat restoration plan could be developed that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species (e.g., avoid the establishment of habitat that attracts high densities of prey animals used by raptors).

- Road cuts, which are favored by pocket gophers and ground squirrels, could be minimized.

- Either no vegetation or native plant species that do not attract small mammals could be maintained around the turbines.

- Tubular supports rather than lattice supports could be used, with no external ladders and platforms.

- The minimum amount of pilot warning and obstruction avoidance lighting specified by the FAA could be used, and the FAA could be consulted.

- Operators could determine if active raptor nests (i.e., raptor nests used during the breeding season) are present. Buffers could be provided to avoid disturbance of nesting raptors.

- Areas with high bird use could be avoided through micro-siting alternatives (e.g., at the Foote Creek Rim project, turbines were located slightly away from the rim edge of a flat top mesa [Strickland et al. 2001a]).

Measures that have been suggested for management of sage grouse and their habitats may apply to sharp-tailed grouse (e.g., Paige and Ritter 1999; Connelly et al. 2000; Montana Sage-Grouse Work Group 2003). The measures that have pertinence to wind energy development projects include:

- Identify and avoid both local (daily) and seasonal migration routes.

- Consider grouse and sage habitat when designing, constructing, and utilizing project access roads and trails.

- Avoid, when possible, siting energy developments in breeding habitats.

- Adjust the timing of activities to minimize disturbance to grouse during critical periods.

- When possible, locate energy-related facilities away from active leks or near grouse habitat.

- When possible, restrict noise levels to 10 dB above background noise levels at the lek sites.

- Minimize nearby human activities when birds are near or on leks.

- As practicable, do not conduct surface-use activities within crucial sage-grouse wintering areas from December 1 through March 15.

- Maintain sagebrush communities on a landscape scale.

- Provide compensatory habitat restoration for impacted sagebrush habitat.

- Avoid the use of pesticides at grouse breeding habitat during the brood-rearing season.

- Develop and implement appropriate measures to prevent the introduction or dispersal of noxious weeds.

- Avoid creating attractions for raptors and mammalian predators in grouse habitat.

- Consider measures to mitigate impacts at off-site locations to offset unavoidable grouse habitat alteration and reduction at the project site.

9.0 Fish – no measures.

10.0 Threatened, Endangered, and Candidate for Listing Species

If federally listed species are present in the project vicinity, the project sponsor is encouraged to contact the USFWS.

A variety of site-specific and species-specific measures may be appropriate to mitigate potential impacts to special status species if present in the project area. Such measures may include:

- Field surveys could be conducted to verify the absence or presence of the species in the project area and especially within individual project footprints.

- Project facilities or lay-down areas could not be placed in areas documented to contain or provide important habitat for those species.

11.0 Air Quality

The potential for adverse air quality impacts during the site monitoring and testing and operation phases would be limited. The greatest potential impacts would occur during the construction and decommissioning phases. Generation of fugitive particulates from vehicle traffic and earthmoving activities would need to be controlled. Typical measures (ABC Wind Company, LLC undated; PBS&J 2002) that could be implemented to control particulates and other pollutants include these:

- Mitigation measures for areas subject to vehicular travel

Access roads and on-site roads could be surfaced with aggregate materials, wherever appropriate.

Dust abatement techniques could be used on unpaved, unvegetated surfaces to minimize airborne dust.

Speed limits could be posted (e.g., 25 mph) and enforced to reduce airborne fugitive dust.

- Mitigation measures for soil and material storage and handling

Workers could be trained to handle construction material to reduce fugitive emissions.

Construction materials and stockpiled soils could be covered if they are a source of fugitive dust.

Storage piles at concrete batch plants could be covered if they are a source of fugitive dust.

- Mitigation measures for clearing and disturbing land

Disturbed areas could be minimized.

Dust abatement techniques could be used as earthmoving activities proceed and prior to clearing.

- Mitigation measures for earthmoving

Dust abatement techniques could be used before excavating, backfilling, compacting, or grading.

Disturbed areas could be revegetated as soon as possible after disturbance.

- Mitigation measures for soil loading and transport

If practicable, soil could be moist while being loaded into dump trucks.

Soil loads could be kept below the freeboard of the truck.

Drop heights could be minimized when loaders dump soil into trucks.

Gate seals could be tight on dump trucks.

Dump trucks could be covered before traveling on public roads.

- Mitigation measure for blasting

Dust abatement techniques could be used during blasting.

12.0 Audible Noise

The following mitigation measures could reduce potential noise impacts:

- Proponents of a wind energy development project could take measurements to assess the existing background noise levels at a given site and compare them with the anticipated noise levels associated with the proposed project.

- Noisy construction activities (including blasting) could be limited to the least noise-sensitive times of day (daytime only between 7 a.m. and 10 p.m.) and weekdays.

- Whenever feasible, different noisy activities (e.g., blasting and earthmoving) could be scheduled to occur at the same time since additional sources of noise generally do not add a significant amount of noise. That is, less-frequent noisy activities would be less annoying than frequent less-noisy activities.

- All equipment could have sound-control devices no less effective than those provided on the original equipment. All construction equipment used could be adequately muffled and maintained.

- All stationary construction equipment (i.e., compressors and generators) could be located as far as practicable from nearby residences.

- If blasting or other noisy activities are required during the construction period, nearby residents could be notified in advance.

13.0 Socioeconomics – no measures.

14.0 Paleontological and Cultural Resources

To mitigate or minimize potential paleontological resource impacts, the following mitigation measures could be adopted:

- Operators could determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or a paleontological survey.

- A paleontological resources management plan could be developed for areas where there is a high potential for paleontological material to be present. Management options may include avoidance, removal of the fossils, or monitoring. If the fossils are to be removed, a mitigation plan could be drafted identifying the strategy for collection of the fossils in the project area. Often it is unrealistic to remove all of the fossils, in which case a sampling strategy can be developed. If an area exhibits a high potential but no fossils were observed during surveying, monitoring could be required. A qualified paleontologist could monitor all excavation and earthmoving in the sensitive area. Whether the strategy chosen is excavation or monitoring, a report detailing the results of the efforts could be produced.

- If an area has a strong potential for containing fossil remains and those remains are exposed on the surface for potential collection, steps could be taken to educate workers and the public on how to report these resources to the landowner.

- To mitigate or minimize potential impacts to cultural resources, the following mitigation measures could be adopted. On state or federal lands, some measures could be required.

- Where a wind farm would be located on state or federal lands, agencies with permitting authority could consult with Native American governments early in the planning process to identify issues and areas of concern regarding the proposed wind energy development. Aside from the fact that consultation is required under the National Historic Preservation Act (NHPA), consultation is necessary to establish whether the project is likely to disturb traditional cultural properties, affect access rights to particular locations, disrupt traditional cultural practices, and/or visually impact areas important to the Tribe(s).

- The presence of archaeological sites and historic properties in the area of potential effect could be determined on the basis of a records search of recorded sites and properties in the area and/or an archaeological survey. The State Historic Preservation Officer (SHPO) is the primary repository for cultural resource information, and the State DNRC offices and most BLM Field Offices also maintain this information for lands under their jurisdiction.

- Archaeological sites and historic properties present in the area of potential effect could be reviewed by an agency and/or a project sponsor to determine whether they meet the criteria of eligibility for listing on the NRHP. Cultural resources listed on or eligible for listing on the NRHP are considered “significant” resources.

- When any ROW application includes remnants of a National Historic Trail, is located within the viewshed of a National Historic Trail’s designed centerline, or includes or is within the viewshed of a trail eligible for listing on the National Register of Historic Places (NRHP), the operator could evaluate the potential visual impacts to the trail associated with the proposed project and identify appropriate mitigation measures.

- If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan could be developed by a regulatory agency and/or a project sponsor. This plan could address mitigation activities to be implemented for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts are observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report could be prepared documenting these activities. The CRMP also could (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.

- Periodic monitoring of significant cultural resources in the vicinity of development projects may help curtail potential looting/vandalism and erosion impacts. If impacts are recognized early, additional actions can be taken before the resource is destroyed.

- Unexpected discovery of cultural resources during construction could be brought to the attention of the responsible authorized officer or landowner immediately. Work could be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

- Wind farm developers could inform construction workers and site operators of appropriate measures to avoid damage to or destruction of cultural resources.

15.0 Visuals

The potential for impacts to visual resources soils could occur during all phases of wind energy development. The following mitigation measures could reduce impacts (NWCC 2002; AusWEA 2002; Gipe 1998, 2002; NYSDEC 2000):

- Turbine arrays and the turbine design could be integrated with the surrounding landscape. To accomplish this integration, several elements of design need to be incorporated.

- The operator could provide visual order and unity among clusters of turbines (visual units) to avoid visual disruptions and perceived “disorder, disarray, or clutter” (Gipe 2002).

- To the extent possible given the terrain of a site, the operator could create clusters or groupings of wind turbines when placed in large numbers; avoid a cluttering effect by separating otherwise overly long lines of turbines, or large arrays; and insert breaks or open zones to create distinct visual units or groups of turbines.

- The operator could create visual uniformity in the shape, color, and size of rotor blades, nacelles, and towers (Gipe 1998).

- The use of tubular towers is recommended for visual unity. Truss or lattice-style wind turbine towers with lacework, pyramidal, or prism shapes could be avoided. Tubular towers present a simpler profile and less complex surface characteristics and reflective/shading properties.

- Components could be in proper proportion to one another. Nacelles and towers could be planned to form an aesthetic unit and could be combined with particular sizes and shapes in mind to achieve an aesthetic balance between the rotor, nacelle, and tower (Gipe 1998).
- Color selections for turbines could be made to reduce visual impact (Gipe 2002) and could be applied uniformly to tower, nacelle, and rotor, unless gradient or other patterned color schemes are used.

- The operator could use nonreflective paints and coatings to reduce reflection and glare. Turbines, visible ancillary structures, and other equipment could be painted before or immediately after installation. Uncoated galvanized metallic surfaces could be avoided because they would create a stronger visual contrast, particularly as they oxidize and darken.

- Commercial messages on turbines and towers could be avoided (Gipe 2002).

- The site design could be integrated with the surrounding landscape.

- To the extent practicable, the operator could avoid placing substations or large operations buildings on high land features and along "skylines" that are visible from nearby sensitive view points. The presence of these structures could be concealed or made less conspicuous. Conspicuous structures could be designed and constructed to harmonize with desirable or acceptable characteristics of the surrounding environment (Gipe 2002).

- The operator could bury power collection cables or lines on the site in a manner that minimizes additional surface disturbance.

- Commercial symbols (such as logos), trademarks, and messages could be avoided on sites or ancillary structures of wind energy projects. Similarly, billboards and advertising messages could be avoided (Gipe 1998, 2002).

- Site design could be accomplished to make security lights nonessential. Such lights increase the contrast between a wind energy project and the night sky, especially in rural/remote environments, where turbines would typically be installed. Where they are necessary, security lights could be extinguished except when activated by motion detectors (e.g., only around the substation) (Gipe 1998).

- Operators could minimize disturbance and control erosion by avoiding steep slopes (Gipe 1998) and by minimizing the amount of construction and ground clearing needed for roads, staging areas, and crane pads. Dust suppression techniques could be employed in arid environments to minimize impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils.

- Disturbed surfaces could be restored as closely as possible to their original contour and revegetated immediately after, or contemporaneously with construction. Action could be prompt to limit erosion and to accelerate restoring the preconstruction color and texture of the landscape.

- The wind development site could be maintained during operation. Inoperative or incomplete turbines cause the misperception in viewers that "wind power does not work" or that it is unreliable.

- Inoperative turbines could be completely repaired, replaced, or removed. Nacelle covers and rotor nose cones could always be in place and undamaged (Gipe 1998).

- Wind energy projects could evidence environmental care, which would also reinforce the expectation and impression of good management for benign or clean power. Nacelles and towers could also be cleaned regularly (yearly, at minimum) to remove spilled or leaking fluids and the dirt and dust that would accumulate, especially in seeping lubricants.

- Facilities and off-site surrounding areas could be kept clean of debris, "fugitive" trash or waste, and graffiti. Scrap heaps and materials dumps could be prohibited and prevented. Materials storage yards, even if thought to be orderly, could be kept to an absolute minimum. Surplus, broken, disused materials and equipment of any size could not be allowed to accumulate (Gipe 2002).

- A decommissioning plan could be developed, and it could include the removal of all turbines and ancillary structures and restoration/reclamation of the site.

16.0 Mitigation during Site Monitoring and Testing

Site monitoring and testing would generally result in only minimal impacts to ecological resources. The following mitigation measures may ensure that ecological impacts during this stage of the project would be minimal:

- Existing roads could be used to the maximum extent feasible to access a proposed project area.

- If new access roads are necessary, they could be designed and constructed to the appropriate standard.

- Existing or new roads could be maintained to the condition needed for facility use.

- The area disturbed during the installation of meteorological towers (i.e., the tower footprint and its associated lay-down area) could be kept to a minimum.

- Individual meteorological towers could not be located in or near sensitive habitats or in areas where ecological resources known to be sensitive to human activities are present.

- Installation of meteorological towers could be scheduled to avoid disruption of wildlife reproductive activities or other important behaviors (e.g., during periods of grouse nesting).

17.0 Mitigation during Plan of Development Preparation and Project Design

Mitigation measures may be considered during preparation of the project design to ensure that the siting of the overall wind energy development project and of individual facility structures, as well as various aspects of the design of individual facility structures, do not result in unacceptable impacts to ecological resources. The following measures could be incorporated into the siting of the wind development project:

- Operators could identify important, sensitive, or unique habitat and biota in the project vicinity and site, and design the project to avoid (if possible), minimize, or mitigate potential impacts to these resources. The design and siting of the facility could follow appropriate guidance and requirements from other resource agencies, as available and applicable.

- The operators could contact appropriate agencies early in the planning process to identify potentially sensitive ecological resources that may be present in the area of the wind energy development.

- The operators could conduct surveys for federal- and state-protected species and other species of concern within the project area.

- Operators could evaluate avian and bat use (including the locations of active nest sites, colonies, roosts, and migration corridors) of the project area by using scientifically rigorous survey methods (e.g., see NWCC 1999).

- The project could be planned to avoid (if possible), minimize, or mitigate impacts to wildlife and habitat.

- Discussion could be held with the appropriate agency biologists regarding the occurrence of sensitive species or other valued ecological resources in the proposed project area.

- Existing information on species and habitats in the project area could be reviewed.

The amount and extent of necessary preproject data would be determined on a project-by-project basis, based in part on the environmental setting of the proposed project location. Methods for collecting such data may be found in NWCC (1999) and California Energy Commission (2007).

17.1 Mitigating Habitat Impacts. The following measures could be considered during project siting to minimize potential habitat disturbance:

- If survey results indicate the presence of important, sensitive, or unique habitats (such as wetlands and sagebrush habitat) in the project vicinity, facility design could locate turbines, roads, and support facilities in areas least likely to impact those habitats.

- Habitat disturbance could be minimized by locating facilities (such as utility corridors and access roads) in previously disturbed areas (i.e., locate transmission lines within or adjacent to existing power line corridors).

- Existing roads and utility corridors could be utilized to the maximum extent feasible.

- New access roads and utility corridors could be configured to avoid high quality habitats and minimize habitat fragmentation.

- Site access roads and utility corridors could minimize stream crossings.

- A habitat restoration management plan could be developed that identifies vegetation, soil stabilization, and erosion reduction measures and requires that restoration activities be implemented as soon as possible following facility construction activities.

- Individual project facilities could be located to maintain existing stands of quality habitat and continuity between stands.

- The creation of, or increase in, the amount of edge habitat between natural habitats and disturbed lands could be minimized.

- To minimize impacts to aquatic habitats from increased erosion, the use of bridges or fill ramps rather than stream bank cutting could be designated for all stream crossings by access roads.

- Stream crossings could be designed to provide in-stream conditions that allow for and maintain uninterrupted movement and safe passage of fish.

17.2 Mitigating Site/Wildlife Interactions. To reduce the potential use of site facilities by perching birds, to reduce the potential for collisions with project facilities, and to reduce the potential for electrocution, the following measures could be considered during the design of individual facility structures:

- Locations that are heavily utilized by migratory birds and bats could be avoided.

- Permanent meteorological towers, transmission towers, and other facility structures could be designed to discourage their use by birds for perching or nesting.

- The use of guy wires on permanent meteorological towers could be avoided or minimized.

- Electrical supply lines could be buried in a manner that minimizes additional surface disturbance. Overhead lines could be used in cases where the burial of lines would result in further habitat disturbance.

- Power lines could be configured to minimize the potential for electrocution of birds, by following established guidelines (e.g., APLIC [2006], APLIC and USFWS ~2O05]).

- Operators could consider incorporating measures to reduce raptor use of the project site into the design of the facility layout (e.g., minimize road cuts and maintain nonattractive vegetation around turbines).

- Turbines and other project facilities could avoid locations in areas with known high bird usage; in known bird and/or bat migration corridors or known flight paths; near raptor nest sites; and in areas used by bats as colonial hibernation, breeding, and maternity/nursery colonies, if site studies show that they would pose a high risk to species of concern.

- Wind energy projects could avoid locations in areas with a high incidence of fog and mist.

- To reduce attraction of migratory birds to turbines and towers, the need for or use of sodium vapor lights at site facilities could be minimized or avoided.

- Turbines could be configured to avoid landscape features known to attract raptors, if site studies show that placing turbines there would pose a significant risk to raptors.

17.3 Mitigating Habitat Disturbance. To mitigate habitat reduction or alternation during construction, the following measures may be implemented:

- The size of all disturbed areas could be minimized.

- Where applicable, the extent of habitat disturbance could be reduced by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.

- Habitat restoration activities could be initiated as soon as possible after construction activities are completed.

17.4 Mitigating Disturbance and Injury of Vegetation and Wildlife. These measures may be applicable to mitigate the disturbance or injury of biota during construction:

- In consultation with staff from natural resource management agencies, construction activities could be scheduled to avoid important periods of wildlife courtship, breeding, nesting, lambing, or calving.

- All construction employees could be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship, nesting) seasons. In addition, any pets could not be permitted on site during construction.

- Buffer zones could be established around raptor nests, bat roosts, and biota and habitats of concern, if site studies show that proposed facilities would pose a significant risk to avian or bat species of concern.

- Noise-reduction devices (e.g., mufflers) could be maintained in good working order on vehicles and construction equipment.

- Explosives could be used only within specified times and at specified distances from sensitive wildlife or surface waters as established by local, state and federal management agencies.

- The use of guy wires on permanent meteorological towers could be avoided.

17.5 Mitigating Erosion and Fugitive Dust Generation. Measures to minimize disturbance of ecological resources from erosion and fugitive dust may include:

- Erosion controls that comply with county, state, and federal standards could be applied. Controls such as jute netting, silt fences, and check dams could be applied near disturbed areas.

- All areas of disturbed soil could be reclaimed using weed-free native grasses, forbs, and shrubs. Reclamation activities could be undertaken as early as possible on disturbed areas.

- Dust abatement techniques could be used on unpaved, unvegetated surfaces to minimize airborne dust.

- Construction materials and stockpiled soil could be covered if they are a source of fugitive dust.

- Erosion and fugitive dust control measures could be inspected and maintained regularly.

17.6 Mitigating Fuel Spills. To minimize potential impacts to ecological resources from accidental fuel spills, the following mitigation measures may be implemented:

- All refueling could occur in a designated fueling area that includes a temporary berm to limit the spread of any spill.

- Drip pans could be used during refueling to contain accidental releases.

- Drip pans could be used under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.

- Spills could be immediately addressed per the appropriate spill management plan, and soil cleanup and soil removal initiated if needed.

18.0 Mitigation during Operation

18.1 Mitigating Fuel Spills and Exposure to Site-Related Chemicals. The following measures may be implemented to minimize the potential for exposure of biota to accidental spills:

- Drip pans could be used during refueling to contain accidental releases.

- Pesticide use could be limited to nonpersistent, immobile pesticides and herbicides and could only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

- Spills could be immediately addressed per the appropriate spill management plan, and soil cleanup and removal initiated, if needed.

18.2 Mitigating Site/Wildlife Interactions. Measures to mitigate these interactions were identified for inclusion in wind farm location and design. The following measures may further reduce the potential for bird collisions, primarily through reducing the attractiveness of the facility to birds:

- Taller vegetation (i.e., shrub species) could be encouraged along powerline transmission corridors to minimize foraging in these areas by raptors to the extent local conditions will support this vegetation.

- Areas around turbines, meteorological towers, and other facility structures could be maintained in an unvegetated state (e.g., crushed gravel), or only vegetation that does not support wildlife use could be planted.

- All unnecessary lighting could be turned off at night to limit attracting migratory birds.

- Employees, contractors, and site visitors could be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, pets could be controlled to avoid harassment and disturbance of wildlife.

- Observations of potential wildlife problems, including wildlife mortality, could be reported to wildlife management agencies.

19.0 Mitigation during Decommissioning

The measures identified to mitigate construction impacts are applicable to decommissioning activities and may include:

- All turbines and ancillary structures could be removed from the site.

- Topsoil from all decommissioning activities could be salvaged and reapplied during final reclamation.

- All areas of disturbed soil could be reclaimed using weed-free native shrubs, grasses, and forbs.

- The vegetation cover, composition, and diversity could be restored to values commensurate with the ecological setting.

Following removal of the project facilities, implementation of appropriate habitat restoration activities could restore disturbed areas to pre-project conditions.