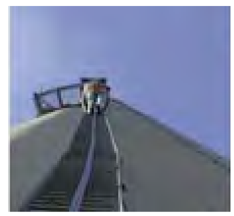

Keystone XL Project
Pipeline Risk Assessment and Environmental Consequence Analysis for Montana

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1.0 Project Overview

TransCanada Keystone Pipeline, L.P. (Keystone) is proposing to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada, to the Port Arthur and east Houston areas of Texas in the United States (US). The project, known as the Keystone XL Project (Project), will have a nominal capacity to deliver up to 900,000 barrels per day (bpd) of crude oil from an oil supply hub near Hardisty to existing terminals in Nederland near Port Arthur and~~ the Houston Ship Channel in Houston~~Moore Junction in Harris County, Texas. The project will consist of three new pipeline segments plus additional pumping capacity on the Cushing Extension Segment of the Keystone Pipeline Project (Keystone Cushing Extension). The Steele City Segment of the Project extends from Hardisty, Alberta southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma south to Nederland, Texas. The Houston Lateral extends from the Gulf Coast Segment, in Liberty County, Texas southwest to Moore Junction, Harris County, Texas near the Houston Ship Channel (**Figure 1.1-1**). In total, the Project will consist of approximately 1,707~~2~~ miles of new, 36-inch-diameter pipeline, consisting of about 327 miles in Canada and 1,380~~75~~ miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension. The Project is planned to be placed into service in phases. The Gulf Coast Segment ~~and the Houston Lateral are ~~is planned to be in service in 2011.~~ and t~~The Steele City Segment and the Houston Lateral are~~ is~~ planned to be in service in 2012.

Figure 1.1-1 Keystone XL Project Route

1.1 Federal and Montana Permitting Processes

The Project will require the issuance of a Presidential Permit by the U.S. Department of State (DOS) to cross the US/Canada border. The proposed route also crosses federal lands managed by the Bureau of Land Management (BLM) that will require the issuance of a ROW grant. The issuance of the Presidential Permit and a ROW grant across federal lands are considered federal actions and, therefore, the Project is subject to environmental review pursuant to the National Environmental Policy Act (NEPA) (42 United States Code § 4321 et seq.). The DOS has been designated as the lead federal agency for NEPA compliance, with the BLM participating as a cooperating agency.

In Montana the Project requires a certificate under the Montana Major Facilities Siting Act (MFSA), which includes environmental review under the Montana Environmental Policy Act (MEPA). The Montana Department of Environmental Quality has indicated that it will also use the NEPA review document and process to satisfy its environmental review requirement under MEPA.

Keystone has~~is~~ submitted~~ing~~ a MFSA application to the MDEQ, which includes an objective disclosure of beneficial and adverse environmental impacts resulting from the Project, as well as a set of reasonable alternatives. This risk assessment supplements the information in the MFSA application, disclosing potential environmental consequences that might occur in the unlikely event of a crude oil release from the Project.

2.0 Introduction

This report represents Keystone's evaluation of the risk of a pipeline disruption and its potential environmental consequences to support the MEPA process. This report focuses on the potential for spills during operations and the subsequent potential effects on sensitive resources and humans associated with major spills. Additional effects on public health and safety that could occur during project construction are discussed under other resource sections (e.g., air quality, water resources, transportation, land use, and aesthetics) within the Project's MFSA Application.

The purpose of this report is threefold. First, the report presents an assessment of potential effects resulting from the operation of the US portion of the Project that is sufficient for the purposes of MEPA. Second, the report provides a preliminary evaluation of potential risk for use during the pipeline's design phase, to facilitate the early selection of possible valve locations. Third, this report provides Keystone an initial basis for the development of emergency response planning and eventual incorporation of the Project into TransCanada's Integrity Management Program. Given these objectives, the analysis summarized within this report is intentionally conservative (i.e., overestimates risk). Keystone's expectation is that the spill frequencies and volumes presented in this analysis are not likely to occur, but are provided as a conservative framework to ensure agency decisions are based on knowledge of the potential range of effects as well as allowing Keystone to prepare for the worst-case scenarios in its emergency response preparations.

This report presents the results of a pipeline incident frequency and spill volume analysis based on Keystone's design and operations criteria and applies the resulting risk probabilities to an environmental consequence analysis that incorporates project-specific environmental data. Specifically, this report evaluates the risk of crude oil spills during pipeline operations, including contribution of natural hazards to spill risk, and the subsequent potential effects on humans and other sensitive resources, particularly high consequence areas (HCAs), that include designated populated areas, drinking water areas, and/or ecologically sensitive areas.

3.0 Incident Frequency-Spill Volume Study

Keystone conducted a project-specific incident[1] frequency and spill volume analysis for the US portion of the Project. The analysis conservatively estimated the frequency and volume of releases for five distinct and independent failure causes. The study quantitatively assessed spill potential for the entire pipeline utilizing publicly available historical incident data collected from Pipeline and Hazardous Materials Safety Administration (PHMSA) incident reports.

3.1 Incident Frequency

Incident frequencies were estimated from publicly available historical data (PHMSA 2008) and modified by segment-specific adjustment factors for the Project. Based on the available information, the study produced a conservative incident frequency of ~~0.000119~~0.000133 incidents per mile per year, equivalent to no more than one spill in ~~30~~ 26 years for the 282 miles of the Project in Montana. For any 1-mile segment, this probability is equivalent to 1 spill every ~~8,400~~7,500 years.

While future events cannot be known with absolute certainty, incident frequencies can be used to estimate the number of events that might occur over a period of time. Actual frequency may differ from the predicted values of this analysis and Keystone believes that the actual number of incidents will be substantially lower than estimated for this report. In this regard, it should be noted that the number of spills on crude oil pipelines has substantially declined in recent years with the implementation of US Department of Transportation's (USDOT) Integrity Management Rule.

3.2 Spill Volume

For this analysis, maximum spill volumes were determined for a complete rupture of the Keystone XL pipeline, accounting for maximum throughput, time to isolate the leak (detection and system shutdown), and subsequent draindown from the affected pipeline segment. While Keystone has reported maximum spill volumes, actual incident data from the *Hazardous Liquid Pipeline Risk Assessment* (California State Fire Marshal 1993) indicate that spill volumes are significantly less than the maximum potential draindown volume. For example, in 50 percent of the cases, the actual spill volume represented less than 0.75 percent of the maximum potential draindown volume. In 75 percent of the cases, the actual spill volume represented less than 4.6 percent of the maximum draindown volume. Procedures to reduce spill volume, by reducing draindown and depressurizing, are not estimated or included in the analysis. If these procedures were included, they most likely would significantly reduce the predicted maximum spill volumes estimated for the Project, if a spill were to occur.

PHMSA's incident database (2008) demonstrates that Keystone's maximum spill volumes are highly conservative (i.e., overstate risk). Examination of the current PHMSA dataset (2002 to present) indicates that the vast majority of actual pipeline spills are relatively small, with 50 percent of the spills consisting of 3.0 barrels or less. In 85 percent of the cases, the spill volume was 100 barrels or less, and in over 95 percent of cases spill volumes were less than 1,000 barrels. Oil spills of 10,000 barrels or greater only occurred in 0.5 percent of cases. These data demonstrate that most pipeline spills are small and very large releases of 10,000 barrels or more are extremely uncommon.

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[1] An "incident" refers to a variety of abnormal pipeline events that are reportable to the PHMSA, including the release of oil greater than 5 gallons; a release resulting in an explosion or fire; and accident resulting in human injuries requiring hospitalization; fatality; or property damage (including operator costs, such as product loss, emergency response, and cleanup costs) in excess of $50,000.

Of the postulated maximum of one spill along the Project in Montana during a ~~30~~26-year period, these PHMSA-derived spill volume statistics suggest that this one spill would have a 50 percent probability of being 3 barrels or less; 35 percent probability of being between 3 and 100 barrels; 10 percent probability of being between 100 and 1,000 barrels; 5 percent probability of being between 1,000 and 10,000 barrels; and a 0.5 percent probability of being more than 10,000 barrels[2].

[2] A barrel of oil equals 42 gallons.

4.0 Consequences of a Spill

4.1 Human Consequences

The risk associated with the operation of the Project can be compared with the general risks encountered in everyday life. Proposed actions that result in negligible additional risk from any cause are generally considered acceptable. The National Center for Health Statistics (Center for Disease Control 2003) overall average annual death rate for the general population in the US is approximately 830 per 100,000. The USDOT reports the historical average risk to the general population per year associated with all hazardous liquids transmission pipelines, such as the Project, is 0.004 in 100,000 (USDOT 2002). Therefore, the predicted risk of fatality to the public from incidents associated with the Project over and above the normal US death rate is negligible.

4.2 Environmental Consequences

The environmental risk posed by a crude oil pipeline is a function of: 1) the probability of an accidental release; 2) the probability of a release reaching an environmental receptor (e.g., waterbody, fish); 3) the concentration of the contamination once it reaches the receptor; and 4) the hazard posed by that concentration of crude oil to the receptor. Based on spill probabilities and estimated spill volumes, this environmental assessment determines the probability of exposure to environmental receptors and the probable impacts based on a range of potential concentrations.

4.2.1 Environmental Fate of Crude Oil Spills

4.2.1.1 Crude Oil Composition

The composition of crude oil varies widely, depending on the source and processing. Crude oils are complex mixtures of hundreds of organic (and a few inorganic) compounds. These compounds differ in their solubility, toxicity, persistence, and other properties that profoundly affect their impact on the environment. The effects of a specific crude oil cannot be thoroughly understood without taking its composition into account.

Crude oil expected to be transported by the Project is derived from the Alberta oil sands region in Canada. The oil extracted from the oil sands is called bitumen, which is highly viscous. In order for the bitumen to be transported by pipeline, it is either mixed with a diluent and is transported as diluted bitumen, or upgraded to synthetic crude oil before transportation. The precise composition of diluted bitumen and synthetic crude will vary by shipper and is considered proprietary information. Diluted bitumen is similar to other crude oils derived from various locations throughout the world, such as portions of California, Venezuela, Nigeria, and Russia. For the purposes of this analysis, transportation of two crude oil types will be assumed: diluted bitumen and synthetic crude. In general, the pipeline will contain segregated batches of these two products.

The primary classes of compounds found in crude oil are alkanes (hydrocarbon chains), cycloalkanes (hydrocarbons containing saturated carbon rings), and aromatics (hydrocarbons with unsaturated carbon rings). Most crude oils are more than 95 percent carbon and hydrogen, with small amounts of sulfur, nitrogen, oxygen, and traces of other elements. Crude oils contain lightweight straight-chained alkanes (e.g., hexane, heptane); cycloalkanes (e.g., cyclyohexane); aromatics (e.g., benzene, toluene); cycloalkanes; and heavy aromatic hydrocarbons (e.g., polycyclic aromatic hydrocarbons [PAHs], asphaltines). Straight-chained alkanes are more easily degraded in the environment than branched alkanes. Cycloalkanes are extremely resistant to biodegradation. Aromatics (e.g., benzene, toluene, ethylbenzene, and xylenes [BTEX] compounds) pose the most potential for environmental concern. Because of their lower molecular weight, they are more soluble in water than alkanes and cycloalkanes.

4.2.1.2 Environmental Fate and Transport

Environmental processes that govern the fate of a crude oil spill include dispersion, evaporation, dissolution, sorption, photodegradation, and natural attenuation. Once released into the terrestrial environment, the crude oil will pool in low-lying areas. If left unattended, some lighter volatile constituents of the crude oil will evaporate into air over time, while other constituents will bind or leach into soils, or dissolve into water. Hydrocarbons that volatilize into the atmosphere are broken down by sunlight into smaller compounds. This process, referred to as photodegradation, occurs rapidly in air and the rate of photodegradation increases as molecular weight increases. If released onto soil, a portion of the crude oil will penetrate the soil as a result of the effects of gravity and capillary action. The rate of penetration will depend on the nature of the soil. Crude oil adheres to soil particles, limiting the spread of crude oil in soils. If released into water, crude oil will float to the water's surface. If crude oil is left on the water's surface over an extended period of time, some constituents within the oil will evaporate, other fractions will dissolve, and, eventually, some material may descend to the bottom as sedimentation.

Spreading of crude oil across soils is governed by slope, soil permeability, and, to a lesser extent, ambient temperature. Crude oil mobility in water increases with wind, stream velocity, and increasing temperature. Most crude oils spread across surface waters at a rate of 100 to 300 meters per hour. Surface ice will greatly reduce the spreading rate of oil across a waterbody. Spreading reduces the bulk quantity of crude oil present in the immediate vicinity of the spill but increases the spatial area within which adverse effects may occur. Thus crude oil in flowing, as opposed to contained, waterbodies will be less concentrated in any given location, but may cause impacts, albeit reduced in intensity, over a much larger area. Spreading and thinning of spilled crude oil also increases the surface area of the slick, thus enhancing surface dependent fate processes such as evaporation, degradation, and dissolution.

Dispersion of crude oil across water increases with increasing surface turbulence. The dispersion of crude oil into water may serve to increase the surface area of crude oil susceptible to dissolution and degradation processes and thereby limit the potential for physical impacts.

Over time, evaporation is the primary mechanism of loss for low molecular weight constituents and light oil products. As lighter components evaporate, remaining crude oil becomes denser and more viscous. Evaporation thus tends to reduce crude oil toxicity but enhances crude oil persistence. In field trials, bulk evaporation of Alberta crude oil accounted for an almost 50 percent reduction in volume over a 12-day period, while the remaining oil was still sufficiently buoyant to float on the water's surface (Shiu et al. 1988). Evaporation increases with increased spreading of a slick, increased temperature, and increased wind and wave action.

Dissolution of crude oil in water is not a significant process controlling the crude oil's fate in the environment, since most components of oils are relatively insoluble (Neff and Anderson 1981). Moreover, overall solubility of crude oils tend to be less than their constituents since solubility is limited to the partitioning between oil and water interface and individual compounds are often more soluble in oil than in water, thus they tend to remain in the oil. Nevertheless, dissolution is one of the primary processes affecting the toxic effects of a spill, especially in confined waterbodies. Dissolution increases with decreasing molecular weight, increasing temperature, decreasing salinity, and increasing concentrations of dissolved organic matter. Greater photodegradation also tends to enhance the solubility of crude oil in water.

In water, heavy molecular weight hydrocarbons will bind to suspended particulates, and this process can be significant in highly turbid or eutrophic waters. Organic particles (e.g., biogenic material) in soils or suspended in water tend to be more effective at sorbing oils than inorganic particles (e.g., clays). Sorption processes and sedimentation reduce the quantity of heavy hydrocarbons present in the water column and available to aquatic organisms. However, these processes also render hydrocarbons less susceptible to degradation. Sedimented oil tends to be highly persistent and can cause shoreline impacts.

Photodegradation of crude oil in terrestrial and aquatic systems increases with greater solar intensity. It can be a significant factor controlling the disappearance of a slick, especially of lighter oil constituents; but it will be less important during cloudy days and winter months. Photodegraded crude oil constituents tend to be more soluble and more toxic than parent compounds. Extensive photodegradation, like dissolution, may thus increase the biological impacts of a spill event.

In the immediate aftermath of a crude oil spill, natural biodegradation of crude oil will not tend to be a significant process controlling the fate of spilled crude oil in environments previously unexposed to oil. Microbial populations must become established before biodegradation can proceed at any appreciable rate. Also, prior to weathering (i.e., evaporation and dissolution of light-end constituents), oils may be toxic to the very organisms responsible for biodegradation and high molecular weight constituents tend to be resistant to biodegradation. Biodegradation is nutrient and oxygen demanding and may be precluded in nutrient-poor aquatic systems. It also may deplete oxygen reserves in closed waterbodies, causing adverse secondary effects to aquatic organisms.

With time, however, microorganisms capable of consuming crude oil generally increase in number and the biodegradation process naturally remediates the previously contaminated soil. The biodegradation process is enhanced as the surface area of spilled oil increases (e.g., by dispersion or spreading). Biodegradation has been shown to be an effective method of remediating soils and sediments contaminated by crude oil.

Overall, the environmental fate of crude oil is controlled by many confounding factors and persistence is difficult to predict with great accuracy. Major factors affecting the environmental fate include spill volume, type of crude oil, dispersal rate of the crude oil, terrain, receiving media, and weather. Once released, the physical environment largely dictates the environmental persistence of the spilled material. Along the Project route, the primary aquatic habitats of concern include low gradient streams, rivers, and small intermittent ponds. Wetlands also occur along the proposed pipeline route. Estimates of the length of time materials could persist at potentially acute concentrations vary depending on the speed and success of emergency containment and cleanup, the size of spill, and environmental conditions. In warm summer months, the acutely toxic volatile components of crude oil will evaporate quickly, and a relatively small release into a high gradient stream would be expected to rapidly dissipate. In contrast, crude oil released into a small stream in winter could become trapped under pockets of ice and, thus, persist longer.

4.2.2 Environmental Impacts

An evaluation of the potential impacts resulting from the accidental release of crude oil into the environment is discussed by environmental resource below.

4.2.2.1 Soils

Because pipelines are buried, soil absorption of spilled crude oil could occur, thus impacting the soils. Subsurface releases to soil tend to disperse slowly and are generally located within a contiguous and discrete area, often limited to the less consolidated soils (lower soil bulk density) within the pipeline trench. Effects to soils can be quite slow to develop, allowing time for emergency response and cleanup actions to mitigate effects to potential receptors.

In the event of a spill, a portion of the released materials would enter the surrounding soil and disperse both vertically and horizontally in the soil. The extent of dispersal would depend on a number of factors, including speed and success of emergency containment and cleanup, size and rate of release, topography of the release site, vegetative cover, soil moisture, bulk density and soil porosity. High rates of release from the buried pipeline would result in a greater likelihood that released materials would escape the trench and reach the ground surface.

If a release were to occur in sandy soils frequently encountered along the Project route, it is likely that the horizontal and vertical extent of the contamination would be greater than in areas containing more organic soils. Crude oil released into sandy soils would likely become visible to aerial surveillance due to product on the soils surface or discoloration of nearby vegetation. If present, soil moisture and moisture from precipitation would increase the dispersion and migration of crude oil.

The vast majority of the Project is located in relatively flat or modestly rolling terrain. In these areas, the oil would generally begin dispersing horizontally within the pipeline trench, and with sufficient spill volume or flow, then the oil could move out of the trench onto the soils surface, generally moving towards and breaking the soil surface in low lying areas. If the spill were to occur on a steep slope where trench breakers had been installed during construction, then crude oil would pool primarily within the trench behind any trench breakers. If sufficient volume existed, the crude oil would breach the soil's surface as it extended over the top of the trench breaker. In either case, once on the soil's surface, the release would be more apparent to leak surveillance patrols.

Both on the surface and in the subsurface, rapid attenuation of light, volatile constituents (due to volatilization) would quickly reduce the total volume of crude oil, while heavier constituents would be more persistent. Except in rare cases of high rate and high total volume releases with environmental settings characterized by steep topography or karst terrain, soil impacts would be confined to a relatively small, contiguous, and easily defined area, facilitating cleanup and remediation. Within a relatively short time, lateral migration would generally stabilize. Downward vertical migration would begin at the onset of a spill, with rates governed by soil permeability. For example, in soils with moderately high permeability, water may penetrate 2.5 inches per hour, while penetration rates for soils of low permeability may occur at 0.05 inch/hour. Crude oil is more viscous than water, therefore permeability of crude oil would be slower than water.

In accordance with Federal and state regulations, Keystone would be responsible for cleanup of contaminated soils and would be required to meet applicable cleanup levels. In Montana, the soil cleanup level for benzene from petroleum hydrocarbon releases is 0.04 part per million (ppm).

It is difficult to estimate the volume of soil that might be contaminated in the event of a spill. Site-specific environmental conditions (e.g., soil type, weather conditions) and release dynamics (e.g., leak rate, leak duration) would result in substantially different surface spreading and infiltration rates, which in turn, affect the final volume of affected soil to be remediated. Based on historical data (PHMSA 2008), soil remediation involved 100 cubic yards of soil or less at the majority of spill sites where soil contamination occurred, and only 3 percent of the spill sites required remediation of 10,000 cubic yards or more (PHMSA 2008).

4.2.2.2 Vegetation and Soil Ecosystems

Crude oil released to the soil's surface could potentially produce localized effects on plant populations. Terrestrial plants are much less sensitive to crude oil than aquatic species. The lowest toxicity threshold for terrestrial plants found in the U.S. Environmental Protection Agency (USEPA) ECOTOX database (USEPA 2001) was 18.2 ppm for benzene, higher than the 7.4 ppm threshold for aquatic species and the 0.005 ppm threshold for human drinking water. Similarly, available data from the USEPA database indicate that earthworms also are less sensitive than aquatic species (toxicity threshold was greater than 1,000 ppm). If concentrations were sufficiently high, crude oil in the root zone could harm individual plants and organisms.

Release of crude oil could result in the contamination of soils (see Section 4.2.2.1, Soils, above). Keystone would be responsible for cleanup of contaminated soils. Once remedial cleanup levels were achieved in the soils, no adverse or long-term impacts to vegetation would be expected.

4.2.2.3 Wildlife

Spilled crude oil can affect organisms directly and indirectly. Direct effects include physical processes, such as oiling of feathers and fur, and toxicological effects, which can cause sickness or mortality. Indirect effects are less conspicuous and include habitat impacts, nutrient cycling disruptions, and alterations in ecosystem relationships. The magnitude of effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of crude oil spilled, the species assemblage present, climate, and the spill response tactics employed.

Wildlife, especially birds and shoreline mammals, are typically among the most visibly affected organisms in any crude oil spill. Effects of crude oil can be differentiated into physical (mechanical) and toxicological (chemical) effects. Physical effects result from the actual coating of animals with crude oil, causing reductions in thermal insulative capacity and buoyancy of plumage (feathers) and pelage (fur).

Crude oil released to the environment may cause adverse biological effects on birds and mammals via inhalation or ingestion exposure. Ingestion of crude oil may occur when animals consume oil-contaminated food, drink oil-contaminated water, or orally consume crude oil during preening and grooming behaviors.

Potential adverse effects could result from direct acute exposure. Acute toxic effects include drying of the skin, irritation of mucous membranes, diarrhea, narcotic effects, and possible mortality. While releases of crude oil may have an immediate and direct effect on wildlife populations, the potential for physical and toxicological effects attenuates with time as the volume of material diminishes, leaving behind more persistent, less volatile, and less water-soluble compounds. Although many of these remaining compounds are toxic and potentially carcinogenic, they do not readily disperse in the environment and their bioavailability is low, and therefore, the potential for impacts is low.

Unlike aquatic organisms that frequently cannot avoid spills in their habitats, the behavioral responses of terrestrial wildlife may help reduce potential adverse effects. Many birds and mammals are mobile and generally will avoid oil-impacted areas and contaminated food (Sharp 1990; Stubblefield et al. 1995). In a few cases, such as cave-dwelling species, organisms that are obligate users of contaminated habitat may be exposed. However, most terrestrial species have alternative, unimpacted habitat available, as will often be the case with localized spills (in contrast to large-scale oil spills in marine systems), therefore, mortality of these species would be limited (Stubblefield et al. 1995).

Indirect environmental effects of spills can include reduction of suitable habitat or food supply. Primary producers (e.g., algae and plants) may experience an initial decrease in primary productivity due to physical effects and acute toxicity of the spill. However, these effects tend to be short-lived and a decreased food supply is not considered to be a major chronic stressor to herbivorous organisms after a spill. If mortality occurs to local invertebrate and wildlife populations, the ability of the population to recover will depend upon the size of the impact area and the ability of surrounding populations to repopulate the area.

4.2.2.4 Water Resources

Crude oil could be released to water resources if the pipeline is breached or leaks occur. As part of project planning and in recognition of the environmental sensitivity of waterbodies, the Project routing process attempted to minimize the number waterbodies crossed, including groundwater aquifers. Furthermore, valves have been strategically located along the Project route to help reduce the amount of crude oil that could potentially spill into waterbodies, if such an event were to occur. The location of valves, spill containment measures, and implementing actions in the Project Emergency Response Plan would mitigate adverse effects to both surface water and groundwater.

<u>Groundwater</u>

Multiple groundwater aquifers underlie the proposed Project. Vulnerability of these aquifers is a function of the depth to groundwater and the permeability of the overlying soils. While routine operation of the Project would not affect groundwater, there is the possibility that a release could migrate through the overlying surface materials and enter a groundwater system.

In general, the potential for groundwater contamination following a spill would be more probable in locations where a release into or on the surface of soils has occurred:

* Where a relatively shallow water table is present (as opposed to locations where a deeper, confined aquifer system is present);
* Where soils with high permeability are present throughout the unsaturated zone; and
* Where, in cooperation with federal and state agencies, the PHMSA (in cooperation with the US Geological Service [USGS] and other agencies) has identified groundwater resources that are particularly vulnerable to contamination. These resources are designated by PHMSA as High Consequence Areas (HCAs; Section 4.3.2).

Depending on soil properties, the depth to groundwater, and the amount of crude oil in the unsaturated zone, localized groundwater contamination can result from the presence of free crude oil and the migration of its dissolved constituents. Crude oil is less dense than water and would tend to form a floating pool after reaching the groundwater surface. Movement of crude oil is generally quite limited due to adherence with soil particles, groundwater flow rates, and natural attenuation (i.e., microbial degradation) (Freeze and Cherry 1979; Fetter 1993). Those compounds in the crude oil that are soluble in water will form a larger, dissolved "plume." This plume would tend to migrate laterally in the direction of groundwater flow. Movement of dissolved constituent typically extends for greater distances than movement of pure crude oil in the subsurface, but is still relatively limited. The flow velocity of dissolved constituents would be a function of the groundwater flow rate and natural attenuation, with the dissolved constituents migrating more slowly than groundwater.

Unlike chemicals with high environmental persistence (e.g., trichloroethylene, pesticides), the aerial extent of the dissolved constituents will stabilize over time due to natural attenuation processes. Natural biodegradation through metabolism by naturally occurring microorganisms is often an effective mechanism for reducing the volume of crude oil and its constituents. Natural attenuation will reduce most toxic compounds into non-toxic metabolic byproducts, typically carbon dioxide and water (Minnesota Pollution Control Agency 2005). Field investigations at historical crude oil release sites indicate the migration of dissolved constituents typically stabilize within several hundred feet of the crude oil source area, depending on groundwater flow velocity and other site-specific hydrogeologic factors (USGS 1998; Charbeneau 2003). Over a longer period, the area of the contaminant plume may begin to reduce due to natural biodegradation. Removal of crude oil contamination will eliminate the source of dissolved constituents impacting the groundwater.

Most crude oil constituents are not water soluble. For those constituents that are water soluble (e.g., benzene) the dissolved concentration is not controlled by the amount of oil in contact with the water, but by the concentration of the specific constituent in the oil (Charbeneau et al. 2000; Charbeneau 2003; Freeze and Cherry 1979). Studies of 69 crude oils found that benzene was the only aromatic or PAH compound tested that is capable of exceeding groundwater protection values for drinking water (i.e., maximum contaminant levels [MCLs] or Water Health Based Limits) (Kerr et al. 1999 as cited in O'Reilly et al. 2001).

If exposure to humans or other important resources would be possible from a release into groundwater, then regulatory standards, such as drinking water criteria (MCL) would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. The promulgated drinking water standards for humans vary by several orders of magnitude for crude oil constituents. For human health protection, the national MCL is an enforceable standard established by the USEPA and is designed to protect long-term human health. Of the various crude oil constituents, benzene has the lowest national MCL at 0.005 ppm[3] and, therefore, it was used to evaluate impacts on drinking water supplies, whether from surface water or groundwater.

However, response and remediation efforts have the potential for appreciable adverse effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation ultimately would allow a return to preexisting conditions in both soil and groundwater.

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[3] Montana also uses the national MCL value of 0.005 ppm.

Depending on the amount of crude oil reaching the groundwater and natural attenuation rates, this would likely require up to tens of years. Keystone will utilize the most appropriate cleanup procedure as determined in cooperation with the applicable federal and state agencies.

Attenuation mechanisms that retard the movement of contaminants include dispersion, sorption, volatilization, abiotic chemical degradation, and biological degradation. The extent to which any of these mechanisms would retard contaminant movement at a given location depends upon site-specific conditions. In general, crude oil in groundwater tends to biodegrade as described for soil releases. Even in the case of large released volumes and floating free crude oil, dispersive forces become balanced with biodegradation and attenuation mechanisms, establishing degradation equilibrium. The typical result is a relatively limited zone of impact, typically 200 meters or less downgradient (USGS 1998). Over time, these natural degradation mechanisms, along with other natural attenuation mechanisms, including dispersion, result in the removal and/or destruction of crude oil materials; both in groundwater, and in overlying impacted soils. Observed degradation rates indicate this process would typically occur in timeframes measured in tens of years, depending on the concentration of crude oil in the groundwater.

Flowing Surface Waters

The PHMSA, in cooperation with various federal and state agencies, has identified surface water resources that are particularly vulnerable to contamination. These surface water resources are designated as HCAs (Section 4.3.2). Broadly, this report evaluated impacts to downstream drinking water sources by comparing projected surface water benzene concentrations with the national MCL for benzene. Like other pipelines already in existence, the Project will cross hundreds of perennial, intermittent, and ephemeral streams. Rather than evaluate the risk to each waterbody crossed by the Project, this risk assessment evaluated categories of streams, based on the magnitude of streamflow and stream width. **Table 4-1** summarizes the stream categories used for the assessment and identifies several representative streams within these categories.

Table 4-1 Stream Categories

	Streamflow (cubic feet per second; cfs)	Stream Width (feet)	Representative Streams
Low Flow Stream	10 – 100	<50	Many unnamed intermittent tributaries, Bear Creek
Lower Moderate Flow Stream	100 – 1,000	50 – 500	Upper Sevenmile Creek, Lone Tree Creek
Upper Moderate Flow Stream	1,000 – 10,000	500 – 1,000	Yellowstone River
High Flow Stream	>10,000	1,000 – 2,500	Missouri River

The following highly conservative assumptions were used for this analysis: 1) the entire volume of a spill was released directly into a waterbody; 2) complete, instantaneous mixing occurred; and 3) the entire benzene content was solubilized into the water column. While none of these assumptions would naturally occur, these were extremely conservative assumptions designed to over-estimate potential effects for planning purposes. It does not reflect Keystone's expectations of actual effects in the unlikely event of a spill.

A 1-hour release period for the entire spill volume was assumed in order to maximize the product concentration in water. The estimated benzene concentrations were then compared with the human health drinking water MCL for benzene (**Tables 4-2** and**4-3**). Based on these ultra-conservative assumptions, results suggest that most spills that enter a waterbody could result in exceedence of the national MCL for benzene. Although the assumptions used are highly conservative and, thus, overestimate potential benzene water concentrations, the analysis indicates the need for rapid notification of managers of municipal water intakes downstream of a spill so that any potentially affected drinking water intakes could be closed to bypass river water containing crude oil.

In addition to evaluating a spill to generic flowing water, the potential for impacts to any specific waterbody also were evaluated. To do this, the occurrence interval for a spill at any one representative stream within one of the four stream categories reflected in Table 4-1 was calculated based on spill probabilities generated from the PHMSA database. To be conservative, a 500-foot buffer on either side of the river was added to the crossing widths identified in **Table 4-1**. The occurrence intervals shown on **Tables 4-2** and **4-3** indicate the chance of a spill occurring at any specific waterbody is very low. Conservative occurrence intervals for a spill at any representative stream within any of the stream categories ranged from ~~about~~ approximately 23,000~~25,000~~ years for a large waterbody to over ~~900~~840,000 years for a small waterbody (less likely to occur in any single small waterbody than any single large waterbody). If any release did occur, it is likely that the total release volume of a spill likely would be 3 barrels or less based on historical spill volumes.

In summary, while a release of crude oil directly into any given waterbody would likely cause an exceedence of drinking water standards, the frequency of such an event would be extremely low. Nevertheless, streams and rivers with downstream drinking water intakes represent sensitive environmental resources and could be temporarily impacted by a crude oil release. Keystone's Emergency Response Plan contains provisions for protecting and mitigating potential impacts to drinking water.

Aquatic Organisms

The concentration of crude oil constituents in an actual spill would vary both temporally and spatially in surface water; however, localized toxicity could occur from virtually any size of crude oil spill. **Table 4-4** summarizes the acute toxicity values (USEPA 2000) of various crude oil hydrocarbons to a broad range of freshwater species. Acute toxicity refers to the death or complete immobility of an organism within a short period of exposure. The LC_{50} is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms. For aquatic biota, most acute LC_{50} for monoaromatics range between 10 and 100 ppm. LC_{50} for the polyaromatic naphthalene were generally between 1 and 10 ppm, while LC_{50} values for anthracene were generally less than 1 ppm.

Table 4-4 shows fish are among the most sensitive aquatic biota, while aquatic invertebrates generally have intermediate sensitivities, and algae and bacteria tend to be the least sensitive. Nevertheless, even when major fish kills have occurred as a result of oil spills, population recovery has been observed, and long-term changes in fish abundance have not been reported. Benthic (bottom-dwelling) aquatic invertebrates tend to be more sensitive than algae, but are equally or less sensitive than fish. Planktonic (floating) species tend to be more sensitive than most benthic insects, crustaceans, and molluscs.

In aquatic environments, toxicity is a function of the concentration of a compound necessary to cause toxic effects combined with the compound's water solubility. For example, a compound may be highly toxic, but if it is not very soluble in water then its toxicity to aquatic biota is relatively low. The toxicity of crude oil is dependent of the toxicity of its constituents. As an example, **Table 4-5** summarizes the toxicity of various crude oil hydrocarbons to the zooplankton, *Daphnia magna*. The relative toxicity of decane is much lower than for benzene or ethylbenzene because of the comparatively low solubility of decane. Most investigators have concluded that the acute toxicity of crude oil is related to the concentrations of relatively lightweight aromatic constituents, particularly benzene.

arison of Estimated Benzene Concentrations with the Benzene MCL Resulting from a Diluted Bitumen Spill

Benzene MCL (ppm)	Stream Flow Rate (cfs)	Product Released							
		Very Small Spill: 3 barrels		Small Spill: 50 barrels		Moderate Spill: 1,000 barrels		Large Spill: 10,000 barrels	
		Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
0.005	10	**0.652**	75,618~~84,513~~	**10.9**	126,029~~140,855~~	**218**	252,059~~281,710~~	**2175**	840,196~~939,033~~
0.005	100	**0.065**	52,932~~59,159~~	**1.09**	88,221~~98,598~~	**21.8**	176,441~~197,197~~	**218**	588,137~~657,323~~
0.005	1,000	**0.007**	39,699~~44,369~~	**0.109**	66,165~~73,949~~	**2.18**	132,331~~147,898~~	**21.8**	441,103~~492,992~~
0.005	10,000	0.0007	22,685~~25,354~~	**0.0109**	37,809~~42,256~~	**0.218**	75,618~~84,513~~	**2.18**	252,059~~281,710~~

hat the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated
umes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental

is based on release of benzene into water over a 1-hour period with uniform mixing conditions.

ed on a 0.15 percent by weight benzene content of the transported material (www..crudeoilmonitor.ca May 2008 Summary)..

ated benzene concentrations that could exceed the benzene MCL of 0.005 ppm.

e based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream
r flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for
corresponding lower occurrence interval.

arison of Estimated Benzene Concentrations with the Benzene MCL Resulting from a Synthetic Crude Spill

Benzene MCL (ppm)	Stream Flow Rate (cfs)	Product Released							
		Very Small spill: 3 barrels		Moderate spill: 50 barrels		Large spill: 1,000 barrels		Very Large spill: 10,000 barrels	
		Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
0.005	10	**0.~~081~~13**	**75,618~~84,513~~**	**~~1.34~~2.2**	**126,029~~140,855~~**	**~~26.9~~43.5**	**252,059~~281,710~~**	**~~268.8~~434.9**	**840,196~~939,033~~**
0.005	100	**0.~~008~~013**	**52,932~~59,159~~**	**0.~~134~~22**	**88,221~~98,598~~**	**~~2.69~~4.3**	**176,441~~197,197~~**	**~~26.9~~43.5**	**588,137~~657,323~~**
0.005	1,000	0.~~0008~~0013	**39,699**~~44,369~~	**0.~~0134~~022**	**66,165~~73,949~~**	**0.~~269~~43**	**132,331~~147,898~~**	**~~2.7~~4.3**	**441,103~~492,992~~**
0.005	10,000	0.~~00008~~00013	**22,685**~~25,354~~	0.~~00134~~0022	**37,809**~~42,256~~	**0.~~0269~~043**	**75,618~~84,513~~**	**0.43**	**252,059~~281,710~~**

hat the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated umes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental

 is based on release of benzene into water over a 1-hour period with uniform mixing conditions.

ed on a 0.03~~2~~ percent by weight benzene content of the transported material (www..crudeoilmonitor.ca May 2008 Summary).

ated benzene concentrations that could exceed the MCL of 0.005 ppm.

e based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream r flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for corresponding lower occurrence interval.

Table 4-4 Acute Toxicity of Aromatic Hydrocarbons to Freshwater Organisms

Species	Toxicity Values (ppm)				
	Benzene	**Toluene**	**Xylenes**	**Naphthalene**	**Anthracene**
Carp (*Cyprinus carpio*)	40.4	---	780	---	---
Channel catfish (*Kctalurus*)	---[1]	240	---	---	---
Clarias catfish (*Clarias* sp.)	425	26	---	---	---
Coho salmon (*Oncorhyncus kisutch*)	100	---	---	2.6	---
Fathead minnow (*Pimephales*)	---	36	25	4.9	25
Goldfish (*Carassius auratus*)	34.4	23	24	---	---
Guppy (*Poecilia reticulate*)	56.8	41	---	---	---
Largemouth bass (*Micropterus*)	---	---	---	0.59	---
Medaka (*Oryzias* sp.)	82.3	54	---	---	---
Mosquitofish (*Gambusia affinis*)	---	1,200	---	150	---
Rainbow trout (*Oncorhyncus mykis)*	7.4	8.9	8.2	3.4	---
Zebrafish (*Therapon iarbua*)	---	25	20	---	---
Rotifer *(Brachionus calyciflorus)*	>1,000	110	250	---	---
Midge *(Chironomus attenuatus)*	---	---	---	15	---
Midge *(Chironomus tentans)*	---	---	---	2.8	---
Zooplankton *(Daphnia magna)*	30	41	---	6.3	0.43
Zooplankton *(Daphnia pulex)*	111	---	---	9.2	---
Zooplanton *(Diaptomus forbesi)*	---	450	100	68	---
Amphipod *(Gammarus lacustris)*	---	---	0.35	---	---
Amphipod *(Gammarus minus)*	---	---	---	3.9	---
Snail *(Physa gyrina)*	---	---	---	5.0	---
Insect *(Somatochloa cingulata)*	---	---	---	1.0	---
Chlorella vulgaris	---	230	---	25	---
Microcystis aeruginosa	---	---	---	0.85	---
Nitzschia palea	---	---	---	2.8	---
Scenedesmus subspicatus	---	130	---	---	---
Selenastrum capricornutum	70	25	72	7.5	---

[1] Indicates no value was available in the database.

Note: Data summarize conventional acute toxicity endpoints from USEPA's ECOTOX database. When several results were available for a given species, the geometric mean of the reported LC_{50} values was calculated.

Table 4-5 Acute Toxicity of Crude Oil Hydrocarbons to *Daphnia magna*

Compound	48-hr LC_{50} (ppm)	Optimum Solubility (ppm)	Relative Toxicity
Hexane	3.9	9.5	2.4
Octane	0.37	0.66	1.8
Decane	0.028	0.052	1.9
Cyclohexane	3.8	55	14.5
methyl cyclohexane	1.5	14	9.3
Benzene	9.2	1,800	195.6
Toluene	11.5	515	44.8
Ethylbenzene	2.1	152	72.4
p-xylene	8.5	185	21.8
m-xylene	9.6	162	16.9
o-xylene	3.2	175	54.7
1,2,4-trimethylbenzene	3.6	57	15.8
1,3,5-trimethylbenzene	6	97	16.2
Cumene	0.6	50	83.3
1,2,4,5-tetramethylbenzene	0.47	3.5	7.4
1-methylnaphthalene	1.4	28	20.0
2-methylnaphthalene	1.8	32	17.8
Biphenyl	3.1	21	6.8
Phenanthrene	1.2	6.6	5.5
Anthracene	3	5.9	2.0
9-methylanthracene	0.44	0.88	2.0
Pyrene	1.8	2.8	1.6

Note: The LC_{50} is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms within a predetermined time period (e.g., 48 hours) (USEPA 2000).

Relative toxicity = optimum solubility/LC_{50}.

While lightweight aromatics such as benzene tend to be water soluble and relatively toxic, they also are highly volatile. Thus, most or all of the lightweight hydrocarbons accidentally released into the environment evaporate, and the environmental persistence of crude oil tends to be low. High molecular weight aromatic compounds, including PAHs, are not very water-soluble and have a high affinity for organic material. Consequently, these compounds, if present, have limited bioavailability, which render them substantially less toxic than more water-soluble compounds (Neff 1979). Additionally, these compounds generally do not accumulate to any great extent because these compounds are rapidly metabolized (Lawrence and Weber 1984; West et al.1984). There are some indications, however, that prolonged exposure to elevated concentrations of these compounds may result in a higher incidence of growth abnormalities and hyperplastic diseases in aquatic organisms (Couch and Harshbarger 1985).

Significantly, some constituents in crude oil may have greater environmental persistence than lightweight compounds (e.g., benzene), but their limited bioavailability renders them substantially less toxic than other more soluble compounds. For example, aromatics with four or more rings are not acutely toxic at their limits of solubility (Muller 1987). Based on the combination of toxicity, solubility, and bioavailability, benzene was determined to drive toxicity associated with potential crude oil spills.

Table 4-6 summarizes chronic toxicity values (most frequently measured as reduced reproduction, growth, or weight) of benzene to freshwater biota. Chronic toxicity from other oil constituents may occur, however, if sufficient quantities of crude oil are continually released into the water to maintain elevated concentrations.

Table 4-6 Chronic Toxicity of Benzene to Freshwater Biota

Taxa	Test species	Chronic Value (ppm)
Fish	Fathead minnow (*Pimephales promelas*)	17.2 *
	Guppy (*Poecilia reticulata*)	63
	Coho salmon (*Oncorhynchus kitsutch*)	1.4
Amphibian	Leopard frog (*Rana pipens*)	3.7
Invertebrate	Zooplankton (*Daphnia* spp.)	>98
Algae	Green algae (*Selenastrum capricornutum*)	4.8 *

Note: Test endpoint was mortality unless denoted with an asterisk (*). The test endpoint for these studies was growth.

The potential impacts to aquatic organisms of various-sized spills to waterbodies were modeled assuming the benzene content within each type of crude oil completely dissolved in the water. The benzene concentration was predicted based on amount of crude oil spilled and streamflow. The estimated benzene concentrations were compared to conservative acute and chronic toxicity values for protection of aquatic organisms. For aquatic biota, the lowest acute and chronic toxicity thresholds for benzene are 7.4 ppm and 1.4 ppm, respectively, based on standardized trout toxicity tests (USEPA 2000). These toxicity threshold values are considered protective of acute and chronic effects to aquatic biota. Although trout are not found in many of the habitats crossed by the project, trout are among the most sensitive aquatic species and reliable acute and chronic trout toxicity data are available.

Tables 4-7 through **4-10** summarize the predicted acute and chronic toxicity to aquatic resources. Broadly, acute toxicity could potentially occur if substantial amounts of crude oil were to enter rivers and streams. If such an event were to occur within a small stream, aquatic species in the immediate vicinity and downstream of the rupture could be killed or injured. Chronic toxicity also could potentially occur in small and moderate sized streams and rivers. However, emergency response, containment, and cleanup efforts would help reduce the concentrations and minimize the potential for chronic toxicity. In comparison, relatively small spills (less than 50 barrels) into moderate and large rivers would not pose a major toxicological threat. In small to moderate sized streams and rivers, some toxicity might occur in localized areas, such as backwaters where concentrations would likely be higher than in the mainstream of the river.

Table 4-7 Comparison of Estimated Benzene Concentrations Following a Diluted Bitumen Spill to the Acute Toxicity Thresholds for Aquatic Life (7.4 ppm) for Streams Crossed by the Project

	Stream Flow Rate (cfs)	Acute Toxicity Threshold (ppm)	Product Released							
			Very Small Spill: 3 barrels		Small Spill: 50 barrels		Moderate Spill: 1,000 barrels		Large Spill: 10,000 barrels	
			Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
Low Flow Stream	10	7.4	0.7	75,618~~84,513~~	**10.9**	**126,029**~~140,855~~	**217.5**	**252,059**~~281,710~~	**2,175**	**840,196**~~939,033~~
Lower Moderate Flow Stream	100	7.4	0.07	52,932~~59,159~~	1.1	88,221~~98,598~~	**21.7**	**176,441**~~197,197~~	**217.5**	**588,137**~~657,323~~
Upper Moderate Flow Stream	1,000	7.4	0.007	39,699~~44,369~~	0.1	66,165~~73,949~~	2.2	132,331~~147,898~~	**21.7**	**441,103**~~492,992~~
High Flow Stream	10,000	7.4	0.0007	22,685~~25,354~~	0.01	37,809~~42,256~~	0.2	75,618~~84,513~~	2.2	252,059~~281,710~~

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.15 percent (www..crudeoilmonitor.ca May 2008 Summary), and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of material released divided by 1 hour of stream flow volume. The model assumes uniform mixing conditions.
- Benzene concentrations are compared against the acute toxicity threshold for benzene.
- Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-8 Comparison of Estimated Benzene Concentrations Following a Synthetic Crude Spill to the Acute Toxicity Thresholds for Aquatic Life (7.4 ppm) for Streams Crossed by the Project

	Stream Flow Rate (cfs)	Acute Toxicity Threshold (ppm)	Product Released							
			Very Small Spill: 3 barrels		Small Spill: 50 barrels		Moderate Spill: 1,000 barrels		Large Spill: 10,000 barrels	
			Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
Low Flow Stream	10	7.4	0.~~09~~13	75,618~~84,513~~	~~1.3~~2.2	126,029~~140,855~~	**43.5~~26.9~~**	**252,059~~281,710~~**	**434.9~~268.8~~**	**840,196~~939,033~~**
Lower Moderate Flow Stream	100	7.4	0.~~009~~013	52,932~~59,159~~	0.22~~1~~	88,221~~98,598~~	**4.3~~2.7~~**	176,441~~197,197~~	**43.5~~26.9~~**	**588,137~~657,323~~**
Upper Moderate Flow Stream	1,000	7.4	0.~~0009~~0013	39,699~~44,369~~	0.022~~1~~	66,165~~73,949~~	**0.43~~0.3~~**	132,331~~147,898~~	4.3~~2.7~~	441,103~~492,992~~
High Flow Stream	10,000	7.4	0.~~00009~~0013	22,685~~25,354~~	0.0022~~1~~	37,809~~42,256~~	**0.043~~0.03~~**	75,618~~84,513~~	0.43~~0.3~~	252,059~~281,710~~

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.~~02~~ 03 percent (www..crudeoilmonitor.ca May 2008 Summary).~~,~~ and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.03~~2~~ percent of the total amount of material released divided by 1 hour of stream flow volume. The model assumes uniform mixing conditions.
- Benzene concentrations are compared against the acute toxicity threshold for benzene.
- Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-9 Comparison of Estimated Diluted Bitumen Concentrations Following a Spill to the Chronic Toxicity Thresholds for Aquatic Life for Streams Crossed by the Project

	Stream Flow Rate (cfs)	Chronic Toxicity Threshold (ppm)	Product Released							
			Very Small Spill: 3 barrels		Small Spill: 50 barrels		Moderate Spill: 1,000 barrels		Large Spill: 10,000 barrels	
			Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
Low Flow Stream	10	1.4	0.004	75,618~~84,513~~	0.06	126,029~~140,855~~	1.3	252,059~~281,710~~	**12.9**	**840,196~~939,033~~**
Lower Moderate Flow Stream	100	1.4	0.0004	52,932~~59,159~~	0.006	88,221~~98,598~~	0.13	176,441~~197,197~~	1.3	588,137~~657,323~~
Upper Moderate Flow	1,000	1.4	0.00004	39,699~~44,36~~	0.0006	66,165~~73,94~~	0.013	132,331~~147,~~	0.13	441,103~~492,~~

Stream				~~9~~		~~9~~		~~898~~		~~992~~
High Flow Stream	10,000	1.4	0.000004	22,685~~25,354~~	0.00006	37,809~~42,256~~	0.0013	75,618~~84,513~~	0.013	252,059~~281,710~~

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.15 percent (www..crudeoilmonitor.ca May 2008 Summary), and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of material released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.
- The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.
- Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.
- Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-10 Comparison of Estimated Synthetic Crude Oil Concentrations Following a Spill to the Chronic Toxicity Thresholds for Aquatic Life for Streams Crossed by the Project

	Stream Flow Rate (cfs)	Chronic Toxicity Threshold (ppm)	Product Released							
			Very Small Spill: 3 barrels		Small Spill: 50 barrels		Moderate Spill: 1,000 barrels		Large Spill: 10,000 barrels	
			Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)	Benzene Conc. (ppm)	Occurrence Interval (years)
Low Flow Stream	10	1.4	0.~~0005~~0008	75,618~~84,513~~	0.~~008~~013	126,029~~140,855~~	0.~~16~~26	252,059~~281,710~~	~~1~~2.6	840,196~~939,033~~
Lower Moderate Flow Stream	100	1.4	0.~~00005~~00008	52,932~~59,159~~	0.~~0008~~0013	88,221~~98,598~~	0.026	176,441~~197,197~~	0.~~16~~26	588,137~~657,323~~
Upper Moderate Flow Stream	1,000	1.4	0.~~000005~~000008	39,699~~44,369~~	0.~~00008~~00013	66,165~~73,949~~	0.0026	132,331~~147,898~~	0.026	441,103~~492,992~~
High Flow Stream	10,000	1.4	0.~~0000005~~0000008	22,685~~25,354~~	0.~~000008~~000013	37,809~~42,256~~	0.00026	75,618~~84,513~~	0.0026	252,059~~281,710~~

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes, which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.~~02~~ 03 percent (www..crudeoilmonitor.ca May 2008 Summary), and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.~~02~~ 03 percent of the total amount of material released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.
- The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.
- Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.
- Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of ~~0.000119~~0.000133 incident/mile*year, projected frequencies of each spill volume, and estimated stream widths.

Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

The likelihood of a release into any single waterbody is low, with an occurrence interval of once every ~~25~~23,000 to ~~900~~840,000 years (**Tables 4-7** through **4-10**). If any release did occur, it is likely that the total release volume of a spill likely would be 3 barrels or less based on historical spill volumes.

While a release of crude oil into any given waterbody might cause immediate localized toxicity to aquatic biota, particularly in smaller streams and rivers, the frequency of such an event would be very low. Nevertheless, streams and rivers with aquatic biota represent the sensitive environmental resources that could be temporarily impacted by a crude oil release.

Wetlands/ Reservoirs/ Lakes

Although planning and routing efforts have reduced the overall number of wetlands and static waterbody environments crossed by the Project, wetlands and waterbodies with persistently saturated soils are present along and adjacent to the Project route. The effects of crude oil released into a wetland environment will depend not only upon the quantity of oil released, but also on the physical conditions of the wetland at the time of the release. Wetlands include a wide range of environmental conditions. Wetlands can consist of many acres of standing water dissected with ponds and channels, or they may simply be areas of saturated soil with no open water. A single wetland can even vary between these two extremes as seasonal precipitation varies. Wetland surfaces are generally low gradient with very slow unidirectional flow or no discernable flow. The presence of vegetation or narrow spits of dry land protruding into wetlands also may isolate parts of the wetland. Given these conditions, spilled materials may remain in restricted areas for longer periods than in river environments.

Crude oil released from a subsurface pipe within a wetland could reach the soil surface. If the water table reaches the surface, the release would manifest as floating crude oil. The general lack of surface flow within a wetland would restrict crude oil movement. Where surface water is present within a wetland, the spill would spread laterally across the water's surface and be readily visible during routine ROW surveillance. The depth of soil impacts likely would be minimal, due to shallow (or emergent) groundwater conditions. Conversely, groundwater impacts within the wetland are likely to be confined to the near-surface, enhancing the potential for biodegradation. If humans or other important resource exposures were to occur in proximity to the wetland, then regulatory drivers would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. However, response and remediation efforts in a wetland have the potential for appreciable adverse effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation would ultimately allow a return to preexisting conditions in both soil and groundwater. This would likely require a timeframe on the order of tens of years. Keystone will utilize the most appropriate cleanup procedures as determined in coordination with the applicable federal and state agencies.

The chance of a spill occurring at any specific wetland along the pipeline is very low. Based on survey data and aerial interpretation, the Project will cross 5.3 miles of wetlands in Montana. Of the estimated maximum of one spill postulated to occur during a ~~30~~26-year period within Montana, there is a 1.9 percent probability that the spill would occur within wetland areas.

The predicted effects of a spill reaching standing water (e.g., reservoirs, lakes) would depend largely upon the volume of crude oil entering the waterbody and the volume of water within the waterbody.

Table 4-11 summarizes the amount of water necessary to dilute spill volumes below aquatic toxicity and drinking water thresholds. While this preliminary approach does not account for fate and transport mechanisms, mixing zones, environmental factors, and emergency response capabilities, it does provide an initial benchmark for identifying areas of potential concern.

Table 4-11 Amount of Water Required to Dilute Crude Oil Spills Below Threshold Values

Barrels of Crude Oil	Volume of Water Required to Dilute Crude Oil Below Threshold (acre-feet)[1]		
	Acute Toxicity Threshold (7.4 milligrams per liter [mg/L])	Chronic Toxicity Threshold (1.4 mg/L)	Drinking Water MCL (0.005 mg/L)
Diluted Bitumen			
3	~~0.3~~0.07	~~1.5~~0.39	~~413~~108
50	~~4.6~~1.3	~~24.3~~6.9	~~6,890~~1,933
1,000	~~92.0~~26.1	~~486.2~~138	~~136,136~~38,668
10,000	~~919.8~~261	~~4,862.0~~1,381	~~1,361,358~~386,678
Synthetic Crude			
3	~~0.04~~0.015	~~0.2~~0.077	~~55~~21.6
50	~~0.6~~0.26	~~3.0~~1.4	~~841~~387
1,000	~~11.4~~5.2	~~60.1~~27.6	~~16,826~~7,734
10,000	~~113.7~~52	~~600.9~~276	~~168,258~~77,336

[1] Thresholds based on aquatic toxicity and drinking water thresholds established for benzene. The estimated benzene content of the diluted bitumen is 0.15 percent by weight. The synthetic crude oil is estimated to have a benzene content of 0.03~~2~~ percent by weight.

Based on a review of publicly available toxicity literature for wetland plant groups (i.e., algae, annual macrophytes, and perennial macrophytes), crude oil is toxic to aquatic plants but at higher concentrations than observed for fish and invertebrates. Therefore, spill concentrations that are less than toxic effect levels for fish and invertebrates (see Aquatic Organisms, above) also would not affect wetland plant species.

In summary, while a release of crude oil into wetland and static waterbodies has the potential to cause temporary environmental impacts, the frequency of such an event would be very low.

4.3 Risk to Populated and High Consequence Areas

Consequences of inadvertent releases from pipelines can vary greatly, depending on where the release occurs. Pipeline safety regulations use the concept of HCAs to identify specific locales and areas where a release could have the most significant adverse consequences. HCAs include populated areas, drinking water, and unusually sensitive ecologically resource areas (USAs) that could be damaged by a hazardous liquid pipeline release. **Table 4-12** identifies the types and lengths of HCAs crossed by the Project. Portions of the pipeline that could affect HCAs if a spill occurred (contributory pipeline segments [CPS]) are subject to higher levels of inspection, per 49 Code of Federal Regulations (CFR) Part 195. These data are compiled from a variety of data sources, including federal and state agencies (e.g., state drinking water agencies, the Environmental Protection Agency). The PHMSA acknowledges that spills within a sensitive area might not actually impact the sensitive resource and encourages operators to conduct detailed analysis, as needed. Keystone has conducted an evaluation of HCAs crossed or located downstream of the pipeline. Keystone has identified a total of 4.7 miles of pipeline in Montana (approximately 1.7 percent) that either crosses or has the potential to affect HCAs through downstream transport.

These CPS will be subject to higher levels of inspection, as required by 49 CFR Part 195. Furthermore, Keystone has subsequently evaluated the location of valves as a measure to reduce potential risk to HCAs. As a result of the HCA evaluation, Keystone moved some proposed valve locations and added valves in specific locations to protect HCAs in Montana.

Assuming that one spill occurred along the Project in a ~~30~~26-year period, it is estimated that there is a ~~1~~1.6 percent chance that the spill would occur within an HCA. Although the number of predicted spills in HCAs is very small, the potential impacts of these individual spills are expected to be greater than in other areas due to the environmental sensitivity within these areas. **Table 4-13** also shows the number of spills and their predicted sizes.

Table 4-12 Release and Spill Volume Occurrence Interval Associated with the Project

	Miles of Pipe[1]	~~Total Number of Predicted Spills~~Occurrence Interval	<3 barrels	3 to 50 barrels	50 to 1,000 barrels	1,000 to 10,000 barrels
Populated Areas	1.3	~~0.00017~~ ~~(~~5,800 years~~)0.00015 (6,500 years)~~	~~0.00009~~ ~~(~~11,600 years~~)0.00008 (12,900 years)~~	~~0.00005~~ ~~(~~19,300 years~~)0.00005 (18,500 years)~~	~~0.00003~~ ~~(~~38,600 years~~)0.00002 (64,600 years)~~	~~0.000008~~ ~~(~~128,500 years~~)0.000007 (143,600 years)~~
Drinking Water Areas	0.9	~~0.00012~~ ~~(~~8,400 years~~)0.0001 (9,300 years)~~	~~0.00006~~ ~~(~~16,700 years~~)0.00005 (18,700 years)~~	~~0.00004~~ ~~(~~27,800 years~~)0.00004 (26,700 years)~~	~~0.00002~~ ~~(~~55,700 years~~)0.00001 (93,400 years)~~	~~0.000005~~ ~~(~~185,600 years~~)0.000005 (207,500 years)~~
Ecologically Sensitive Areas	3.2	~~0.00043~~ ~~(~~2,400 years~~)0.0004 (2,600 years)~~	~~0.00021~~ ~~(~~4,700 years~~)0.0002 (5,300 years)~~	~~0.00013~~ ~~(~~7,800 years~~)0.0001 (7,500 years)~~	~~0.00006~~ ~~(~~15,700 years~~)0.00003 (26,300 years)~~	~~0.00002~~ ~~(~~52,200 years~~)0.00002 (58,400 years)~~

[1] The amount of pipe that has the potential to affect an HCA in the unlikely event of a spill. Probability of a spill was based on the conservative incident frequency of ~~0.000119~~0.000133 incidents per mile per year. These areas overlap; the total length of pipeline that could affect HCAs in Montana is 4.7 miles.

4.3.1 Populated Areas

PHMSA defines populated area HCAs based on US Census data. While there are no populated area HCAs crossed by the Project in Montana (**Table 4-12**), Keystone has identified 1.3 miles of CPS where a crude oil spill from the pipeline could potentially be transported downstream to a populated HCA. CPS locations will be subject to higher levels of inspection, as required by 49 CFR Part 195, in order to reduce the chance of pipeline incident.

4.3.2 Drinking Water

PHMSA identifies certain surface water and groundwater resources as drinking water USAs (49 CFR Part 195.6 and 49 CFR 195.450). Surface water USAs include intakes for community water systems and non-transient non-community water systems that do not have an adequate alternative drinking water source. Groundwater USAs include the source water protection area for community water systems and non-transient non-community water systems that obtain their water supply from a Class I or Class IIA aquifer and do not have an adequate alternative drinking water source. If the source water protection area has not been established by the state, the wellhead protection area becomes the USA.

Surface water USAs identified for their potential as a drinking water resource have a 5-mile buffer placed around their intake location. The groundwater USAs have buffers that vary in size. Source water protection areas in Montana are designated by the state and are 0.5 mile in diameter.

In Montana, there are no drinking water HCAs crossed by the Project (**Table 4-12**). Keystone has identified 0.9 mile of CPS where a crude oil spill from the pipeline could potentially be transported downstream to a populated HCA. CPS locations will be subject to higher levels of inspection, as per 49 CFR Part 195, in order to reduce the chance of pipeline incident.

4.3.3 Ecologically Sensitive Areas

Certain ecologically sensitive areas are classified as HCAs by PHMSA due to potential risks to ecologically sensitive resources. These areas focus on the characteristics of rarity, imperilment, or the potential for loss of large segments of an abundant population during periods of migratory concentration. These include:

- Critically imperiled and imperiled species and/or ecological communities;
- Threatened and endangered species (or multi-species assemblages where three or more different candidate resources co-occur);
- Migratory waterbird concentrations;
- Areas containing candidate species or ecological communities identified as excellent or good quality; and
- Areas containing aquatic or terrestrial candidate species and ecological communities that are limited in range.

An isolated segment (0.4 miles in length) of the Project in Montana crosses an ecologically sensitive HCA (**Table 4-12**). Keystone has identified an additional 2.8 miles of CPS locations that have the potential to affect HCAs. All these areas will be subject to higher levels of inspection, as required by 49 CFR Part 195, in order to reduce the chance of pipeline incident.

4.3.4 Management of Risk Within HCAs

To protect particularly sensitive resources, portions of the pipeline that have the potential to affect an HCA would be subject to a higher level of inspection per USDOT regulations. Federal regulations require periodic assessment of the pipe condition and timely correction of identified anomalies within HCAs. Keystone will develop management and analysis processes that integrate available integrity-related data and information and assess the risks associated with segments that can affect HCAs.

Due to Homeland Security concerns, the precise risk for specific locations of HCAs is highly confidential. Keystone will provide a confidential evaluation of site-specific risk to HCAs for federal agencies' review. As required by federal regulations (Integrity Management Rule, 49 CFR Part 195), the site-specific evaluation of risk is an ongoing process and is regulated by the PHMSA.

Based on Keystone's preliminary assessment of HCAs, some valve locations were moved from their initial locations and additional valves have been added to provide supplemental protection of HCAs, where warranted. In addition, Keystone will develop and implement a risk-based integrity management program (IMP). The IMP will use state-of-practice technologies applied within a comprehensive risk-based methodology to assess and mitigate risk associated with all pipeline segments including HCAs.

5.0 Keystone's Pipeline Safety Program

Pipelines are one of the safest forms of crude oil transportation and provide a cost-effective and safe mode of transportation for oil on land. Overland transportation of oil by truck or rail produces higher risk of injury to the general public than the proposed pipeline (USDOT 2002). The Project will be designed, constructed, and maintained in a manner that meets or exceeds industry standards.

Historically, the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. The pipeline will be built within an approved ROW and markers will be installed at all road, railway, and water crossings. The depth of cover required by federal regulations is 30 inches in most locations. In an effort to reduce excavation damage, Keystone has taken the proactive measure to increase the typical depth of cover to 4 feet (18 inches more cover than federal requirements). Keystone also will mitigate third-party excavation risk by implementing a comprehensive Integrated Public Awareness program focused on education and awareness in accordance with 49 CFR Part 195.440 and API RP1162. Further, Keystone's operating staff will complete regular visual inspections of the ROW (at least once every 3 weeks and a minimum of 26 times per year) as per 49 CFR Part 195.412 and monitor activity in the area to prevent unauthorized trespass or access.

Keystone will have a maintenance, inspection, and repair program that ensures the integrity of the pipeline. Keystone's annual Pipeline Maintenance Program (PMP) will be designed to maintain the safe operation of the pipeline. The PMP will include routine aerial patrol of the ROW, periodic inline inspections, and cathodic protection readings underpinned by a company-wide goal to ensure facilities are reliable and in service. Data collected in each year of the program will be fed back into the decision-making process for the development of the following year's program. In addition, the pipeline will be monitored 24 hours a day, 365 days a year from the oil control center using leak detection systems and supervisory control and data acquisition (SCADA). During operations, Keystone will have a Project Emergency Response Program in place to manage a variety of events.

6.0 Conclusion

In summary, this conservative analysis of the proposed Project shows that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently, risk of environmental impacts is minimal. Compliance with regulations, application of Keystone's IMPs and Emergency Response Plan, as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline.

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8.0 Glossary

Accidental Release

An accidental release is an unplanned occurrence that results in a release of oil from a pipeline.

Acute exposure

Exposure to a chemical or situation for a short period of time.

Acute toxicity

The ability of a substance to cause severe biological harm or death soon after a single exposure or dose.

Adverse effect

Any effect that causes harm to the normal functioning of plants or animals due to exposure to a substance (i.e., a chemical contaminant).

Algae

Chiefly aquatic, eukaryotic one-celled or multicellular plants without true stems, roots and leaves that are typically autotrophic, photosynthetic, and contain chlorophyll. They are food for fish and small aquatic animals.

Aquifer

An underground layer of water-bearing permeable rock, or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted using a water well.

Barrel

A barrel is a standard measure of a volume of oil and is equal to 42 gallons.

Bioavailability

How easily a plant or animal can absorb a particular contaminant from the environment.

Biodegradation

Biodegradation is the breakdown of organic contaminants by microbial organisms into smaller compounds. The microbial organisms transform the contaminants through metabolic or enzymatic processes. Biodegradation processes vary greatly, but frequently the final product of the degradation is carbon dioxide or methane.

BPD

Abbreviation for barrels per day

Cathodic Protection System

A technique to provide corrosion protection to a metal surface by making the surface of the metal object the cathode of an electrochemical cell. In the pipeline industry that is done using impressed current. Impressed current cathodic protection (ICCP) systems use an anode connected to a DC power source (a cathodic protection rectifier).

Chronic toxicity

The capacity of a substance to cause long-term poisonous health effects in humans, animals, fish, or other organisms. Biological tests use sublethal effects, such as abnormal development, growth, and reproduction, rather than mortality, as endpoints.

Contaminant

Any physical, chemical, biological, or radiological substance found in air, water, soil or biological matter that has a harmful effect on plants or animals; harmful or hazardous matter introduced into the environment.

Ecosystem

The sum of all the living plants and animals, their interactions, and the physical components in a particular area.

Exposure

How a biological system (i.e., ecosystem), plant, or animal comes in contact with a chemical.

Event

An event is a significant occurrence or happening. As applicable to pipeline safety, an event could be an accident, abnormal condition, incident, equipment failure, human failure, or release.

Facility

Any structure, underground or above, used to transmit a product.

Habitat

The place where a population of plants or animals and its surroundings are located, including both living and non-living components.

High Consequence Area (HCA)

A high consequence area is a location that is specially defined in PHMSA pipeline safety regulations as an area where pipeline releases could have greater consequences to health and safety or the environment. For oil pipelines, HCAs include high population areas, other population areas, commercially navigable waterways, and areas unusually sensitive to environmental damage, including certain ecologically sensitive areas and drinking water resources. Regulations require a pipeline operator to take specific steps to ensure the integrity of a pipeline for which a release could affect an HCA and, thereby, provide protection of the HCA.

High Population Area

A high population area is an urbanized area, as defined and delineated by the US Census Bureau, which contains 50,000 or more people and has a population density of at least 1,000 people per square mile. High population areas are considered HCAs.

Incident

As used in pipeline safety regulations, an incident is an event occurring on a pipeline for which the operator must make a report to the Office of Pipeline Safety. There are specific reporting criteria that define an incident that include the volume of the material released, monetary property damage, injuries, and fatalities (Reference 49 CFR 191.3, 49CFR 195.50).

Incident Frequency

Incident frequency is the rate at which failures are observed or are predicted to occur, expressed as events per given timeframe.

Integrity Management Program

An IMP is a documented set of policies, processes, and procedures that are implemented to ensure the integrity of a pipeline. An oil pipeline operator's IMP must comply with the federal regulations (i.e., the Integrity Management Rule, 49 CFR 195).

Integrity Management Rule

The Integrity Management Rule specifies regulations to assess, evaluate, repair, and validate the integrity of hazardous liquid pipelines that, in the event of a leak or failure, could affect HCAs.

Invertebrates

Animals without backbones: e.g., insects, spiders, crayfish, worms, snails, mussels, clams, etc.

LC_{50}

A concentration expected to be lethal to 50 percent of a group of test organisms.

Leak

A leak is a small opening, crack, or hole in a pipeline allowing a release of oil.

Likelihood

Likelihood refers to the probability that something possible may occur. The likelihood may be expressed as a frequency (e.g., events per year), a probability of occurrence during a time interval (e.g., annual probability), or a conditional probability (e.g., probability of occurrence, given that a precursor event has occurred).

Maximum Contaminant Level (MCL)

The maximum level of a contaminant allowed in drinking water by federal or state law and is based on the avoidance of health effects and currently available water treatment methods.

National Pipeline Mapping System (NPMS)

The National Pipeline Mapping System is a GIS database that contains the locations and selected attributes of natural gas transmission lines, hazardous liquid trunklines, and liquefied natural gas (LNG) facilities operating in onshore and offshore territories of the United States.

Operator

An operator is a person who owns or operates pipeline facilities (Reference 49 CFR 195.2).

Polycyclic Aromatic Hydrocarbons (PAHs)

Group of organic chemicals.

Pipeline

Used broadly, pipeline includes all parts of those physical facilities through which gas, hazardous liquid, or carbon dioxide moves in transportation. Pipeline includes but is not limited to: line pipe, valves and other appurtenances attached to the pipe, pumping/compressor units and associated fabricated units, metering, regulating, and delivery stations, and holders and fabricated assemblies located therein, and breakout tanks.

Receptor

The species, population, community, habitat, etc. that may be exposed to contaminants.

Risk

Risk is a measure of both the likelihood that an adverse event could occur and the magnitude of the expected consequences should it occur.

Sediment

The material of the bottom of a body of water (i.e., pond, river, stream, etc.).

Stressor

Any factor that may harm plants or animals; includes chemical (e.g., metals or organic compounds), physical (e.g., extreme temperatures, fire, storms, flooding, and construction/development) and biological (e.g., disease, parasites, depredation, and competition).

Supervisory Control and Data Acquisition System (SCADA)

A SCADA is a pipeline control system designed to gather information such as pipeline pressures and flow rates from remote locations and regularly transmit this information to a central control facility where the data can be monitored and analyzed.

Throughput

The volume of oil through a pipeline during a specified time (e.g., barrels per day).

Toxicity Threshold

Numerical values that represent concentrations of contaminants in abiotic media (sediments, water, soil) or tissues of plants and animals above which those contaminants are expected to cause harm.

Unusually Sensitive Areas (USAs)

USAs refers to certain drinking water and ecological resource areas that are unusually sensitive to environmental damage from a hazardous liquid pipeline release, as defined in 49 CFR 195.6.

Zooplankton

Small, usually microscopic animals (such as protozoans) found in lakes and reservoirs.

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location AECOM

Date/Time of Contact May 15, 2009 / 12:53 p.m.

KXL Team Member(s) Patti Lorenz

Contact Information:

Name	Danielle Kepford
Title	Realty Specialist
Organization	US Fish and Wildlife Service Charles M. Russell National Wildlife Refuge
Address	333 Airport Road P.O. Box 110 Lewistown, MT 59457
County	
Phone	406/538-8706 Ext. 25
Email address	Danielle_Kepford@fws.gov

Contact Information:

Type of Contact (phone, in-person, etc.): ___ _Email________________________________

Issue: FWS Easements   **Concern Level: High___Moderate_x_Low__.**

Description:

50cfrROWapp.doc

Patricia--
Jerry Rodriguez, Medicine Lake NWR in MT, has asked me to contact you in order to answer your question below pertaining to Congressional notification. I have attached a copy of 50 CFR which talks specifically about ROW applications. Section 29.21-9 discusses ROW for gas/pipelines. Letter 'm' discusses Congressional notification and the time limitations for that part of the process. To briefly answer your questions, yes we would have to ask for Congressional notification. Another resource I have attached is the link to the Keystone Pipeline proposal and information we are working on that is going through the eastern part of the Dakotas. This may help you in some of your questions as well. I hope these two resources answer your questions.

(See attached file: 50cfrROWapp.doc)

www.fws.gov/mountain-prairie/keystonepipeline/

Now that we have been connected, I have a couple of questions for you on the Keystone XL project. First, have you been in touch with Tim Modde, our Denver Regional Office NEPA coordinator?

Also, are you preparing the EIS for all three alternative routes? I am also a Realty Specialist for Bowdoin NWR and Charles M. Russell NWR (CMR) in MT. The proposed pipeline is not crossing any of these refuge lands. However, I believe it may cross potential wetland easements in the Bowdoin district and the powerlines to the proposed route cross a small portion of primary jurisdiction of CMR. If you are not the EIS coordinator for these alternatives, do you know who is? We have some questions about the CMR portion and have been unable to find out who to contact with these questions. Do you know if the FWS is a cooperating agency for this project and EIS? If so, could you tell me who signed the documents (was it at the national level or Denver level), or maybe even send me a copy of the agreement?

Thanks, so much, Patti, for your help and guidance the last part of this email. It would be wonderful to start moving forward with this project on our end of things. I am hopeful to hear from you soon.

Danielle L. Kepford
Realty Specialist
US Fish and Wildlife Service
333 Airport Road
P.O. Box 110
Lewistown, MT 59457
406/538-8706 (phone)
406/538-7521 (fax)

TITLE 50--WILDLIFE AND FISHERIES

CHAPTER I--UNITED STATES FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR--(Continued)

PART 29_LAND USE MANAGEMENT--Table of Contents

[42 FR 43919, Aug. 31, 1977, as amended at 48 FR 31655, July 11, 1983]

Sec. 29.21-9 Rights-of-way for pipelines for the transportation of oil, natural gas, synthetic liquid or gaseous fuels, or any refined product produced therefrom.

(m) Congressional notification. The Secretary shall notify the House and Senate Committees on Interior and Insular Affairs promptly upon receipt of an application for a right-of-way for pipeline 24 inches or more in diameter, and no right-of-way for such a pipeline shall be granted until 60 days (not including days on which the House or Senate has adjourned for more than three days) after a notice of intention to grant the right-of-way together with the Secretary's detailed findings as to terms and conditions he proposes to impose, has been submitted to the Committees, unless each Committee by resolution waives the waiting period.

FOR INTERNAL KXL PROJECT USE ONLY

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location	ENSR
Date/Time of Contact	7/1/09, 3:10 p.m.
KXL Team Member(s)	Patti Lorenz

Contact Information:

Name	Windy Davis
Title	Energy Specialist
Organization	Montana Fish Wildlife and Parks
Address	FWP Region 7 Headquarters Industrial Site West Miles City, MT 59301
County	
Phone	(406) 234-0900
Email address	widavis@mt.gov

Contact Information:

Type of Contact (phone, in-person, etc.): ___ Email________________________________

Issue: Sage Grouse Winter Habitat__ **Concern Level: High__x__Moderate__Low__.**

Description:

Hi Patti,
  the data from last winter has not even been entered yet. Sorry, but it will be a while.
Windy

____

From: Lorenz, Patricia [Patricia.Lorenz@aecom.com]
Sent: Wednesday, July 01, 2009 2:58 PM
To: Davis, Windy; Lorenz, Patricia
Subject: RE: KXL_MFSA_Grouse Winter Habitats

Hi Windy,

Just thought I'd check in to see if there were any updates on sage-grouse winter habitat within the Project area. The company writing the EIS was looking for an update. Let me know, have a happy 4th!

Patti

From: Davis, Windy [mailto:Widavis@mt.gov]
Sent: Friday, February 20, 2009 4:42 PM
To: Lorenz, Patricia
Subject: RE: KXL_MFSA_Grouse Winter Habitats

that sounds good.

Windy
\

-----Original Message-----
From: Lorenz, Patricia [mailto:Patricia.Lorenz@aecom.com]
Sent: Friday, February 20, 2009 3:15 PM
To: Davis, Windy
Cc: Messer, Adam
Subject: RE: KXL_MFSA_Grouse Winter Habitats

... scratch that. Sound good if we add:

"Identification of sage-grouse winter habitat is ongoing and will be submitted when available"?

From: Lorenz, Patricia
Sent: Friday, February 20, 2009 3:05 PM
To: 'Davis, Windy'
Cc: Messer, Adam
Subject: RE: KXL_MFSA_Grouse Winter Habitats

So we should stick with the determination that we do not cross winter habitats for the MFSA?

From: Davis, Windy [mailto:Widavis@mt.gov]
Sent: Friday, February 20, 2009 3:00 PM
To: Lorenz, Patricia
Cc: Messer, Adam
Subject: RE: KXL_MFSA_Grouse Winter Habitats

Hi Patti,
We do not have a designated winter range for grouse, but we have done some surveys in Fallon County that have identified important winter areas. I don't have that data processed and at my fingertips so maybe you could go ahead without it for the MFSA, but we could add it for the EIS?

Windy

-----Original Message-----
From: Lorenz, Patricia [mailto:Patricia.Lorenz@aecom.com]
Sent: Friday, February 20, 2009 2:20 PM
To: Davis, Windy
Cc: Messer, Adam
Subject: KXL_MFSA_Grouse Winter Habitats

Windy,

We are getting ready to submit a supplemental filing for the MFSA and I wanted to make sure we have the correct information on sage grouse and sharp-tail grouse winter habitats/range. Initially, Adam thought that we did not cross any winter range with the three alternatives but during the meeting this month in Glasgow, you mentioned some known winter ranges. Could you provide us with those locations so I can add it to our permit application?

Thanks,

Patti Lorenz, Wildlife Biologist
AECOM Environment
D 970-530-3410
patricia.lorenz@aecom.com<mailto:patricia.lorenz@aecom.com>

AECOM
1601 Prospect Parkway
Fort Collins, CO 80525
T 970-493-8878 F 970-493-0213
www.aecom.com<http://www.aecom.com/>

Please note: My e-mail has changed to patricia.lorenz@aecom.com. Please update your address books accordingly.

ENSR's parent company, AECOM Technology Corporation, is evolving to better serve its global clients. AECOM is forming a global business line – AECOM Environment – by utilizing the skills and capabilities from across its global environmental operations, including resources from ENSR, Earth Tech, STS and Metcalf & Eddy. AECOM Environment is devoted to providing quality environmental services to its global clients. With access to approximately 4,200 staff in 20 countries, AECOM Environment will be one of five new AECOM business lines, which also include AECOM Water, AECOM Transportation, AECOM Design, and AECOM Energy.

AECOM Environment provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. Though our appearance is changing, our commitment to the success of your projects and your organization remains strong. We will keep you apprised of future details.

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location Ft Collins / Helena

Date/Time of Contact 5/15/09.

KXL Team Member(s) Strom

Contact Information:

Name	Nancy Johnson
Title	Landscape Architect
Organization	Montana DEQ
Address	
County	
Phone	406.444.6797
Email address	

Contact Information:

Type of Contact (phone, in-person, etc.): _______**Phone**_X_______________________________

Issue: MFSA Visual Resources Contrast Rating Approach **Concern Level: High__Moderate__X__Low__.**

Description:

Contrast Rating Approach:

I told NJ that I didn't think that a contrast rating "overlay" was workable, but suggested that I would do contrast ratings for KOPs at major road crossings using a summary table based on BLM VRM contrast rating procedures.

- She agreed that this approach sounded good.
- She has received the annotated photos & said they gave her a much better sense of the landscape we were dealing with in NE MT.

Issue: Reclamation Problem Areas **Concern Level: High__Moderate_X_Low**

.

Description:
Regarding reclamation potential, I noted that the reclamation difficulty spreadsheet I'd received was broken down into segments as small as .04 mi. (`200 ft.), or less, & I thought it was unworkable to address visual effects on such a fine scale. o NJ agreed; she said she was most interested in large areas with high visual sensitivity, e.g. rocky areas on terrain raised up in front of a major highway crossing.

Issue: Missouri River Crossing **Concern Level: High__Moderate_X_ Low__.**

Description:
She asked about how we would be going through the bluffs at the Missouri River crossing? o I said I thought it would be directionally drilled, but would check.

Follow-up Required / Requested
Check on directional drilling end points for Missouri River crossing.

Additional Comments

TransCanada – Keystone XL Phase II Pipeline
Contact Summary Form

Communication Location	Fort Collins
Date/Time of Contact	05/15/09 9:40 AM
Keystone XL Team Member(s)	K. Arndt

Contact Information:

Name	Randy Baldwin
Title	Utility Engineering Specialist
Organization	Montana Department of Transportation - Glendive District
Address	503 N. River Ave /P.O. Box 7039 Glendive, MT 59330
County	McCone County
Phone	406.345.8227
Email address	

Contact Information:

Type of Contact (phone, in-person, etc.): _______Phone_______________________

Issue: TL Road Crossing

Description:
I contacted Randy Baldwin regarding TL crossings of State Highways and secondary paved roads. Mr. Baldwin told me that the only necessary permit needed by the Montana Department of Transportation is a Utility Occupancy Agreement. He then told me that I should contact each county individually to figure out what permits were needed on the county level.

Follow-up Required / Requested

TransCanada – Keystone XL Phase II Pipeline
Contact Summary Form

Communication Location	Fort Collins
Date/Time of Contact	5/18/09 10:00 AM
Keystone XL Team Member(s)	K. Arndt

Contact Information:

Name	Rick Seiler
Title	Valley County Road and Bridge Dept
Organization	Valley County
Address	501 Court Square Glasgow, MT 59230
County	Valley
Phone	406. 263.1479
Email address	rseiler@co.valley.mt.us

Contact Information:

Type of Contact (phone, in-person, etc.): _______Phone______________________

Issue: ____

Description:

I contacted Mr. Seiler in regards to Transmission Line crossings of county roads in Valley County. Mr. Seiler said that there are no required permits unless the Transmission Line is located within the county road right of way. I told him that none of the Transmission Lines or their alternatives were located within a county road right of way. Then, Mr. Seiler said there is no permit required for county road crossings in Valley County MT.

Follow-up Required / Requested

TransCanada – Keystone XL Phase II Pipeline
Contact Summary Form

Communication Location	Fort Collins
Date/Time of Contact	5/15/09 10:00 AM
Keystone XL Team Member(s)	K. Arndt

Contact Information:

Name	Jim Shanks
Title	Roosevelt County Commissioner
Organization	Roosevelt County Commissioner
Address	400 2ns Avenue South Wolf Point, MT 59201
County	Roosevelt
Phone	406.448.2595
Email address	shanks@nemontel.com

Contact Information:

Type of Contact (phone, in-person, etc.): _______Phone_______________________

Issue: ____

Description:

I contacted Mr. Shanks in regards to Transmission Line crossings of county roads in Roosevelt County. Mr. Shanks said that there are no required permits unless the Transmission Line is located within the county road right of way. I told him that none of the Transmission Lines or their alternatives were located within a county road right of way. Then, Mr. Shanks said there is no permit required for county road crossings in Roosevelt County MT.

Follow-up Required / Requested

TransCanada – Keystone XL Phase II Pipeline
Contact Summary Form

Communication Location Fort Collins

Date/Time of Contact 5/19/09 4:00 PM

Keystone XL Team Member(s) K. Arndt

Contact Information:

Name	Jim Greil
Title	Bureau Chief
Organization	MDOT Aeronautics Division
Address	PO Box 200507 Helena, MT 59620-0507
County	
Phone	406.444.9569
Email address	

Contact Information:

Type of Contact (phone, in-person, etc.): _______Phone_______________________

Issue: ____

Description:

I contacted Jim Greil in regards to MDOT Aeronautical standards for Transmission Lines. MR. Greil explained that there are no State regulations in regards to Transmission line placement near airports. Mr. Greil told me that the counties can generate and enforce their own regulations. He suggested that I call the counties to find out about their regulations.

Follow-up Required / Requested

Mr. Greil requested that I send him a map of the transmission line alternatives showing their relation ship to the airports.

TransCanada – Keystone XL Phase II Pipeline
Contact Summary Form

Communication Location Fort Collins, CO

Date/Time of Contact 9:30 AM

Keystone XL Team Member(s) Kyle Arndt

Contact Information:

Name	Max Murphy
Title	
Organization	Montana Department of transportation Aeronautics Division
Address	PO Box 200507 Helena, MT 59620
County	
Phone	406.444.9581
Email address	mmurph@mt.gov

Contact Information:

Type of Contact (phone, in-person, etc.): _______Phone______________________

Issue: ____

Description:

Max Murphy contacted me after I sent a set of transmission line alternative maps to Jim Greil who is the Montana Department of Transportation Aeronautics Bureau Chief. These maps contained the location of two airports within the project vicinity (Circle Town Airport and Big Sky Field Airport). Here is what he answered back with:

Kyle

Just to put what I said in writing, your company needs to be concerned that you don't penetrate the 34:1 slope off of runway 12, which begins 200' level from the runway end, and extends over a section of the railroad tracks. Your option next to the rail tracks, has the possibility of penetration of the 34:1 runway slope.

Also the idea of installing balls on the power line will be very helpful for liability, the same is true at Big Sky Field where the power line comes nearest to the end of runway. In Circle airport it would be wise to consider putting sight balls of the end of turf runway 21 also. Along those power lines make sure to file 7460 forms with the FAA for the air obstructions that your company has plans to construct.

I hope the planning and construction goes well, thanks.

Max

ENSR | AECOM

ENSR
1601 Prospect Parkway, Fort Collins, Colorado 80525
T 970.493.8878 F 970.493.0213 www.ensr.aecom.com

May 29, 2008

Tribal Historic Preservation Officer John Murray
Blackfeet Nation
PO Box 2809
Quarter 108, E. Gov. Square
Browning, MT 59417

RE: TransCanada - Keystone XL Pipeline

Dear Mr. Murray,

TransCanada, a leader in the responsible development and reliable operation of North American energy infrastructure, is proposing to construct a 36-inch-diameter crude oil pipeline, the Keystone XL Pipeline Project, from Hardisty, Alberta, Canada, to the Port Arthur and east Houston areas of Texas in the United States (U.S.). Phase 2 of the Project consists of approximately 851 miles of the Mainline pipeline to be located between the U.S./Canadian border and Steele City, Nebraska. Phase 1 of the Project consists of approximately 476 miles of the Mainline pipeline proposed between Cushing, Oklahoma and Nederland, Texas. The Houston Lateral pipeline also is proposed to extend the approximately 50 miles from Nederland to the Port of Houston. A brochure providing an overview of the project is enclosed.

As planned, the pipeline will be constructed within an area generally 110 feet wide, consisting of both a temporary 60-foot-wide construction right-of-way (ROW) and a 50-foot-wide permanent ROW or easement. The enclosed maps are generalized illustrations of the proposed routes. The Phase 2 portions of the Mainline will be constructed in a new ROW that is not co-located with any existing utilities. The majority of Phase 1 of the Project and all of the Houston Lateral are co-located with existing pipelines and/or electrical utilities. Phase 1 is expected to be constructed in 2010, and Phase 2 in 2011.

TransCanada has retained ENSR to complete the field studies and permitting for the Project. To support these efforts, ENSR has retained subcontractors to complete the necessary cultural resource investigations. The lead federal agency for this project is the Bureau of Land Management (BLM), which will consult with the State Historic Preservation Offices (SHPOs), Tribal Historic Preservations Offices (THPOs), and federally recognized tribes with historic ties to the lands to be crossed by the Mainline and Houston Lateral pipelines. TransCanada has also requested that we start discussions with interested Native American tribal organizations to facilitate project review and coordination.

BLM will engage tribes when they have begun their analysis of the project, likely later this summer or early fall. In the interim, we are required to start our field survey program and would like to engage you to discuss tribal concerns related to field surveys. Engaging at this time will allow you to contribute to the identification, evaluation, and protection or treatment of historic properties that may be of particular interest or concern to your tribe, especially those of religious or cultural significance.

If you would prefer to deal directly with the BLM through government-to-government consultation, please let us know, and we can certainly provide you with names, addresses, and phone numbers of the appropriate people to contact.

If you would like to start early discussions with us on this project, then please let us know so that we can send you relevant Project documents. These include more detailed maps, file research review results, and survey methodologies. We are about to begin the field inventory in the Area of Potential Effects of the proposed Mainline. As such, we have developed Survey Protocols in consultation with the SHPOs and we would like to share these documents with interested tribes.

If you have any interest in this Project and in the historic properties that may be affected, or in participating in the field surveys, please contact us within 30 days. Our field investigations will take place this summer. You may contact us at any time. A prompt response will allow us to convey your interests and concerns to the BLM and SHPOs early in the planning and permitting process.

We can be reached at any time at the following address and phone numbers, and we look forward to hearing from you soon.

Sincerely,

Scott Patti
ENSR Phase 2 Manager
spatti@ensr.aecom.com

Chantal Cagle
Senior Project Manager
ccagle@ensr.aecom.com

ENSR
1601 Prospect Parkway
Fort Collins, CO 80525
970-493-8878

encl. Overview Maps
Project Brochure

Cc: Project File
S. Bedard, TransCanada

Addresses where Tribal Correspondence Letter was Sent

Tribal Historic Preservation Officer John Murray
Blackfeet Nation
PO Box 2809
Quarter 108, E. Gov. Square
Browning, MT 59417

Tribal Business Council Earl Old Person
Blackfeet Nation
P.O. Box 850
Browning, MT 59417

Rocky Boy's Reservation
Chippewa Cree
P.O. Box 544
Rural Route #1
Box Elder, MT 59521

Chairman Business Council John Houle
Chippewa Cree
P.O. Box 544
Rural Route #1
Box Elder, MT 59521

Crow Reservation
P.O. Box 159
Bacheeitche Ave.
Crow Agency, MT 59022

Chairman Tribal Council Carl Venne
Crow
P.O. Box 159
Crow Agency, MT 59022

Tribal Historic Preservation Officer Dale Horn
Crow
P.O. Box 850
Crow Agency, MT 59022

Tribe Cultural Resource Manager George Reed
Crow
P.O. Box 1094
Crow Agency, MT 59022

Chairman Cultural Committee George Reed
Crow
P.O. Box 850
Crow Agency, MT 59022

Fort Belknap Reservation
RR1, Box 66
101 Tribal Way
Harlem, MT 59526

President Community Council Julia Doney
Fort Belknap
RR1, Box 66
Harlem, MT 59526

Fort Peck Reservation
P.O. Box 1027
501 Medicine Bear Road
Poplar, MT 59255

Chairman Tribal Executive Board Rusty Stafne
Fort Peck
P.O. Box 1027
Poplar, MT 59255

Director Cultural Resource Dept. & NAGPRA
Coordinator Curly Youpee
Fort Peck
P.O. Box 1027
Poplar, MT 59255

Governor's Office of Indian Affairs
P.O. Box 200801
1301 E. 6th Ave.
Helena, MT 0

Little Shell
P.O. Box 1384
1807 3rd NW suite 35A
Great Falls, MT 59403

Chairman Tribal Council John Sinclair
Little Shell
P.O. Box 1384
Great Falls, MT 59403

Northern Cheyenne Reservation
Northern Cheyenne
P.O. Box 128
600 Cheyenne Ave.
Lame Deer, MT 59043

Acting President Rick Wolfname
Northern Cheyenne
P.O. Box 128
Lame Deer, MT 59043

Tribal Historic Preservation Officer
Conrad Fisher
Northern Cheyenne
P.O. Box 128
Lame Deer, MT 59043

Addresses where Tribal Correspondence Letter was Sent

Flathead Reservation
Salish & Kootenai Tribes
P.O. Box 278
51383 Highway 93 N
Pablo, MT 59855

Chairman Tribal Council James Steele
Salish & Kootenai Tribes
P.O. Box 278
Pablo, MT 59855

Tribal Historic Preservation Officer Marcia
Pablo
Salish & Kootenai Tribes
PO Box 278
Tribal Preservation Department
Pablo, MT 59855

John Murray, THPO
Blackfeet Tribe
P.O. Box 2809
Browning, MT 59417
406-338-7181
John.Murray@blackfeetplanning.or

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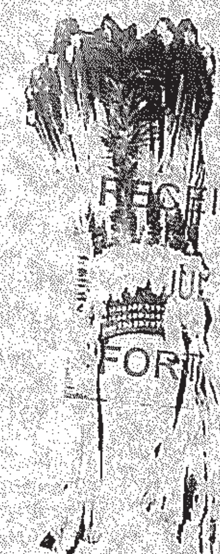

To: Scott Patti
ENSR Phase 2 Manager
ENSR
1601 Prospect Parkway
Fort Collins, CO 80524

RECEIVED ENSR
JUL 2 - 2008
FORT COLLINS

RE: Trans Canada - Keystone XL Pipeline June 27, 2008

The Blackfeet Tribe in Browning, Montana has historic properties that may be affected by this project in North Eastern Montana. The Blackfeet THPO would to be involved in the entire process of the pipeline as per the National Historic Preservation Act

John Murray, THPO

NORTHERN CHEYENNE TRIBE
TRIBAL HISTORIC PRESERVATION OFFICE
P.O. Box 128
Lame Deer, Montana 59043
Tel:(406) 477-6035 Fax: (406) 477-6491

Native American Consultation Response Form

Site Name:	Keystone Pipeline Prj.
TCNS Notification ID Number:	
Site Address: **Fax:** 1(403)-920-2397	TransCanada **Attn:** Sylvia Bedard

Response:

- **REQUEST ADDITIONAL INFORMATION**______(Initials of duly authorized Tribal Officials) I require the following additional information in order to provide a finding of effect for this purpose undertaking:____
- **NO ADVERSE EFFECT** ________(Initials of duly authorized Tribal Official) I believe the proposed project would have no adverse effect on these properties.
- **ADVERSE EFFECT**______(Initials of duly authorized Tribal Official) Based on the information given, I believe the proposed project would cause an adverse effect on these properties.
- **NO INTEREST**________(Initials of duly authorized Tribal Official) I have identified that there are no properties of religious and cultural significance to the Northern Cheyenne in the proposed construction area.
- **NO EFFECT**________(Initials of duly authorized Tribal Official) I have determined that there are no properties of religious and cultural significance to the Northern Cheyenne Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
- **NO COMMENT**________(Initials of duly authorized Tribal Official)
- **Other (Specify)** Tribal Consultation mtg requested

Exception: If archaeological materials or human remains are encountered during construction, the State Historic Preservation Office and applicable Native American Tribes will be notified.

______________________ Signature   7/15/08 Date

Mr. Conrad Fisher, Director N.C.T./THPO Printed Name   1(406) 477-6035 Telephone No.

Table N-4 Access Road Additional Information Overview

Generalized Rule Content	Miles Crossed			Location in Document	AR Comment
	Route A	Route A1A	Route B		
c) Poor or seasonally restricted areas	NA	NA	NA	Attachment P, page 3, Response to SIR-1, Section	The access roads identified will be used for construction only. Construction is not anticipated during periods of limited access; therefore poor access should not be of concern during those periods. Roads will be reclaimed and will not be used during operation of the pipeline.
d) Compatibility or interference with transmission, transportation or communication facilities	NA	NA	NA		Temporary construction and use of access roads is anticipated to cause no impacts to transmission, transportation, or communication facilities.
e) Discussion and supporting documentation of problems or concerns associated with crossing highways or encroachment on highway ROWs through consultation with the Montana Department of Transportation (MDT).	NA	NA	NA	Attachment A, Mapbook 1 Section 4.3.11.2	Access roads do not cross any major thorough fares. Refer to text for MDT consultation.
f) Floodplains	1.8	3.0	0	Attachment A, Mapbook 3	Because access roads will be temporary and will not be used in inclement weather, no adverse impacts to floodplains resulting from use are anticipated.
10. Visual resource and viewer information					See below
a) Scenic quality overlay	See comment			Attachment P, page P-123	Scenic quality rating: C (see visual quality overlay)

Table N-4 Access Road Additional Information Overview

Generalized Rule Content	Miles Crossed			Location in Document	AR Comment
	Route A	Route A1A	Route B		
b) Visual contrast overlay	See comment			Attachment P, page P-123	Visual contrast rating: Visual contrast would be "weak" to "none" at 5 years, after reclamation. (Pipeline visual effects were assessed for KOPs; no overlay was prepared. See visual contrast table for nearest contrast rating).
c) Tabulation of classes of scenic quality	See comment			Attachment P, page P-123	See visual quality table
d) Explanation of any difference with FS visual inventory maps	See comment			-	Forest Service land is not located on any or near any access roads, hence No FS visual inventory.

Table N-4 Access Road Additional Information Overview

Generalized Rule Content	Miles Crossed			Location in Document	AR Comment
	Route A	Route A1A	Route B		
e) Identification of key observation points	See comment			-	The access road originates at a very low traffic volume county road. The nearest residence, a farmstead, is approximately 0.6 mile SSW of the road intersection. Neither would be considered a KOP.
f) Viewer characteristics	See comment			-	Local resident ranchers and farmers; sensitivity expected to be fairly low.
g) Photographs from observation points	See comment			Attachment P, page P-64	See photo B 269.0-160-CR247 for comparable landscape character, although the location of the access road would be flat and nearly level.
h) Viewsheds for key observation points	See comment			-	Areas as defined in 3.7(10)h are not crossed by access road, therefore viewsheds for key observation points are not required.
11. Assessment of visual resource impacts	See comment			-	Visual resource impacts would be minimal and temporary. The road would be reclaimed after construction.
12. Description of existing biological resources and an assessment of impacts to these resources for each alternative and access roads…	NA	NA	NA		

Table N-4 Access Road Additional Information Overview

Generalized Rule Content	Miles Crossed			Location in Document	AR Comment
	Route A	Route A1A	Route B		
a) A list of species and habitats of greatest susceptibility to project-related impacts and an explanation of rationale used to create the list.	NA	NA	NA	Attachment E	See Attachment E for list of special status plants and animals and associated habitats. The four vegetation types were determined from the landcover dataset. This dataset was digitized from 2006 satellite imagery from the National Agriculture Imagery Program (NAIP). The landcover/land use layer was subsequently compared and additional data about cropland added based on Montana Department of Revenues (MDR) agricultural land reappraisal layer. The access roads are pre-existing therefore no additional impacts to these habitat types and associated species are foreseen.

Attachment O

Associated Facilities

Electrical Transmission Lines

Contents

List of Tables

Electrical Transmission Lines

Electrical service requirements for the Project include utilizing existing service lines and the construction of electrical transmission and distribution transmission lines to pump stations and delivery facilities. Because local electrical power providers, not Keystone, will be constructing and operating the electrical transmission lines, the electrical transmission companies will be responsible for obtaining any necessary approvals or authorizations from federal, state, and local governments. While the permitting process for the electrical facilities is an independent process from the pipeline ROW approval process, the construction and operation of these transmission lines are considered connected actions under NEPA and MEPA and, therefore, are evaluated within this application for the Project. Keystone has requested a clarification from Montana DEQ (MDEQ) with regard to the treatment of the transmission lines, but for the current application filing, Keystone is evaluating the preliminary transmission lines along the preferred route and alternative routes as associated facilities. Associated facilities are described in Circular MFSA-2, Section 3.7(12) and Section 3.8 (1)(v). These sections were used to evaluate potential impacts to resources due to construction and maintenance activities.

Electrical Transmission Line Requirements

New electrical transmission lines (i.e., transmission lines with voltage of 69 kilovolts [kV] or greater) will be constructed to service pump stations along the Project route in Montana. Other electric transmission requirements (e.g., at valve sites) will be supplied by distribution service drops from adjacent distribution transmission lines (i.e., transmission lines with voltage below 69 kV). Each of these distribution service drops will require the installation of approximately one or two poles and a transformer. The length of these distribution service drops typically will be less than 200 feet. Permitting and construction of these transmission lines would be performed by the local power providers. Power providers would restore the work area as required upon completion of the new service drops in accordance with local standards and applicable permits.

Table O-1 provides preliminary details for the new electrical transmission lines associated with the Project pump stations. In conjunction with local power providers, Keystone has identified proposed routing for each transmission line along the preferred pipeline route (Route B). Additionally, Keystone has identified preliminary routes for transmission lines that would service the pump station locations along the alternative pipeline routes (Route A and A1A). Where feasible, the entire length of each of these proposed or preliminary transmission line routes (Routes) has been placed along existing county roads, section lines, or field edges to minimize interference with adjacent agricultural lands. The Routes that link existing transmission lines to each pump station along the preferred ~~route~~ and alternative pipeline ~~R~~routes are illustrated in **Attachment A, Transmission Line, Figure 1**.

Furthermore, criteria from Circular MFSA-2, Sections 3.2, 3.4, and 3.7 were incorporated into power line route analysis that would either avoid, or allow means for mitigation of, adverse impacts to resources outlined in Section 3.7(12) and Section 3.8(1)(v). Avoidance areas and land ownership including national wildlife refuges, state wildlife management areas are described in **Attachment A, Transmission Line, Figure 1**.

Table O-1 Approximate Length of the Proposed Transmission Line Routes in Montana

Pump Station Number	County	Kilovolt	Approximate Length (miles)	Typical Pole/Tower Spacing (feet)
Route A				
PS 09	Phillips	115	62.4	500-600
PS 10	Valley	115	56.1	500-600

Table O-1 Approximate Length of the Proposed Transmission Line Routes in Montana

Pump Station Number	County	Kilovolt	Approximate Length (miles)	Typical Pole/Tower Spacing (feet)
PS 11	Roosevelt	115	33.8	500-600
PS 12	Roosevelt	115	6.0	500-600
Route A1A				
PS 09	Phillips	115	62.4	500-600
PS 10	Valley	115	56.1	500-600
PS 11	Daniels, Roosevelt	115	45.6	500-600
PS 12	Sheridan, Roosevelt	115	65.0	500-600
PS 13	Roosevelt	115	9.5	500-600
Route B				
PS 09	Phillips	115	62.4	500-600
PS 10	Valley/McCone	115	51.0	500-600
PS 11	McCone/Valley	115	12.0	500-600
PS 12	McCone	115	3.3	500-600
PS 13	Prairie	115	13.5	500-600
PS 14	Fallon	115	5.2	500-600
~~PS 15~~	~~Fallon~~	~~115~~	~~42.1~~	~~500-600~~

Electrical Transmission Line Construction

The construction phase for each electrical transmission line will consist of ROW acquisition, ROW clearing, construction, and site restoration and cleanup. The following is a brief summary of the typical steps associated with transmission line construction. Actual transmission line construction procedures will be developed by each transmission provider to address site-specific conditions.

- ROW easements. The electric utilities will obtain any necessary easements.
- ROW clearing. Limited clearing will be required along existing roads in rangelands, grasslands, and croplands. Some trees may require removal to provide adequate clearance between the conductors and underlying vegetation. Trimming to avoid tree removal may be employed in some locations.
- Transmission line construction. The structures will be delivered on flatbed trucks. A mobile crane or picker truck may be needed to install the poles. Holes will be excavated for structure placement, typically with radial arm diggers. The wooden or steel poles will be directly embedded into the ground and anchors may be required at angles and dead ends. Pulling or reeling areas will be needed for installation of the conductor wires. Conductors (wires) will be attached to the structure using porcelain or fiberglass insulators.
- Restoration. After the transmission line structures are in place and the conductors are strung between the structures, the disturbed areas will be restored. The soil in the disturbed areas will be reshaped

and contoured to its original condition. Reseeding will follow landowner requirements. All litter and other remaining materials will be removed from the construction areas and properly disposed.

Affected Environment and Environmental Consequences

This section addresses the resources affected by the construction, operation, and maintenance of the proposed electrical transmission lines associated with the Project. Impacts associated with the electrical distribution line service drops are expected to be minimal and comparable to those associated with supplying electricity to the average home or farm, and are not further addressed. The following analysis assumes that existing access roads will be utilized for construction and maintenance of the Routes. It is also assumed that further review of potential construction and/or improvement of access roads will be conducted by the local power providers.

The proposed and alternative transmission line Routes were evaluated for potential environmental impacts through aerial photo interpretation. Further environmental review of the Routes will be carried out by the local power providers as required by their respective transmission line permitting processes.

Land Ownership

The linear mileage crossed by the power line ~~R~~routes is categorized by surface ownership in **Table O-2**. Land ownership on all of the Routes is primarily private. Routes on Alternatives A and A1A cross Tribal-owned lands, while Routes associated with Alternative B do not cross any Tribal-owned lands. All Routes cross state and federal lands. Land ownership along the Routes is shown in **Attachment A, Transmission Line, Figure 1**.

Table O-2 Ownership of Lands Crossed by Proposed Transmission Line Routes in Montana

Pump Station Number	Ownership (miles)				
	Federal	**State**	**Private**	**Tribal**	**Total**
Route A					
PS 09	28.4~~28.9~~	2.1~~1.5~~	31.9	0.0	62.4~~62.3~~
PS 10	12.4	12.1	31.6	0.0	56.1
PS 11	0.0	0.0	0.0	33.8	33.8
PS 12	1.5	0.0	4.5	0.0	6.0
Total	**~~42.8~~42.3**	**~~13.6~~14.2**	**68.0**	**33.8**	**~~158.2~~158.3**
Route A1A					
PS 09	~~28.9~~28.4	2.1~~1.5~~	31.9	0.0	62.4~~62.3~~
PS 10	12.4	12.1	31.6	0.0	56.1
PS 11	0.0	3.0	4.1	38.5	45.6
PS 12	1.7	2.0	61.2	0.0	~~65.0~~64.9
PS 13	0.0	0.0	9.5	0.0	9.5
Total	**~~43.0~~42.5**	**~~18.6~~19.2**	**138.3**	**38.5**	**238.5**
Route B					
PS 09	28.4	2.1~~1.5~~	31.9	0.0	62.4~~62.3~~

Table O-2 Ownership of Lands Crossed by Proposed Transmission Line Routes in Montana

Pump Station Number	Ownership (miles)				
	Federal	**State**	**Private**	**Tribal**	**Total**
PS 10	~~8.7~~7.9	~~11.9~~12.4	~~30.4~~30.8	0.0	51.0
PS 11	5.9	1.1	5.0	0.0	12.0
PS 12	0.0	0.9	2.4	0.0	3.3
PS 13	0.0	0.0	13.5	0.0	13.5
PS 14	~~0.0~~<0.1	1.0	4.2	0.0	~~5.3~~5.2
~~PS 15~~	~~11.2~~	~~3.0~~	~~27.9~~	~~0.0~~	~~42.1~~
Total	**~~43.5~~43.0**	**~~16.5~~17.0**	**87.4**	**0.0**	**147.4**

[1] Discrepancies in total mileage are due to rounding.

The Tribal land ownership type includes Bureau of Indian Affairs Trust Lands, Turtle Mountain Allotted Lands, as well as private lands on the Fort Peck Indian Reservation. Federal lands are predominantly BLM lands in both the Malta and Miles City Districts, but also include a short crossing of US Fish and Wildlife Service land on Route A1A and a crossing of US Department of Defense/Army Corps of Engineers property on Route B. State-owned land is almost exclusively Montana State Trust Lands.

Land Use

Land use associated with the power line ~~R~~routes would be similar in character to those associated with the Project. The following overview of land use types within the proposed Routes represents information gathered from publicly available literature, federal, state, and local agencies, review of current and aerial photography. The information provides a baseline inventory of land usage occurring within the Routes. Land use is classified as the following:

- Developed: lands used for residential areas as well as industrial and commercial areas. Specifically, these areas contain all, but are not limited to houses, structures, roads, railroads, windbreaks, and cleared ROW;
- Agriculture/cropland: land suitable for or used for the cultivation of crops;
- Grassland/rangeland: land that is occupied by native herbaceous or shrubby vegetation which is grazed by domestic or wild herbivores. Grasslands can be native or improved land;
- Forest land: land consisting of wooded upland forests. This land is dominated by trees and shrubs and includes areas planted with trees for the pulp and/or paper industry;
- Water: rivers, streams, creeks, ponds, lakes, etc.; and
- Wetlands: low-lying areas of land that are saturated with moisture, especially when regarded as the natural habitat of wildlife. These lands include emergent wetlands, scrub/shrub wetlands, and forested wetlands.

Table O-3 Land Use Crossed by the Proposed Transmission Line Routes in Montana

Pump Station Number	Agriculture					Grassland/ Rangeland	Waterbody	Forest	Wetland/ Riparian	Developed	Total
	Dryland Cropland	Piviot Irrigated Crop	Sprinkler Irrigated Crop	Flood Irrigated Crop	Fallow Crop						
Route A											
PS 09	1.2	0.0	0.0	2.9	4.6	51.2	1.7	<0.1	0.1	0.6	~~62.3~~62.4
PS 10	1.6	0.0	0.1	0.8	16.2	31.8	0.4	0.3	0.3	4.6	56.1
PS 11	0.0	0.0	0.0	0.0	9.5	22.7	0.2	0.0	0.0	1.3	33.7
PS 12	0.0	0.0	0.0	0.0	1.0	3.4	0.0	0.0	0.0	1.5	5.9
Total	**2.8**	**0.0**	**0.1**	**3.7**	**31.3**	**109.1**	**2.3**	**0.4~~0.3~~**	**0.4**	**8.0**	**158.1~~158.0~~**
Route A1A											
PS 09	1.2	0.0	0.0	2.9	4.6	51.2	1.7	<0.1	0.1	0.6	~~62.3~~62.4
PS 10	1.6	0.0	0.1	0.8	16.2	31.8	0.4	0.3	0.3	4.6	56.1
PS 11	0.0	0.0	0.0	0.0	23.2	21.3	0.3	0.0	0.0	0.8	45.6
PS 12	1.3	0.0	0.0	0.0	15.3	17.9	0.4	0.1	0.0	29.9	64.9
PS 13	0.1	0.0	0.0	0.0	1.8	4.9	0.0	0.0	0.0	2.7	9.5
Total	**4.2**	**0.0**	**0.1**	**3.7**	**61.1**	**127.1**	**2.8**	**~~0.4~~0.5**	**0.4**	**38.6**	**238.5~~238.4~~**
Route B											
PS 09	1.2	0.0	0.0	2.9	4.6	51.2	1.7	<0.1	0.1	0.6	~~62.3~~62.4
PS 10	1.7	0.0	0.1	0.8	15.~~5~~4	27.7	0.3	0.3	0.3	4.4	51.0~~51.1~~
PS 11	<0.1	0.0	<0.1	0.9	0.8	9.5	0.4	0.2	<0.1	0.2	12.0
PS 12	0.1	0.0	0.0	0.0	1.9	1.1	<0.1	0.0	0.1	0.2	3.4
PS 13	0.0	0.1	0.0	0.9	1.8	9.8	0.3	0.0	0.0	0.5	13.4
PS 14	0.7	0.0	0.0	0.0	0.0	4.2	0.2	0.0	0.0	<0.1	5.2~~5.1~~
~~PS 15~~	~~1.2~~	~~0.0~~	~~0.0~~	~~0.0~~	~~2.1~~	~~36.6~~	~~0.7~~	~~0.0~~	~~0.0~~	~~1.5~~	~~42.1~~
Total	**3.7**	**0.1**	**0.1**	**5.5**	**24.5~~24.6~~**	**103.5**	**2.9**	**~~0.5~~0.6**	**0.5**	**~~5.9~~6.0**	**147.4~~147.3~~**

Note: Discrepancies in totals are due to rounding.

The GIS Land Use layer for the three routes was digitized from 2006 aerial photos. The layer was subsequently compared, and cropland types further attributed based on MDR agricultural land reappraisal layer. MDR layer is in development and no metadata were available for the dataset from the state.

Land use types crossed by the power line Routes are detailed in **Table O-3** in miles. The types of land use are categorized by agricultural land, grassland/rangeland, developed, forest land, wetland/riparian, and waterbody. Specific information on the types of agricultural lands also is included in the table. On Routes A, A1A, and B, the predominant land use type crossed by power lines is grassland/rangeland with cropland as the second most common type.

Impacts on land uses within the power line Routes could result from various project-related construction activities including: establishment of construction yards and staging areas; improving access roads; clearing and excavating tower sites and installing towers; removal of obstructions (e.g., vegetation and trees) along Routes; and installing conductors. Long-term impacts would be similar to those described for the Project and include:

- Temporary loss of agricultural productivity during the construction period;
- Visual impacts associated with the construction ROW, which include removal of existing vegetation, exposure of bare soils, and earthwork and grading scars;
- Visual impacts associated with transmission structure contrast and impacts on "natural" landscapes, or scenic quality impacts;
- Increased noise and dust to nearby residential and commercial areas from transmission line construction activities;
- No trees in ROW; and
- No other structures in ROW.

Vegetation

Vegetation communities crossed by the potential transmission line Routes would be similar to those described for the Project and are summarized in **Table O-4**. Because of the nature of transmission lines, minimal impacts to vegetation communities would be expected, with the exception of wooded areas, where trees and shrubs would be trimmed or cleared. Vegetative types were identified and delineated based on review of literature, internet database resources, aerial photography, and general observations made during field reconnaissance activities. The Routes traverse four vegetation types in the State of Montana. Vegetation types include agriculture, grasslands/rangeland, palustrine emergent/scrub-shrub/forested wetlands, and upland forest.

Transmission line construction would involve both the temporary and permanent alteration of vegetation during ROW preparation and excavation, high traffic activity, and the clearing of shrubs and trees. Vegetation recovery rates are estimated to be 1 to 5 years for herbaceous components, 5 to 15 years for low shrubs, and trees would not be allowed to return. After construction, reclamation of affected lands would be performed by the local power providers in accordance with local standards and associated permits.

Table O-4 Vegetation Types Crossed by the Proposed Transmission Line Routes in Montana

Pump Station Number	Agriculture	Forest	Grassland	Wetland	Total
Route A					
PS 09	8.7	<0.1	51.2	0.1	~~60.0~~60.1
PS 10	18.7	0.3	31.8	0.3	51.1
PS 11	9.5	0.0	22.7	0.0	32.2
PS 12	1.0	0.0	3.4	0.0	4.4
Total	**37.9**	**~~0.3~~0.4**	**109.1**	**0.4**	**~~147.7~~147.8**

Table O-4 Vegetation Types Crossed by the Proposed Transmission Line Routes in Montana

Pump Station Number	Agriculture	Forest	Grassland	Wetland	Total
Route A1A					
PS 09	8.7	<0.1	51.2	0.1	60.1~~60.0~~
PS 10	18.7	0.3	31.8	0.3	51.1
PS 11	23.2	0.0	21.3	0.0	44.5
PS 12	~~16.7~~16.6	0.1	17.9	0.0	34.7
PS 13	1.8	0.0	4.9	0.0	6.7
Total	**69.1**	**~~0.4~~0.5**	**127.1**	**0.4**	**197.0**
Route B					
PS-09	8.7	<0.1	51.2	0.1	~~60.0~~60.1
PS-10	18.0	0.3	27.7	0.3	46.3
PS-11	1.7	0.2	9.5	<0.1	11.4
PS-12	2.0	0.0	1.1	0.1	3.2
PS-13	2.8	0.0	9.8	0.0	12.6
PS-14	0.7	0.0	~~4.3~~4.2	0.0	~~5.0~~4.9
~~PS-15~~	~~3.3~~	~~0.0~~	~~36.6~~	~~0.0~~	~~39.9~~
Total	**33.9**	**~~0.5~~0.6**	**~~103.6~~103.5**	**0.5**	**138.5**

The GIS Land Use layer for the three routes was digitized from 2006 aerial photos. The layer was subsequently compared, and cropland types further attributed based on MDR agricultural land reappraisal layer. MDR layer is in development and no metadata were available for the dataset from the state.

Terrestrial and Aquatic Wildlife

Terrestrial and aquatic wildlife potentially impacted by the transmission line Routes would be similar to those described for the Project and are summarized in **Attachment H** (Special Status Species). **Attachment A, Confidential Transmission Line, Figure 1**, to be filed with MDEQ, details the location of sensitive species affected by the Routes including sage grouse leks and other sensitive species. **Attachment A, Transmission Line, Figure 2**, describes the big-game, fisheries, and avian resources potentially affected by the proposed Routes.

During construction, impacts to terrestrial and aquatic wildlife resources would be similar to those for the Project. The primary potential adverse impacts include direct mortality, habitat loss and fragmentation, disturbance and displacement of individual animals, interference with behavioral activities, and increased public access. Many impacts to habitat associated with sensitive species can be avoided during construction and operation by spanning these habitats therefore, relatively few permanent disturbances to terrestrial or aquatic wildlife would occur.

Transmission line construction could also include the improvement of access roads that may increase access to remote habitat and, therefore, increase hunting and fishing pressures on public properties. As shown in **Table O-2**, the Routes would cross approximately ~~70.3~~60 miles of public lands on Alternative B, ~~51.3~~56.5 miles on Alternative A, and ~~56.6~~61.7 miles on Alternative A1A. These public lands allow access to hunting and fishing. In addition, these associated facilities may provide additional access to the Missouri River, a Class II fishery**.**

Additionally, impacts to avian wildlife would occur related to permanent standing structures and associated facilities. The power line Routes cross rivers and riparian areas that are likely to attract migratory birds including raptors, waterfowl, and whooping cranes. ~~raptors and migratory birds.~~ The new transmission line segments will incrementally increase the collision potential for migrating and foraging bird species (e.g., raptors and migratory birds [APLIC 1994]). However, collision potential typically is dependent on variables such as the line location in relation to high use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design. In addition, distribution lines that are less than 69 kV but greater than 1 kV could pose an electrocution hazard for raptor species attempting to perch on the structure. Configurations less than 1 kV or greater than 69 kV typically do not present an electrocution potential, based on conductor placement and orientation (APLIC 1996).

Spanning wetlands and waterbodies has the potential to increase impacts to migratory birds including raptors, waterfowl, and whooping cranes ~~raptors and migratory birds~~ that likely utilize these habitat locations. Transmission lines associated with PS 12 on Route A1A crosses a diversion canal that supplies, and is included within, Medicine Lake NWR, an area important to waterfowl as described for the project in Section 4.3.4.3. Other prime habitat locations occur in vegetated cover types grassland/rangeland and upland forest.

Potential collision and electrocution impacts to bird species from the Project could be reduced further if electrical service providers agree to implement the following mitigation measures.

- Incorporation of standard, safe designs, as outlined in Suggested Practice for Raptor Protection on Transmission Lines (APLIC 1996), into the design of electrical distribution lines in areas of identified avian concern to prevent electrocution of raptor species attempting to perch on the transmission poles and lines. These measures include, but are not limited to, a 60-inch separation between conductors and/or grounded hardware and recommended use of insulating materials and other applicable measures depending on line configuration (APLIC 1996).
- Incorporation of standard raptor-proofing designs, as outlined in Mitigating Bird Collision with Transmission Lines (APLIC 1994), into the design of the electrical distribution lines to prevent collision to foraging and migrating raptors within the project area, as applicable.

In addition to electrocution and collision impacts, transmission lines may have impacts to grouse species occurring along the route. According to the final management plan and conservation strategies for sage grouse in Montana (MSGWG 2005), "Transmission lines provide additional hunting perches for raptors in otherwise treeless areas. Transmission lines most likely impact grouse near leks, in brood-rearing habitat, and in wintering areas that also support large numbers of wintering raptors."

Geology

Geologic resources found along the power line Routes would be similar in character to those associated with the Project. Generally, the geology consists of gently sloping sedimentary rocks of late Cretaceous to early Tertiary age. Stream erosion has formed dendritic drainage patterns producing moderate to steeply incised valleys. Extensive areas of glacial outwash and Quaternary fluvial deposits are exposed throughout each of the alternative Routes.

Potential issues associated with geology would be due to construction of the transmission lines; no additional impacts would be expected during operation. Issues could include potential hazards associated with seismic activities and landslides. Other hazards may result from construction on Cretaceous shales that contain bentonite beds. The high swelling hazard may cause slope instability during periods of precipitation.

Additionally, impacts would occur due to the upgrading of existing roads. Shales of the Bearpaw and Claggett formations are known to be susceptible to mass wasting and slope failure. The high swelling and high plasticity characteristics of these shales, coupled with their high slaking potential, tend to produce slope failure in moderate to steep terrains. Areas of potential slope failure are shown in **Attachment A, Transmission Line, Figure 3**.

Water Resources

Wetlands and waterbodies crossed by the power line Routes are summarized in **Table O-5**. Wetlands within the Routes were classified into four categories: palustrine emergent wetlands (PEM); palustrine scrub-shrub wetlands (PSS); palustrine forested wetlands (PFO) and riverine/open water. Riverine/open water areas include any ephemeral, intermittent, or perennial stream as well as any ponds, lakes, reservoirs, or stock ponds.

Potential impacts to water resources and wetlands could result from accelerated erosion and sedimentation from the construction and maintenance activities on or adjacent to streams or wetlands. Other potential impacts include water quality degradation, and decreased wetland size, function, or value. In areas where potential impacts to water resources and wetlands are possible, mitigation measures would be expected to be effective in reducing or eliminating potential impacts.

Transmission line construction requires one utility location to be placed approximately 200 feet from the next utility location, therefore avoiding surface features such as streams and wetlands is possible by spanning the feature between two support poles. Therefore, the utility pole locations will be selected to minimize impacts to wetlands. Once transmission lines were in place, impacts would be minimal.

Table O-5 Wetland and Waterbody Types Crossed by Proposed Transmission Line Routes in Montana (miles crossed)

Pump Station Number	Palustrine Emergent	Palustrine Forested	Riverine/ Open Water	Palustrine Scrub-Shrub
NWI Codes	PEM	PFO	ROW	PSS
Route A				
PS 09	0.1	0.0	1.4	0.0
PS 10	0.2	0.0	0.4	0.0
PS 11	0.0	0.0	0.2	0.0
PS 12	0.0	0.0	0.0	0.0
Total Miles	0.3	0.0	2.0	0.0
Route A1A				
PS 09	0.1	0.0	1.4	0.0
PS 10	0.2	0.0	0.4	0.0
PS 11	0.0	0.0	0.3	0.0
PS 12	0.0	0.0	0.4	0.0
PS 13	0.0	0.0	0.0	0.0
Total Miles	0.3	0.0	2.5~~2.9~~	~~0.1~~0.0
Route B				
PS 09	0.1	0.0	1.7	0.0
PS 10	0.1	<0.1	0.3	0.1

Table O-5 Wetland and Waterbody Types Crossed by Proposed Transmission Line Routes in Montana (miles crossed)

Pump Station Number	Palustrine Emergent	Palustrine Forested	Riverine/ Open Water	Palustrine Scrub-Shrub
PS 11	<0.1	0.0	0.4	0.0
PS 12	0.1	0.0	<0.1	0.0
PS 13	0.0	0.0	0.3	0.0
PS 14	0.0	0.0	<0.1	0.0
~~PS 15~~	~~0.0~~	~~0.0~~	~~0.7~~	~~0.0~~
Total Miles	0.3	<0.1	~~2.7~~2.8	0.1

Mileages reflect national vegetation cover (USDA NRCS 2008).

Cumulative Impacts

Cumulative impacts are defined in the CEQ regulations 40 CFR 1508.7 as "…the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency… or person undertakes such other actions." These actions include current and projected area development (e.g., oil and gas); management activities and authorizations on public lands (e.g., rangeland conversion); land use trends; and applicable industrial/infrastructure components (e.g., utility corridors).

The construction of the electrical transmission and distribution transmission lines necessary for the Project will occur during the same timeframe and in the same general area as the Project. Construction activities will be of short duration in any single location. Most transmission lines will be co-located with other ROWs (i.e., roadways, pipeline corridors, and existing transmission lines) or located along field edges or section lines to reduce the overall amount of habitat fragmentation and interference with agricultural operations. The amount of land associated with the transmission line ROWs represents a small fraction of available native vegetation in the region. As a consequence, these transmission lines do not represent a substantial cumulative disturbance to the environment.

Other than the Keystone Pipeline Project, no foreseeable construction projects that overlap in space and time with the transmission lines were identified.

References

Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute/Raptor Research Foundation, Washington, D.C., 128 pp.

____. 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C., 78 pp.

Montana Sage Grouse Work Group (MSGWG). 2005. Management Plan and Conservation Strategies for Sage Grouse in Montana, Section VI. (2005).

Power Lines Less than 10 Miles Long

Based on discussions with MDEQ power lines less than 10 miles long will be considered associated facilities for the purposes of this application. The following tables provide information on the alternative power line routes that meet this criterion.

The previous sections of this Attachment discuss a preferred power line Route for pump stations on all three pipeline route alternatives (A, A1A, & B) in Montana, regardless of length. This section provides information on three alternative power line Routes for the four pump stations with less than 10 miles of power line: PS 12 on Route A; PS 13 on Route A1A; and PS 12 and PS 14 on Route B.

Table O-6 provides data and information to address Circular MFSA-2 requirements in 3.2 and 3.4. Table O-7 provides data and information to address requirements in 3.7.

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.2.1(d)							
a) i. national wilderness areas	0	0	0	0	0	0	Not crossed; no impact
ii. national primitive areas	0	0	0	0	0	0	Not crossed; no impact
iii. national wildlife refuges and ranges	0	0	0	0	0	0	Not crossed; no impact
iv. state wildlife management areas and wildlife habitat protection areas	0	0	0	0	0	0	Not crossed; no impact
v. national parks and monuments	0	0	0	0	0	0	Not crossed; no impact
vi. state parks	0	0	0	0	0	0	Not crossed; no impact
vii. national recreation areas	0	0	0	0	0	0	Not crossed; no impact
viii. corridors of rivers in the national wild and scenic rivers system and rivers eligible for inclusion in the system	0	0	0	0	0	0	Not crossed; no impact
ix. roadless areas of 5,000 acres or greater in size, managed by federal or state agencies to retain their roadless character	0	0	0	0	0	0	Not crossed; no impact
x. rugged topography defined as areas with slopes greater than 30 percent	0	0	0	0	0	0	Not crossed; no impact. Based on nationwide data

Table 0-6   Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xi. specially managed buffer areas surrounding national wilderness areas and national primitive areas.	0	0	0	0	0	0	Not crossed; no impact
Section 3.4(1)							
b) state or federal waterfowl production area	0	0	0	0	0	0	Not crossed; no impact
c) national natural landmarks, natural areas, research natural areas, areas of critical environmental concern, special interest areas, research botanical areas, outstanding natural areas designated by the national park service, the USDA forest service, the Bureau of Land Management, or the State of Montana	0	0	0	0	0	0	Not crossed; no impact
d) designated critical habitat for state or federally listed threatened and endangered species	0	0	0	0	0	0	Not crossed; no impact
e) habitats occupied at least seasonally by resident state or federally listed threatened or endangered species	0	0	0	0	0	0	Not crossed; no impact - based on Montana Natural Heritage Program data request.
f) national historic landmarks, national register historic districts and sites	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
g) national register historic districts and sites nominated to or designated by SHPO	4	3	3	0	1	0	Information in table is provided in number of sites within 1/4 mile of power line alternative.
h) municipal watersheds	0.8	1.1	0.3	0	0	0	All three alternative power line routes for PS 12 on Route A cross municipal watershed. (Miles crossed)
i) streams and rivers listed in Montana department of fish, wildlife and parks river database as being class I or II streams or rivers	0	0	0	0	0	0	Not crossed; no impact
j) Streams listed by DEQ pursuant to 75-5-702, MCA that are not attaining beneficial uses of water.	0	0	0	0	0	0	Not crossed; no impact
k) Highly erodible soils and areas with severe reclamation constraints, defined as soils developed on Cretaceous shales, intrusives, and certain latchstring deposits.	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
l) areas where the presence of the facility would be incompatible with published visual management plans or regulations designed to protect view sheds adopted by federal, state, or local governments.	See Comment			See Comment			The power lines are proposed primarily for VRM Class III and IV areas. They would be single-pole structures with 69kV or 115kV capacity conductors. They would be located in rural areas with grassland and agricultural uses. The visual contrast is judged to be moderate to weak for structural modifications, which would readily comply with VRM objectives for Class III and Class IV areas. All 3 alternatives for the proposed power line to serve Route A - PS 12 would cross into a VRM Class II area for approximately 0.4 to 0.8 mile. This Class II area exists primarily as a corridor along highway U.S. 2. The proposed power line would tie into an existing major transmission line (see photos A 172.7-340 - US2 and A 172.7-360 - US2). The 3 alternatives for this line would all be behind the existing transmission line, as seen from U.S. 2. Consequently, the introduced visual contrast would be similar to existing structures and is deemed to be weak, which would meet the VRM objective for a Class II area.
i. Class II	0.4	0.5	0.8	0	0	0	VRM Class Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. (Miles crossed)
ii. Class III	5.6	6.2	3.5	0	0	0	VRM Class Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. (Miles crossed)
iii. Class IV	0	0.9	3.0	5.8	6.9	6.3	VRM Class Objective: To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. (Miles crossed)

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
m) Winter distribution of elk, deer, moose, pronghorn, mountain goat, and bighorn sheep and areas where they concentrate during severe winters, as identified by the Montana Department of Fish, Wildlife and Parks, the Bureau of Land Management, and the USDA Forest Service.	3.7	3.4	4.7	0	0	0	Reference Section 4.3.4.5 - Impacts similar to those discussed under terrestrial wildlife. Winter distribution of elk, moose, mountain goat, and big horn sheep is not crossed by alternative power lines for PS13 on Route A1A. For deer wintering grounds crossed by power lines for PS 12 on Route A, construction activities would be prohibited within winter range between December 1 and May 15 on BLM lands. Habitat boundaries are coarse; line segments sharing a boundary with habitat were included to be conservative. (Miles crossed)
i. elk	0	0	0	0	0	0	Not crossed; no impact
ii. combined deer	3.7	3.4	4.7	0	0	0	See m) above. (Miles crossed)
iii. mule deer	3.0	3.0	3.0	0	0	0	See m) above. (Miles crossed)
iv. white-tail deer	0.7	0.4	1.7	0	0	0	See m) above. (Miles crossed)
v. moose	0	0	0	0	0	0	Not crossed; no impact
vi. pronghorn	0	0	0	0	0	0	Not crossed; no impact
vii. mountain goat	0	0	0	0	0	0	Not crossed; no impact
viii. bighorn sheep	0	0	0	0	0	0	Not crossed; no impact
n) Major elk summer security areas	0	0	0	0	0	0	Not crossed; no impact
o) Seasonally occupied mountain sheep and mountain goat habitats	0	0	0	0	0	0	Not crossed; no impact
p) Sage and sharp-tailed grouse leks and winter habitats	5.3	2.6	6.3	0	0	0	Reference Section 4.3.4.10 for specific discussion on impacts to lekking birds (pg 4-45) and the terrestrial and aquatic wildlife section of this Attachment (Miles crossed)

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
q) High waterfowl densities (prime waterfowl habitat)	0	0	0	0	0	0	Not crossed; no impact
r) Undeveloped land or water areas with natural features of unusual scientific, educational or recreational significance	0	0	0	0	0	0	Not crossed; no impact
s) Geologic units or formations with a high probability of including paleontological resources	See Comment			See Comment			Ground disturbing activities have the potential to impact paleontological resources if they exist. Refer to Tables 4-38 to 4-40 of the MFSA December filing to see a table summary of resources by pipeline milepost as an indication of what resources may be near power lines.
t) Sites that have religious or heritage significance to Native Americans	See Comment			See Comment			Reference General project statement in Section 4.3.9.2
u) Standing water bodies, including any lake, wetland, marsh or reservoir; and intermittent water bodies and internally drained basins that reach a surface area of 20 acres or more at least 1 year out of 10.	0	0	0	0	0	0	Not crossed; no impact
v) Surface supplies of potable water	0.8	1.1	0.3	0	0	0	All three power line routes for PS 12 on Route A cross this feature. (Miles crossed)
w) Active faults near substations, switchyards, or terminus points	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.4 (7)							
a) Relationship between land uses and economic/social activities	See Comment			See Comment			Compensation for damages to land use and property resulting from power lines will be addressed by third-party power providers.
Section 3.4(8)							
Nature and magnitude of public concerns	See Comment			See Comment			See Section 5.3.1 for overall Project concerns.
Section 3.4(9)							
b) Existing landscape inventory maps	See VRM Classes from 3.4(1)(l)			See VRM Classes from 3.4(1)(l)			See **Attachment A, Figure 4**, Visual Resource Management Areas and power line maps in revised **Attachment O**. See **Attachment F,** pg 19A for communications documenting the lack of BLM landscape inventory classification maps.
c) Overlay of land areas categorized for visual quality	See above			See above			See A**ttachment A** - **Figure 4** and power line maps in revised **Attachment O** to view the overlay of these areas.
d) Overlay of land areas categorized for visual compatibility	See above			See above			See **Attachment A** - **Figure 4** and power line maps in revised **Attachment O** to view the overlay of these areas.

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.2.1(d)							
a) i. national wilderness areas	0	0	0	0	0	0	Not crossed; no impact
ii. national primitive areas	0	0	0	0	0	0	Not crossed; no impact
iii. national wildlife refuges and ranges	0	0	0	0	0	0	Not crossed; no impact
iv. state wildlife management areas and wildlife habitat protection areas	0	0	0	0	0	0	Not crossed; no impact
v. national parks and monuments	0	0	0	0	0	0	Not crossed; no impact
vi. state parks	0	0	0	0	0	0	Not crossed; no impact
vii. national recreation areas	0	0	0	0	0	0	Not crossed; no impact
viii. corridors of rivers in the national wild and scenic rivers system and rivers eligible for inclusion in the system	0	0	0	0	0	0	Not crossed; no impact
ix. roadless areas of 5,000 acres or greater in size, managed by federal or state agencies to retain their roadless character	0	0	0	0	0	0	Not crossed; no impact
x. rugged topography defined as areas with slopes greater than 30 percent	0	0	0	0	0	0	Not crossed; no impact. Based on nationwide data.
xi. specially managed buffer areas surrounding national wilderness areas and national primitive areas.	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.4(1)							
b) state or federal waterfowl production area	0	0	0	0	0	0	Not crossed; no impact
c) national natural landmarks, natural areas, research natural areas, areas of critical environmental concern, special interest areas, research botanical areas, outstanding natural areas designated by the national park service, the USDA forest service, the Bureau of Land Management, or the State of Montana	0	0	0	0	0	0	Not crossed; no impact
d) designated critical habitat for state or federally listed threatened and endangered species	0	0	0	0	0	0	Not crossed; no impact
e) habitats occupied at least seasonally by resident state or federally listed threatened or endangered species	0	0	0	0	0	0	Not crossed; no impact - based on Montana Natural Heritage Program data request.
f) national historic landmarks, national register historic districts and sites	0	0	0	0	0	0	Not crossed; no impact
g) national register historic districts and sites nominated to or designated by SHPO	9	11	9	2	18	23	Information in table is provided in numbers of sites within 1/4 mile of power line alternative.
h) municipal watersheds	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
i) streams and rivers listed in Montana department of fish, wildlife and parks river database as being class I or II streams or rivers	0	0	0	0	0	0	Not crossed; no impact
j) Streams listed by DEQ pursuant to 75-5-702, MCA that are not attaining beneficial uses of water.	1	1	1	0	0	0	PS12 on Route B cross the Redwater River between Hell Creek and Buffalo Springs Creek, which has partial support of aquatic life given nitrogen and phosphorus levels. Neither of the pollutants listed as causes will be affected by construction or operation of the Project. Refer to Section 4.3.5.5 for text regarding general potential impacts. (Number crossed)
k) Highly erodible soils and areas with severe reclamation constraints, defined as soils developed on Cretaceous shales, intrusives, and certain latchstring deposits.	0	0	0	0	0	0	Not crossed; no impact
l) areas where the presence of the facility would be incompatible with published visual management plans or regulations designed to protect view sheds adopted by federal, state, or local governments.	See Comment			See Comment			The power lines are proposed primarily for VRM Class III and IV areas. They would be single-pole structures with 69kV or 115kV capacity conductors. They would be located in rural areas with grassland and agricultural uses. The visual contrast is judged to be moderate to weak for structural modifications, which would readily comply with VRM objectives for Class III and Class IV areas.
i. Class II	0	0	0	0	0	0	VRM Class Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
ii. Class III	3.3	5.0	4.7	2.4	2.2	2.0	VRM Class Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. (Miles crossed)
iii. Class IV	0	0	0	2.9	2.9	3.2	VRM Class Objective: To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. (Miles crossed)
m) Winter distribution of elk, deer, moose, pronghorn, mountain goat, and bighorn sheep and areas where they concentrate during severe winters, as identified by the Montana Department of Fish, Wildlife and Parks, the Bureau of Land Management, and the USDA Forest Service.	0	0	1.1	0	0	0	Reference Section 4.3.4.5 - Impacts similar to those discussed under terrestrial wildlife as well as the terrestrial and aquatic wildlife section of this Attachment. Winter distribution of elk, moose, mountain goat, and big horn sheep is not crossed by power lines. (Miles crossed)
i. elk	0	0	0	0	0	0	Not crossed; no impact
ii. combined deer	0	0	0	0	0	0	Not crossed; no impact
iii. mule deer	0	0	0	0	0	0	Not crossed; no impact
iv. white-tail deer	0	0	0	0	0	0	Not crossed; no impact
v. moose	0	0	0	0	0	0	Not crossed; no impact

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
vi. pronghorn	0	0	1.1	0	0	0	Construction activities would be prohibited within winter range between December 1 and May 15 on BLM lands. Habitat boundaries are coarse; line segments sharing a boundary with habitat were included to be conservative.
vii. mountain goat	0	0	0	0	0	0	Not crossed; no impact
viii. bighorn sheep	0	0	0	0	0	0	Not crossed; no impact
n) Major elk summer security areas	0	0	0	0	0	0	Not crossed; no impact
o) Seasonally occupied mountain sheep and mountain goat habitats	0	0	0	0	0	0	Not crossed; no impact
p) Sage and sharp-tailed grouse leks and winter habitats	0	0	0	5.2	5.1	5.2	Reference Section 4.3.4.10 for specific discussion on impacts to lekking birds (pg. 4-45) as well as the terrestrial and aquatic wildlife section of this Attachment. (Miles crossed)
q) High waterfowl densities (prime waterfowl habitat)	0	0	0	0	0	0	Not crossed; no impact
r) Undeveloped land or water areas with natural features of unusual scientific, educational or recreational significance	0	0	0	0	0	0	Not crossed; no impact
s) Geologic units or formations with a high probability of including paleontological resources	See Comment			See Comment			Ground disturbing activities have the potential to impact paleontological resources if they exist. Refer to Tables 4-38 to 4-40 of the MFSA December filing to see a table summary of resources by pipeline milepost.

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
t) Sites that have religious or heritage significance to Native Americans	See Comment			See Comment			Reference General project statement in Section 4.3.9.2
u) Standing water bodies, including any lake, wetland, marsh or reservoir; and intermittent water bodies and internally drained basins that reach a surface area of 20 acres or more at least 1 year out of 10.	0	0	0	0	0	0	Not crossed; no impact
v) Surface supplies of potable water	0	0	0	0	0	0	Not crossed; no impact
w) Active faults near substations, switchyards, or terminus points	0	0	0	1	1	1	Inferred fault. (Number crossed)
Section 3.4 (7)							
a) Relationship between land uses and economic/social activities	See Comment			See Comment			Compensation for damages to land use and property resulting from power lines will be addressed by third-party power providers.
Section 3.4(8)							
Nature and magnitude of public concerns	See Comment			See Comment			See Section 5.3.1 for overall Project concerns.
Section 3.4(9)							
b) Existing landscape inventory maps	See VRM Classes from 3.4(1)(l)			See VRM Classes from 3.4(1)(l)			See **Attachment A**, **Figure 4**, Visual Resource Management Areas and power line maps in revised **Attachment O**. See **Attachment F**, pg 19A for communications documenting the lack of BLM landscape inventory classification maps.

Table 0-6 Power Line Environmental Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
c) Overlay of land areas categorized for visual quality	See above			See above			See **Attachment A - Figure 4** and power line maps in revised **Attachment O** to view the overlay of these areas.
d) Overlay of land areas categorized for visual compatibility	See above			See above			See **Attachment A - Figure 4** and power line maps in revised Attachment O to view the overlay of these areas.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.7(2-6)							
2. Overlay of land use information							
a) Cities, towns, residential clusters, unincorporated areas	0.5	0.9	0.4	0	0	0	Data provided in miles to nearest populated place (within two miles). 0 is greater than 2 miles.
b) Developed residential, industrial, and commercial areas	0	0.1	0	0	0	0	Data provided in miles to nearest developed area (within two miles). 0 is greater than 2 miles.
c) Designated residential growth areas	0	0	0	0	0	0	Power lines do not cross any designated residential growth areas.
d) Roads and highways	10	5	11	4	8	3	Total number of roads crossed.
Scenic Byways	0	0	0	0	0	0	Scenic byways are an additional designation to roads and are not included in the total in the row above.
State and Secondary Highway	4	2	1	0	0	0	Number crossed.
Local Road/City Street	5	3	10	3	5	3	Number crossed.
Driveway/Service Road	0	0	0	1	3	0	Number crossed.
4x4 trail	1	0	0	0	0	0	Number crossed.
e) Railroads and ROW's	0	0	0	0	0	0	Not crossed; no impact.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
f) Transmission lines 50 kV and larger	1	1	1	1	1	1	Number crossed.
g) Grassland rangeland	3.4	3.4	2.6	3.5	4.8	4.0	All power line alternatives cross some grassland/ rangeland. (Miles crossed)
h) Forested	0	0	0	0	0.1	0	Only alt 1 for PS 13 on Route A1A crosses a small amount of forested land. (Miles crossed)
i) Communication infrastructure	0.9	0.7	0.1	0	0	0	Data provided in miles to nearest communication structure. (within 2 miles)
j) Military installations	1.4	0.5	0.8	0	0	0	Data provided in miles to nearest MT National Guard Facility. (within 2 miles)
k) Agency conservation easements	0	0	0	0	0	0	No agency conservation easements are crossed by the power line routes.
l) Airports and airstrips	0.3	1.1	1.0	0	0	0	Data provided in miles to nearest airport. (within 2 miles)
m) National trails	2.1	2.0	2.1	0	0	0	Data provided in miles to nearest trail. (within 2 miles)
n) Cropland (dry, irrigated, mechanically irrigated)	1.0	3.6	3.3	1.5	1.8	1.9	All power line alternatives cross some cropland. (Miles crossed)
o) Prime or unique farmlands or orchards	0	0.7	0	0	0	0	Only Alt 1 on Route A crosses this feature. (Miles crossed)
p) Permitted mines	0	0	0	0	0	0	Not crossed, no impact

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
q) Platted subdivisions	0	0	0	0	0	0	Not crossed, no impact.
r) Major public buildings	0	0	0	0	0	0	CISDM was used (Montana Critical Structures database)
s) Pipelines 8 inches or greater	0	0	0	0	0	0	Not crossed; no impact.
t) Schools	1.0	1.9	0.7	0	0	0	Data provided in miles to nearest school. (within 2 miles)
u) Ag. Experiment stations	0	0	0	0	0	0	Not crossed; no impact
v) Individual residences	1	4	2	1	1	0	Number of residences within 500 feet of power line.
w) Public concern over structure locations in fence lines and field boundaries	See Comment			See Comment			No concerns specific to power lines have been identified to date.
3. Construction crew size, skill and wage levels	See Comment			See Comment			This will be determined by the local power provider. Lower Yellowstone REA. Generally utilities use journeymen linemen and laborers. Compensation for Journeymen linemen are from $30-$35/hr and laborers are generally $20-$25/hr.
4. Assessment of impacts on agricultural, residential, commercial, industrial, mining, and public land uses	See Comment			See Comment			Please see general discussion in the Land Use section of this Attachment.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
5. Social impacts	See Comment			See Comment			Please see discussion of general Project social impacts in the MFSA application, Chapter 4, Section 4.3.
6. Public attitudes and concerns							
a) concern over social, socioeconomic, tax, land use changes the facility could cause individual resentment and public debate	See Comment			See Comment			No issues specific to power lines have been identified to date. County commissioners are in favor of having the KXL Project pass through their county. They anticipate no social concerns and expect positive social and economic impacts and little or no negative environmental and land use impacts from the Keystone XL Project. County Commissioners in Daniels, Roosevelt and Sheridan counties were favorable to the A-1-A pipeline route.
b) concern about natural environmental features	See Comment			See Comment			Refer to text for overall Project attitudes and concerns, Chapter 5, section 5.3.1.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
c) issues that may divide communities, cause individual resentment and public debate	See Comment			See Comment			No issues specific to power lines have been identified to date. Please see general Project discussion in the MFSA application, Chapter 5, section 5.3.2.
d) concern to landowners & residents in close proximity	See Comment			See Comment			Refer to text for overall Project attitudes and concerns, Chapter 5, section 5.3.1.
3.7 (8 to 19) – Please refer to Table N- for information related to Section 3.7(7)							
8. Earth resource impacts. …an estimate of the mileage of each alternative location crossing each category of mapped information requested below							See quantification below.
a) Overlay of wind and water erosion risk and a discussion of impacts considering soil characteristics, slope, predicted amount of disturbance and climatic conditions							See quantification below.
Severe water erosion potential	2.2	2.2	2.1	1.1	1.7	2.3	Temporary impacts for soils include structure placement pads, access roads, pulling and tensioning areas, turn arounds, and staging areas. Permanent impacts for soil include foundations for poles, and access roads. (Miles

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
							crossed by power line)
Severe wind erosion potential	0	0	0	0	0	0	Not crossed; no impact.
b) Overlay and discussion of mass movement potential	0	0	0	0	0	0	Not crossed; no impact.
c) Overlay and discussion of constraints to reclamation and revegetation	0	0	0	0	0	0	Not crossed; no impact.
9. Engineering of the facility in each alternative location							
a) Location differences relating to the feasibility of expanding the transmission capacity through multiple circuiting or design modifications, ROW width	See Comment			See Comment			No substantial difference between alternative facility locations.
b) a discussion and appropriate drawings of alternative structure types and technologies that would be necessary to address physical constraints, impacts and engineering differences among the alternative facility locations if any.	See Comment			See Comment			No substantial difference between alternative facility locations.
c) Poor or seasonally restricted areas	See Comment			See Comment			Construction is not anticipated during periods of limited access; therefore poor access should not be of

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
							concern during those periods.
d) Compatibility or interference with transmission, transportation or communication facilities	See Comment			See Comment			See **Attachment P**, page P-123, Clarification to 3.7(9)(d).
e) Discussion and supporting documentation of problems or concerns associated with crossing highways or encroachment on highway ROWs through consultation with the Montana Department of Transportation (MDT).	See Comment			See Comment			The State requires a utility occupancy agreement when crossing state highways and secondary paved roads. Counties contacted indicated that no permit is needed if the power line will not be in the road right-of-way. See **Attachment F,** pg 94r-94u for communication records.
f) Floodplains	0	0	0	0	0	0	Not crossed; no Impact
g) Aeronautical hazards/mitigation measures	Big Sky Field Airport is near all the power line alternatives for PS 12. Installing balls on the power line is helpful for liability. Along those power lines file 7460 forms with the FAA for the air obstructions.			none			See **Attachment F,** pg 94v for communication record.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
10. Visual resource and viewer information							
a) Scenic quality overlay	See Below			See Below			An overlay was prepared for the pipeline ROWs (**Attachment P**, Scenic quality overlay); see item 10.c. below for a tabulation of scenic quality for areas outside the pipeline ROWs.
b) Visual contrast overlay	Route A - PS 12: Visual contrast for all Alts. would be moderate to weak for linear structures, with contrast for the preferred alt. slightly greater than for the other 2 alts. because of proximity to MT 16; VRM objectives for Class III & IV areas would be achieved. Contrast in the VRM Class II area to the south would be weak because the P-line would be behind the existing E-W T-line from the U.S. 2 motorists' perspective; the Class II VRM objectives would be met in this area as well.			Route A1A - PS 13: Visual contrast for all Alts. would be moderate to weak for linear structures; VRM class objectives would be met for Class IV, which encompasses the entire study area.			
c) Tabulation of classes of scenic quality	B=0.0; C=6.0	B=0.0; C=7.6	B=0.0; C=7.3	B=0.0; C=5.8	B=0.0; C=6.9	B=0.0; C=6.3	
d) Explanation of any difference with FS visual inventory maps	See Comment			See Comment			Forest Service land is not located on any or near any power line, hence no FS visual inventory.
e) Identification of key observation points	4 homes plus the NE edge of Culbertson town.	11 homes	12 homes plus the N edge of Culbertson town.	4 homes	6 homes	2 homes	Number of residences within 0.75 mi. is itemized to the left. **Route A - PS 12**: Preferred Alt. parallels MT 16 within 0.75 mi. for its entire length; Alt. 1 is within 0.75 mi. of MT 16 for approximately 3 miles; Alt. 2

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
							is within 0.75 mi. for approximately 2 miles; the southern tips of all 3 alternatives are within 0.75 mi. of U.S. 2. **Route A1A - PS 13**: There are no major roads or highways within 0.75 mi. of any of the 3 alternatives.
f) Viewer characteristics	Route A - PS 12: Viewers would include motorists on MT 16 and, to a lesser degree, U.S. 2; small town residents; and farmers/ranchers.			Route A1A - PS 13: Ranchers/farmers and oil & gas workers.			
g) Photographs from observation points	Route A - PS 12: See photos for M.P. 156.6, in particular A 156.6-110 - MT16 illustrates the site of Pump Station 13.			Route A1A - P.S. 13: Representative photos not available.			
h) Viewsheds for key observation points	See Comment			See Comment			Areas as defined in 3.7(10)h are not crossed by power line alternatives, therefore viewsheds for key observation points are not required.
11. Assessment of visual resource impacts	Route A - PS 12: All 3 alternatives would meet the VRM objectives for VRM Class II, III and IV areas; Alt. 1 has the least residential exposure; Alt. 2 has the least highway exposure.			Route A1A - PS 13: All 3 alternatives would readily meet the applicable VRM Class IV objectives.			
12. Description of existing biological resources and an assessment of impacts to these resources for each alternative…	See Comment			See Comment			Existing biological resources potentially impacted by the power line routes are generally discussed in the vegetation, terrestrial and aquatic wildlife, and water resources section of this Attachment.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
a) A list of species and habitats of greatest susceptibility to project-related impacts and an explanation of rationale used to create the list.	See Comment			See Comment			See **Attachment E** for list of special status plants and animals and associated habitats. The four vegetation types were determined from the landcover dataset. This dataset was digitized from 2006 satellite imagery from the National Agriculture Imagery Program (NAIP). The landcover/land use layer was subsequently compared and additional data added on cropland types when compared with Montana Department of Revenue (MDOR) agricultural land reappraisal layer.
b) An evaluation of impacts to each species or habitat listed in (a) including:	See Comment			See Comment			Refer to text in **Attachment E**
i. National wildlife refuges and ranges	0	0	0	0	0	0	Power lines do not cross any wildlife refuges or ranges.
ii. State wildlife management areas and wildlife habitat protection areas	0	0	0	0	0	0	Project power lines do not cross any State wildlife management areas or habitat protection areas.
iii. National recreation areas	0	0	0	0	0	0	Power lines will not cross any National Recreation Areas.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
vi. Corridors of rivers in the National Wild and Scenic rivers system and rivers eligible for inclusion in the system.	0	0	0	0	0	0	Power lines do not cross any corridors of rivers in the National Wild and Scenic rivers system and rivers eligible for inclusion in the system.
vii. Managed roadless areas greater than 5,000 acres in size	0	0	0	0	0	0	Power lines do not cross any managed roadless areas greater than 5,000 acres in size.
ix. Unique habitats and natural areas designated by the National Park Services, USDA Forest Service, BLM, or the State of Montana as national natural landmarks, natural areas, research natural areas, areas of critical environmental concerns, special interest areas	0	0	0	0	0	0	Power lines do not cross any natural areas designated by the National Park Services, USDA Forest Service, BLM, or the State of Montana as national natural landmarks, natural areas, research natural areas, areas of critical environmental concerns, and special interest areas.
x. Designated critical habitat for Threatened and Endangered species	0	0	0	0	0	0	Power lines do not cross any designated critical habitat for Threatened and Endangered species.
xi. Streams and rivers listed as having fisheries value class of I or II by FWP	0	0	0	0	0	0	Power lines do not cross any streams or rivers listed as having fisheries values class of I or II by FWP.
xii. Agricultural experiment stations	0	0	0	0	0	0	Power lines do not cross any agricultural experiment stations.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xiii. Habitats occupied at least seasonally by resident state or federally listed threatened or endangered species.	0	0	0	0	0	0	Power lines do not cross habitats occupied at least seasonally by resident state or federally listed species.
xiv. Specially managed buffer areas around wilderness	0	0	0	0	0	0	Power lines do not cross any wilderness areas.
xv. Winter distribution of elk, deer, moose, pronghorn, mountain goat, and bighorn sheep, and areas where they concentrate during severe winters based on consultation.	3.7	3.4	4.7	0	0	0	See below. (Miles crossed)
White-Tail deer	0.7	0.4	1.7	0	0	0	All of the power line alternatives on Route A PS 12 cross land used by deer species during the winter. Impacts to big game would be short-term similar to those discussed in section 4.3.4.5 and the terrestrial and aquatic wildlife section of this Attachment. Construction activities would be prohibited within winter range between Dec 1 and May 15 on BLM lands. Habitat boundaries are coarse; line segments sharing a boundary with habitat were included to be conservative.
Mule Deer	3.0	3.0	3.0	0	0	0	
Pronghorn	0	0	0	0	0	0	
Elk	0	0	0	0	0	0	
Moose	0	0	0	0	0	0	
Mountain Goat	0	0	0	0	0	0	
Bighorn Sheep	0	0	0	0	0	0	

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xvi. Major elk summer security areas	0	0	0	0	0	0	No major elk habitat is located along any power line.
xvii. Mountain goat and big horn sheep seasonal habitat	0	0	0	0	0	0	There is no mountain goat or big horn sheep habitat crossed by any power line.
xviii. Sage and sharp-tailed grouse leks and winter distribution	5.3	2.6	6.3	0	0	0	Lek areas include the actual lek site plus a four mile buffer for greater sage grouse and a two mile buffer for sharp-tailed grouse. Route A - PS 12 crosses approximately 2.6 to 6.3 miles of sharp-tailed lek areas. This analysis includes breeding areas only. Sage-grouse winter habitat is not available from MFWP. (Miles crossed)
Sage Grouse General Distribution	0	0	0	0	0	0	Not crossed; no impact
Sage Grouse Lek Area	0	0	0	0	0	0	Not crossed; no impact
Sage Grouse Leks within 4 Miles	0	0	0	0	0	0	None
Sharp-Tail Grouse General Distribution	2.0	4.1	2.5	5.8	6.9	6.3	All power line routes cross sharp-tailed grouse general distribution. According to the MFWP (personal communication, 5/28/2008), the sharp-tailed grouse is not listed as a species of concern, but they are lekking birds that have important breeding lek locations that need protection.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Sharp-tail Grouse Lek Area	5.3	2.6	6.3	0	0	0	Route A - PS 12 crosses within approximately 2.6 to 6.3 miles of sharp-tailed lek areas. This includes the actual lek site plus a two mile buffer for nesting activities. The BLM has a no surface occupancy stipulations within 1/4 mile of sharp-tail leks. MFWP recommends no surface use or disturbance within two miles of a lek from March 1 - June 15. Because the sharp-tailed grouse in not listed as a species of concern, MFWP would recommend that any disturbance to lek sites be done outside the breeding time (mid March - mid May).
Sharp-tail Grouse Leks within 4 Miles	4	1	6	0	0	0	Route A - PS 12 preferred route is within 2 miles of 4 historic sharp-tailed grouse lek sites. Alternate 1 is within 2 miles of 1 historic sharp-tailed grouse lek site. Alternative 2 is within 2 miles of 6 historic sharp-tailed grouse lek sites. (Number within 4 miles)
xix. High waterfowl population densities	0	0	0	0	0	0	Not crossed; no impact

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xx. Any undeveloped land or water areas that contain known natural features of unusual scientific educational or recreational significance	0	0	0	0	0	0	Power lines do not cross areas that contain undeveloped water or areas that contain known natural features of unusual scientific educational or recreational significance.
xxi. Mature riparian forests	0	0	0	0	0	0	Power lines do not cross any mature riparian forests.
xxii. Nesting colonies	0	0	0	0	0	0	Power lines do not impact known nesting colonies of any of the species listed below.
American White Pelican	0	0	0	0	0	0	Power lines do not impact known nesting colonies of American White Pelican.
Caspian Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Caspian Tern.
Common Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Common Tern.
Forster's Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Forster'sof Forster's Tern.
Franklin's Gull	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Franklin's Gull.
xviii. Habitats occupied	0	0	0	0	0	0	No critical habitat is crossed

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
at least seasonally and critical to species listed as "species of special concern or interest" by the FWP, or species listed or considered candidates for listing by the U.S. Fish and Wildlife service as threatened or endangered.							by any of the power line Alternative Routes.
xix. Locations of known nests of raptorial birds within ½ mile of alternative facility locations.	1 historic nest location			no historic nest locations			The Montana Natural Heritage Program Wildlife Tracker database (MTNHP 2009) was accessed as recommended by MFWP to identify historic nest sites near the proposed Project power line locations. According to the data search, one historic raptor nest site was located near the Route A, pump station 12.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
c) A general assessment of impacts from hunting and fishing pressure if increased access to secure habitats would likely occur in the general vicinity of each alternative line location because new access roads would be constructed outside the impact zone	See Comment			See Comment			Currently, public lands are experiencing an increase in hunting. The construction of the power lines would not affect current hunting and fishing status. Hunting and fishing pressures on private lands would be site-specific and depend on whether the landowners allowed these activities on their property. A permanent access road on private lands that allowed hunting would increase hunting and/or fishing pressures in that area.
d) A description of the method used to evaluate impacts to wildlife, fisheries, and vegetation.	See Comment			See Comment			Refer to text in Chapter 4, Section 4.3.4.6
e) For impacts described in (b) and (c), a description of mitigating measures that could be implemented to reduce significant impacts and the cost of such measures.	See Comment			See Comment			Mitigation measures that agencies will require for the Project have not been defined. This will be addressed by the third-party power providers.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
f) Documentation that agencies with management responsibility for any affected biological resources have been consulted concerning impacts and mitigation and a description and evaluation of the mitigation measures suggested by these agencies.	See Comment			See Comment			Mitigation measures will be solicited from management agencies when a preferred power line route is selected.
13. Cultural, historical, and paleontological data							
a) Results of an on-the-ground survey and documentation	See Comment			See Comment			File search only.
b) Consultation with State Historic Preservation Office (SHPO) relative to eligibility for listing on the national register	See Comment			See Comment			Refer to text in Chapter 4, Section 4.3.9.2 - This will occur through 106 process by DOS.
14. Assessment of impacts to cultural, historical, and paleontological resources.							

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
a) For each of the following potentially affected cultural resource properties or sites and for any properties or sites identified by (13)(b) which may be eligible for listing on the national register, a discussion of whether the facility would affect the	• 6 historic sites; 4 historic sites listed as ineligible for the NRHP, and remaining 2 considered undetermined. • 1 prehistoric site; listed as eligible for NRHP listing.			• 5 unknown or no indication of age sites; listed as undetermined for NRHP status.			
i. National historic landmarks, and national register historic districts and sites;	See Comment			See Comment			There are no national historic landmarks, NRH Districts or sites.
ii. National register historic districts and sites nominated to or designated by SHPO;	4	3	3	0	1	0	Information in table is provided in numbers of sites within 1/4 mile of power line alternative.
b) A discussion of whether the proposed facility would affect the qualities of:							
i. Areas with geologic units or formations that show a high probability of including significant paleontological resources; and	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.8.2

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
ii. Sites that have, or may have, religious or heritage significance and value to Native Americans as identified by Section 3.4(1)(t).		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.9.2. This will occur through 106 process by DOS.
c) Identification of special construction methods and topographic screening that could eliminate or reduce impacts, and a discussion of the likelihood of success of each measure in reducing impact.		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.9.2.
d) Documentation that consultation has occurred with SHPO, affected state and federal agencies, and tribes regarding any affected cultural sites, impacts, and mitigation.		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.9.2. This will occur through 106 process by DOS.
15. Baseline data for recreation areas and sites		See Comment			See Comment		
a) Maps depicting recreation areas and sites.		See Comment			See Comment		Recreation sites are not crossed.
b) Description of each site or area, how area is used, and use level estimates		See Comment			See Comment		Recreation sites are not crossed.
c) List of possible recreation areas & sites		See Comment			See Comment		Recreation sites are not crossed.

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
16. Assessment of impacts on recreation areas and sites							
a) Change in access	See Comment			See Comment			Recreation sites are not crossed.
b) Aesthetic impacts on sites	See Comment			See Comment			Recreation sites are not crossed.
c) Location of facility relative to site	See Comment			See Comment			Recreation sites are not crossed.
d) Description of how activities and experiences could change	See Comment			See Comment			Recreation sites are not crossed, see information in 3.7(12)(b) for potential hunting impacts.
e) Description of regional supply of recreational opportunities for affected sites.	See Comment			See Comment			Recreation sites are not crossed.
f) Documentation of consultation	See Comment			See Comment			Recreation sites are not crossed.
17. Overlay showing names of perennial streams crossed and WQ classification	See Comment			See Comment			See power line maps.
18. Assessment of impacts to surface and ground water	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.5
Impact to water users	See Comment			See Comment			Power lines do not cross areas that would result in impacts to water users.
Impact to hydrology and	See Comment			See Comment			Power lines can span

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
stream banks							streams where necessary. No impacts are anticipated.
Impacts to municipal watershed		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.5
Impacts to potable water		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.5
Impacts to streams		See Comment			See Comment		Power lines can span streams where necessary. No impacts are anticipated.
19. Noise, radio, and television impacts		See Comment			See Comment		During construction, power providers will be required to comply with any local construction noise requirements. Areas directly adjacent to construction will experience a short-term inconvenience from construction equipment noise for a period of 1 to 2 weeks for a section of power line; for a substation 3-6 months Also see **Attachment P**.
a) for 230 kV (noise)		See Comment			See Comment		<230kV, NA
b) for 230 kV (overlay)		See Comment			See Comment		<230kV, NA
c) Induced currents		See Comment			See Comment		**Attachment P**, response to SIR 1.42

Table 0-7 Power Line Additional Information Overview – Routes A and A1A

	Route A – PS 12			Route A1A – PS 13			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
d) Noise impacts		See Comment			See Comment		During construction, Power providers will be required to comply with any local construction noise requirements. Areas directly adjacent to construction will experience a short-term inconvenience from construction equipment noise for a period of 1 week to 30 days
e) Potential impacts of electrical and magnetic fields		See Comment			See Comment		**Attachment P**, response to SIR 1.42
f) Radio and TV impacts		See Comment			See Comment		**Attachment P**, response to SIR 1.42
g) mitigation to reduce noise, EMF, induced currents, and interference with communication facilities.		See Comment			See Comment		Chapter 4, Section 4.3.13

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Section 3.7(2-6)							
2. Overlay of land use information							
a) Cities, towns, residential clusters, unincorporated areas	0	1.1	0	0	0	0	Data provided in miles to nearest populated place (within 2 miles) 0 is greater than 2 miles.
b) Developed residential, industrial, and commercial areas	0.1	0.2	0.2	0	0	0	Data provided in miles to nearest developed area (within two miles). 0 is greater than 2 miles.
c) Designated residential growth areas	0	0	0	0	0	0	Power lines do not cross any designated residential growth areas.
d) Roads and highways	3	5	5	8	12	10	Total number of roads crossed.
Scenic Byways	0	2	0	0	0	0	Scenic byways are an additional designation to roads and are not included in the total in the row above.
State and Secondary Highway	2	3	2	0	0	0	Number crossed.
Local Road/City Street	1	2	3	6	8	6	Number crossed.
Driveway/Service Road	0	0	0	2	4	4	Number crossed.
4x4 trail	0	0	0	0	0	0	Number crossed.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
e) Railroads and ROW's	1	1	1	0	0	0	NSF railroad is crossed by all three alternative routes for PS 12 on Route B. (Number crossed)
f) Transmission lines 50 kV and larger	2	2	3	1	1	1	(Number crossed).
g) Grassland rangeland	1.1	2.7	1.4	4.3	3.8	4.8	All power line alternatives cross some grassland/ rangeland. (Miles crossed)
h) Forested	0	0	0	0	0	0	Not crossed; no impact.
i) Communication infrastructure	1.9	1.0	0	1.4	1.4	1.4	Data provided in miles to nearest communication structure. (within 2 miles)
j) Military installations	0	0	0	0	0	0	Data provided in miles to nearest MT National Guard Facility. (within 2 miles) None.
k) Agency conservation easements	0	0	0	0	0	0	No agency conservation easements are crossed by the power line routes.
l) Airports and airstrips	1.0	0.5	1.8	0	0	0	Data provided in miles to nearest airport. (within 2 miles)
m) National trails	0	0	0	0	0	0	Data provided in miles to nearest trail. (within 2 miles)
n) Cropland (dry, irrigated, mechanically irrigated)	2.0	1.7	2.7	0.7	1.1	0.3	All power line alternatives cross some cropland. (Miles crossed)

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
o) Prime or unique farmlands or orchards	0.9	0.2	1.7	0.3	0.3	0.3	All power line alternatives cross this feature. (Miles crossed)
p) Permitted mines	0	0	0	0	0	0	Not crossed, no impact
q) Platted subdivisions	0	0	0	0	0	0	Not crossed, no impact
r) Major public buildings	0	0	0	0	0	0	CISDM was used (Montana Critical Structures database)
s) Pipelines 8 inches or greater	0	0	0	1	1	1	Unknown size. (number crossed)
t) Schools	0	1.8	0	0	0	0	Data provided in miles to nearest school. (within 2 miles)
u) Ag. Experiment stations	0	0	0	0	0	0	Not crossed; no impact
v) Individual residences	0	1	2	0	0	0	Number of residences within 500 feet of power line.
w) Public concern over structure locations in fence lines and field boundaries	See Comment			See Comment			No concerns specific to power lines have been identified to date.
3. Construction crew size, skill and wage levels	See Comment			See Comment			This will be determined by the local power provider. On Route B, PS 12 would be constructed by McCone Electric Coop; and PS 14 by Montana-Dakota Utilities Company. Generally utilities use journeymen linemen and

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
							laborers. Compensation for Journeymen linemen are from \$30-\$35/hr and laborers are generally \$20-\$25/hr.
4. Assessment of impacts on agricultural, residential, commercial, industrial, mining, and public land uses	See Comment			See Comment			Please see general discussion in the Land Use section of this Attachment.
5. Social impacts	See Comment			See Comment			Please see general Project social impact in the MFSA application, Chapter 4, Section 4.3.
6. Public attitudes and concerns							
a) concern over social, socioeconomic, tax, land use changes the facility could cause individual resentment and public debate	See Comment			See Comment			No issues specific to power lines have been identified to date. All county commissioners are in favor of having the KXL Project pass through their county. They anticipate no social concerns and expect positive social and economic impacts and little or no negative environmental and land use impacts from the Keystone XL Project. County Commissioners in Daniels, Roosevelt and Sheridan counties were favorable to the A-1-A alternate route.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
b) concern about natural environmental features	See Comment			See Comment			Refer to text for overall Project attitudes and concerns, Chapter 5, section 5.3.1.
c) issues that may divide communities, cause individual resentment and public debate	See Comment			See Comment			No issues specific to power lines have been identified to date. Please see general Project discussion in the MFSA application, Chapter 5, section 5.3.2.
d) concern to landowners & residents in close proximity	See Comment			See Comment			Refer to text for overall Project attitudes and concerns, Chapter 5, section 5.3.1.
3.7 (8 to 19) – Please refer to Table N- for information related to Section 3.7(7)							
8. Earth resource impacts. an estimate of the mileage of each alternative location crossing each category of mapped information requested below							See quantification below.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
a) Overlay of wind and water erosion risk and a discussion of impacts considering soil characteristics, slope, predicted amount of disturbance and climatic conditions	See Comment			See Comment			See quantification below.
Severe water erosion potential	0.0	0.5	0.0	0.3	0.4	0.6	Temporary impacts for soils include structure placement pads, access roads, pulling and tensioning areas, turn arounds, and staging areas. Permanent impacts for soil include foundations for poles, and access roads. (Miles crossed by power line)
Severe wind erosion potential	0	0	0	0	0	0	Not crossed; no impact.
b) Overlay and discussion of mass movement potential	0	0	0	0	0	0	Not crossed; no impact.
c) Overlay and discussion of constraints to reclamation and revegetation	0	0	0	0	0	0	Not crossed; no impact.
9. Engineering of the facility in each alternative location							

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
a) Location differences relating to the feasibility of expanding the transmission capacity through multiple circuiting or design modifications, ROW width	See Comment			See Comment			No substantial difference between alternative facility locations.
b) a discussion and appropriate drawings of alternative structure types and technologies that would be necessary to address physical constraints, impacts and engineering differences among the alternative facility locations if any.	See Comment			See Comment			No substantial difference between alternative facility locations.
c) Poor or seasonally restricted areas	See Comment			See Comment			Construction is not anticipated during periods of limited access; therefore poor access should not be of concern during those periods.
d) Compatibility or interference with transmission, transportation or communication facilities	See Comment			See Comment			See **Attachment P**, page P-123, Clarification to 3.7(9)(d).
e) Discussion and supporting documentation of problems or concerns	See Comment			See Comment			The State requires a utility occupancy agreement when crossing state highways and secondary paved roads.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
associated with crossing highways or encroachment on highway ROWs through consultation with the Montana Department of Transportation (MDT).							Counties contacted indicated that no permit is needed if the power line will not be in the road right-of-way. See **Attachment F,** pgs 94r-94u for communication records.
f) Floodplains	0	0	0	0	0	0	Not crossed; no Impact
g) Aeronautical hazards/mitigation measures	Circle Town County Airport is near all the power line alternatives for this PS. Installing balls on the power line is helpful for liability. Need to maintain a 34:1 slope off of runway 12, which begins 200' level from the runway end, and extends over a section of the railroad tracks. Along those power lines file 7460 forms with the FAA for the air obstructions.			none			See **Attachment F,** pg 94v for communication record.
10. Visual resource and viewer information							
a) Scenic quality overlay	See Below			See Below			An overlay was prepared for the pipeline ROWs (**Attachment P**, Scenic quality overlay); see item 10.c. below for a tabulation of scenic quality for areas outside the pipeline ROWs.
b) Visual contrast overlay	Route B - PS 12: Visual contrast for all Alts. would be moderate to weak for linear structures, which would meet the VRM objectives for Class III areas.			Route B - PS 14: Visual contrast for all Alts. would be weak for linear structures, especially through the oil & gas field; VRM objectives for Class III & IV areas would be achieved.			

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
c) Tabulation of classes of scenic quality	B=0.9; C=2.4	B=0.6; C=4.4	B=1.2; C=3.5	B=0.4; C=4.9	B=0.4; C=4.7	B=0.4; C=4.8	
d) Explanation of any difference with FS visual inventory maps	See Comment			See Comment			Forest Service land is not located on any or near any power line, hence no FS visual inventory.
e) Identification of key observation points	2 homes	13 homes	5 homes	0 homes	0 homes	1 home	Number of residences within 0.75 mi. is itemized to the left. **Route B - PS 12**: Preferred Alt. has 2 highway crossings and 0.6 mile parallel to the highway; Alt. 1 has 3 highway crossings and 1.5 miles parallel to highways; Alt. 2 has 2 highway crossing and no parallel miles. **Route B - PS 14**: All 3 alternatives have a single very similar crossing of Anticline Road.
f) Viewer characteristics	Route B – PS12: Small town residential and motorists on Highways 13, 200, and 200S			Route B – PS14: Oil and gas workers, randers, and motorists on anticline road.			
g) Photographs from observation points	Route B - PS 12: See photos for MPs 145.9, 146.9, and 147.8.			Route B - PS 14: Representative photos not available.			
h) Viewsheds for key observation points	See Comment			See Comment			Areas as defined in 3.7(10)h are not crossed by power line alternatives, therefore viewsheds for key observation points are not required.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
11. Assessment of visual resource impacts	Route B - PS 12: All three alternatives would meet VRM Class III objectives. Alt. 1 has the greatest exposure to residences and state highway motorists with 3 highway crossings and 1.5 miles parallel to highways; the Preferred Alt. has the fewest nearby residences, 2 highway crossings and 0.6 mile parallel to the highway; Alt. 2 has 2 highway crossing and no parallel miles.			Route B - PS 14: All three alternatives would meet VRM Class III and IV objectives; there are very few residences nearby and the road exposure is essentially the same for all 3 alternatives.			
12. Description of existing biological resources and an assessment of impacts to these resources for each alternative…	See Comment			See Comment			Existing biological resources potentially impacted by the power line routes are generally discussed in the vegetation, terrestrial and aquatic wildlife, and water resources section of this Attachment.
a) A list of species and habitats of greatest susceptibility to project-related impacts and an explanation of rationale used to create the list.	See Comment			See Comment			See **Attachment E** for list of special status plants and animals and associated habitats. The four vegetation types were determined from the landcover dataset. This dataset was digitized from 2006 satellite imagery from the National Agriculture Imagery Program (NAIP). The landcover/land use layer was subsequently compared and additional data added on cropland types when compared with Montana Department of Revenue (MDOR) agricultural land reappraisal layer.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
b) An evaluation of impacts to each species or habitat listed in (a) including:	See Comment			See Comment			Refer to text in **Attachment E**
i. National wildlife refuges and ranges	0	0	0	0	0	0	Power lines do not cross any wildlife refuges or ranges.
ii. State wildlife management areas and wildlife habitat protection areas	0	0	0	0	0	0	Project power lines do not cross any State wildlife management areas or habitat protection areas.
iii. National recreation areas	0	0	0	0	0	0	Power lines will not cross any National Recreation Areas.
vi. Corridors of rivers in the National Wild and Scenic rivers system and rivers eligible for inclusion in the system.	0	0	0	0	0	0	Power lines do not cross any corridors of rivers in the National Wild and Scenic rivers system and rivers eligible for inclusion in the system.
vii. Managed roadless areas greater than 5,000 acres in size	0	0	0	0	0	0	Power lines do not cross any managed roadless areas greater than 5,000 acres in size.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
ix. Unique habitats and natural areas designated by the National Park Services, USDA Forest Service, BLM, or the State of Montana as national natural landmarks, natural areas, research natural areas, areas of critical environmental concerns, special interest areas	0	0	0	0	0	0	Power lines do not cross any natural areas designated by the National Park Services, USDA Forest Service, BLM, or the State of Montana as national natural landmarks, natural areas, research natural areas, areas of critical environmental concerns, and special interest areas.
x. Designated critical habitat for Threatened and Endangered species	0	0	0	0	0	0	Power lines do not cross any designated critical habitat for Threatened and Endangered species.
xi. Streams and rivers listed as having fisheries value class of I or II by FWP	0	0	0	0	0	0	Power lines do not cross any streams or rivers listed as having fisheries values class of I or II by FWP.
xii. Agricultural experiment stations	0	0	0	0	0	0	Power lines do not cross any agricultural experiment stations.
xiii. Habitats occupied at least seasonally by resident state or federally listed threatened or endangered species.	0	0	0	0	0	0	Power lines do not cross habitats occupied at least seasonally by resident state or federally listed species.
xiv. Specially managed buffer areas around wilderness	0	0	0	0	0	0	Power lines do not cross any wilderness areas.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xv. Winter distribution of elk, deer, moose, pronghorn, mountain goat, and bighorn sheep, and areas where they concentrate during severe winters based on consultation.	0	0	1.1	0	0	0	See below. (Miles crossed)
White-Tail deer	0	0	0	0	0	0	Alternative 2 on Route B Pump Station 12 crosses land used by pronghorn in the winter. Impacts to big game would be short-term similar to those discussed in section 4.3.4.5 and the terrestrial and aquatic wildlife section of this Attachment. Construction activities would be prohibited within winter range between December 1 and May 15 on BLM lands. Habitat boundaries are coarse; line segments sharing a boundary with habitat were included to be conservative.
Mule Deer	0	0	0	0	0	0	
Pronghorn	0	0	1.1	0	0	0	
Elk	0	0	0	0	0	0	
Moose	0	0	0	0	0	0	
Mountain Goat	0	0	0	0	0	0	
Bighorn Sheep	0	0	0	0	0	0	
xvi. Major elk summer security areas	0	0	0	0	0	0	No major elk habitat is located along any power line.
xvii. Mountain goat and big horn sheep seasonal habitat	0	0	0	0	0	0	There is no mountain goat or big horn sheep habitat crossed by any power line.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xviii. Sage and sharp-tailed grouse leks and winter distribution	0	0	0	5.2	5.1	5.2	Lek areas include the actual lek site plus a four mile buffer for greater sage grouse and a two mile buffer for sharp-tailed grouse. Route B - 14 crosses approximately 5 miles of greater sage grouse lek areas. This analysis includes breeding areas only. Sage-grouse winter habitat is not available from MFWP. (Miles crossed)
Sage Grouse General Distribution	1.4	3.2	2.1	5.2	5.1	5.2	Route B - PS 12 and 14 cross general sage grouse distribution. MFWP recommends constructing after June 14 to avoid the breeding and nesting period of sage grouse. Additionally, the BLM recommends no surface occupancy within 2 miles of a lek site. MFWP recommends no surface occupancy within 4 miles of a lek site. (Miles crossed)
Sage Grouse Lek Area	0	0	0	5.2	5.1	5.2	Route B - 14 crosses approximately 5 miles of sage grouse lek areas. Lek areas include the actual lek site and a four mile buffer. (Miles crossed)

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
Sage Grouse Leks within 4 Miles	0	0	0	5	5	5	Route B - 14 is within 4 miles of 5 lek sites. The BLM recommends no surface occupancy within 2 miles of a lek site. MFWP recommends no surface occupancy within 4 miles of a lek site. (Number within 4 miles)
Sharp-Tail Grouse General Distribution	3.3	5.0	4.7	5.2	5.1	5.2	All power line routes cross sharp-tailed grouse general distribution. According to the MFWP (personal communication, 5/28/2008, the sharp-tailed grouse is not listed as a species of concern, but they are lekking birds that have important breeding lek locations that need protection. (Miles crossed)
Sharp-tail Grouse Lek Area	0	0	0	0	0	0	Not crossed; no impact.
Sharp-tail Grouse Leks within 4 Miles	0	0	0	0	0	0	Not crossed; no impact.
xix. High waterfowl population densities	0	0	0	0	0	0	Power lines will not impact areas with high waterfowl population densities.
xx. Any undeveloped land or water areas that contain known natural features of unusual scientific educational or recreational significance	0	0	0	0	0	0	Power lines do not cross areas that contain undeveloped water or areas that contain known natural features of unusual scientific educational or recreational significance.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xxi. Mature riparian forests	0	0	0	0	0	0	Power lines do not cross any mature riparian forests.
xxii. Nesting colonies	0	0	0	0	0	0	Power lines do not impact known nesting colonies of any of the species listed below.
American White Pelican	0	0	0	0	0	0	Power lines do not impact known nesting colonies of American White Pelican.
Caspian Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Caspian Tern.
Common Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Common Tern.
Forster's Tern	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Forster's Tern.
Franklin's Gull	0	0	0	0	0	0	Power lines do not impact known nesting colonies of Franklin's Gull.
xviii. Habitats occupied at least seasonally and critical to species listed as “species of special concern or interest” by the FWP, or species listed or considered candidates for listing by the U.S. Fish and Wildlife service as threatened or endangered.	0	0	0	0	0	0	No critical habitat is crossed by any of the power line Alternative Routes.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
xix. Locations of known nests of raptorial birds within ½ mile of alternative facility locations.	1 historic nest location			1 historic nest location			The Montana Natural Heritage Program Wildlife Tracker database (MTNHP 2009) was accessed as recommended by MFWP to identify historic nest sites near the proposed Project power line locations. According to the data search, one historic raptor nest site was located near Route B, pump station 12; and Route B, pump station 14 power line alternatives.
c) A general assessment of impacts from hunting and fishing pressure if increased access to secure habitats would likely occur in the general vicinity of each alternative line location because new access roads would be constructed outside the impact zone	See Comment			See Comment			Currently, public lands are experiencing an increase in hunting. The construction of the power lines would not affect current hunting and fishing status. Hunting and fishing pressures on private lands would be site-specific and depend on whether the landowners allowed these activities on their property. A permanent access road on private lands that allowed hunting would increase hunting and/or fishing pressures in that area.
d) A description of the method used to evaluate impacts to wildlife, fisheries, and vegetation.	See Comment			See Comment			Refer to text in Chapter 4, Section 4.3.4.6
e) For impacts described in (b) and (c), a	See Comment			See Comment			Mitigation measures that agencies will require for the

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
description of mitigating measures that could be implemented to reduce significant impacts and the cost of such measures.							Project have not been defined. This will be addressed by the third-party power providers.
f) Documentation that agencies with management responsibility for any affected biological resources have been consulted concerning impacts and mitigation and a description and evaluation of the mitigation measures suggested by these agencies.	See Comment			See Comment			Mitigation measures will be solicited from management agencies when a preferred power line route is selected.
13. Cultural, historical, and paleontological data							
a) Results of an on-the-ground survey and documentation	See Comment			See Comment			File search only.
b) Consultation with State Historic Preservation Office (SHPO) relative to eligibility for listing on the national register	See Comment			See Comment			Refer to text in Chapter 4, Section 4.3.9.2 - This will occur through 106 process by DOS.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
14. Assessment of impacts to cultural, historical, and paleontological resources.							
a) For each of the following potentially affected cultural resource properties or sites and for any properties or sites identified by (13)(b) which may be eligible for listing on the national register, a discussion of whether the facility would affect the	• 22 historic sites; 12 historic sites eligible for listing on the NRHP and 10 historic sites remain undetermined. • 4 unknown or no indication of time sites; Two no indication of time sites eligible for NRHP listing and 2 are ineligible			• 5 historic sites; none listed eligible for listing in NRHP; 1 listed ineligible by BLM Programmatic agreement (PA); remaining 4 listed as undetermined or non-consensus determination by BLM (NCD BLM PA). • 7 prehistoric sites; one ineligible by BLM PA; remaining 6 BLM NCD or undetermined status. • 35 unknown or no indication of age sites; listed as having no clear indication of time, of these sites none eligible, 1 ineligible, 13 BLM NCD status, and remaining 21 undetermined.			
i. National historic landmarks, and national register historic districts and sites;	See Comment			See Comment			There are no national historic landmarks, NRH Districts or sites.
ii. National register historic districts and sites nominated to or designated by SHPO;	9	11	9	2	18	23	Information in table is provided in numbers of sites within 1/4 mile of power Line alternative.
b) A discussion of whether the proposed facility would affect the qualities of:							

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
i. Areas with geologic units or formations that show a high probability of including significant paleontological resources; and	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.8.2
ii. Sites that have, or may have, religious or heritage significance and value to Native Americans as identified by Section 3.4(1)(t).	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.9.2. This will occur through 106 process by DOS.
c) Identification of special construction methods and topographic screening that could eliminate or reduce impacts, and a discussion of the likelihood of success of each measure in reducing impact.	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.9.2.
d) Documentation that consultation has occurred with SHPO, affected state and federal agencies, and tribes regarding any affected cultural sites, impacts, and mitigation.	See Comment			See Comment			Refer to text, Chapter 4, Section 4.3.9.2. This will occur through 106 process by DOS.
15. Baseline data for recreation areas and sites							

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
a) Maps depicting recreation areas and sites.		See Comment			See Comment		Recreation sites are not crossed.
b) Description of each site or area, how area is used, and use level estimates		See Comment			See Comment		Recreation sites are not crossed.
c) List of possible recreation areas & sites		See Comment			See Comment		Recreation sites are not crossed.
16. Assessment of impacts on recreation areas and sites							
a) Change in access		See Comment			See Comment		Recreation sites are not crossed.
b) Aesthetic impacts on sites		See Comment			See Comment		Recreation sites are not crossed.
c) Location of facility relative to site		See Comment			See Comment		Recreation sites are not crossed.
d) Description of how activities and experiences could change		See Comment			See Comment		Recreation sites are not crossed, see information in 3.7(12)(b) for potential hunting impacts.
e) Description of regional supply of recreational opportunities for affected sites.		See Comment			See Comment		Recreation sites are not crossed.
f) Documentation of consultation		See Comment			See Comment		Recreation sites are not crossed.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
17. Overlay showing names of perennial streams crossed and WQ classification		See Comment			See Comment		See power line maps.
18. Assessment of impacts to surface and ground water		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.5
Impact to water users		See Comment			See Comment		Power lines do not cross areas that would result in impacts to water users.
Impact to hydrology and stream banks		See Comment			See Comment		Power lines can span streams where necessary. No impacts are anticipated.
Impacts to municipal watershed		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.5
Impacts to potable water		See Comment			See Comment		Refer to text, Chapter 4, Section 4.3.5
Impacts to streams		See Comment			See Comment		Power lines can span streams where necessary. No impacts are anticipated.

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
19. Noise, radio, and television impacts	See Comment			See Comment			During construction, Power providers will be required to comply with any local construction noise requirements. Areas directly adjacent to construction will experience a short-term inconvenience from construction equipment noise for a period of 1 to 2 weeks for a section of power line; for a substation 3-6 months. Also see **Attachment P**.
a) for 230 kV (noise)	See Comment			See Comment			<230kV, NA
b) for 230 kV (overlay)	See Comment			See Comment			<230kV, NA
c) Induced currents	See Comment			See Comment			**Attachment P**, response to SIR 1.42
d) Noise impacts	See Comment			See Comment			During construction, power providers will be required to comply with any local construction noise requirements. Areas directly adjacent to construction will experience a short-term inconvenience from construction equipment noise for a period of 1 week to 30 days.
e) Potential impacts of electrical and magnetic fields	See Comment			See Comment			**Attachment P**, response to SIR 1.42

Table 0-7 Power Line Additional Information Overview – Route B

	Route B – PS 12			Route B – PS 14			
Power Line Analysis	**Preferred**	**Alt 1**	**Alt 2**	**Preferred**	**Alt 1**	**Alt 2**	**Comments**
f) Radio and TV impacts	See Comment			See Comment			**Attachment P**, response to SIR 1.42
g) mitigation to reduce noise, EMF, induced currents, and interference with communication facilities.	See Comment			See Comment			Chapter 4, Section 4.3.13

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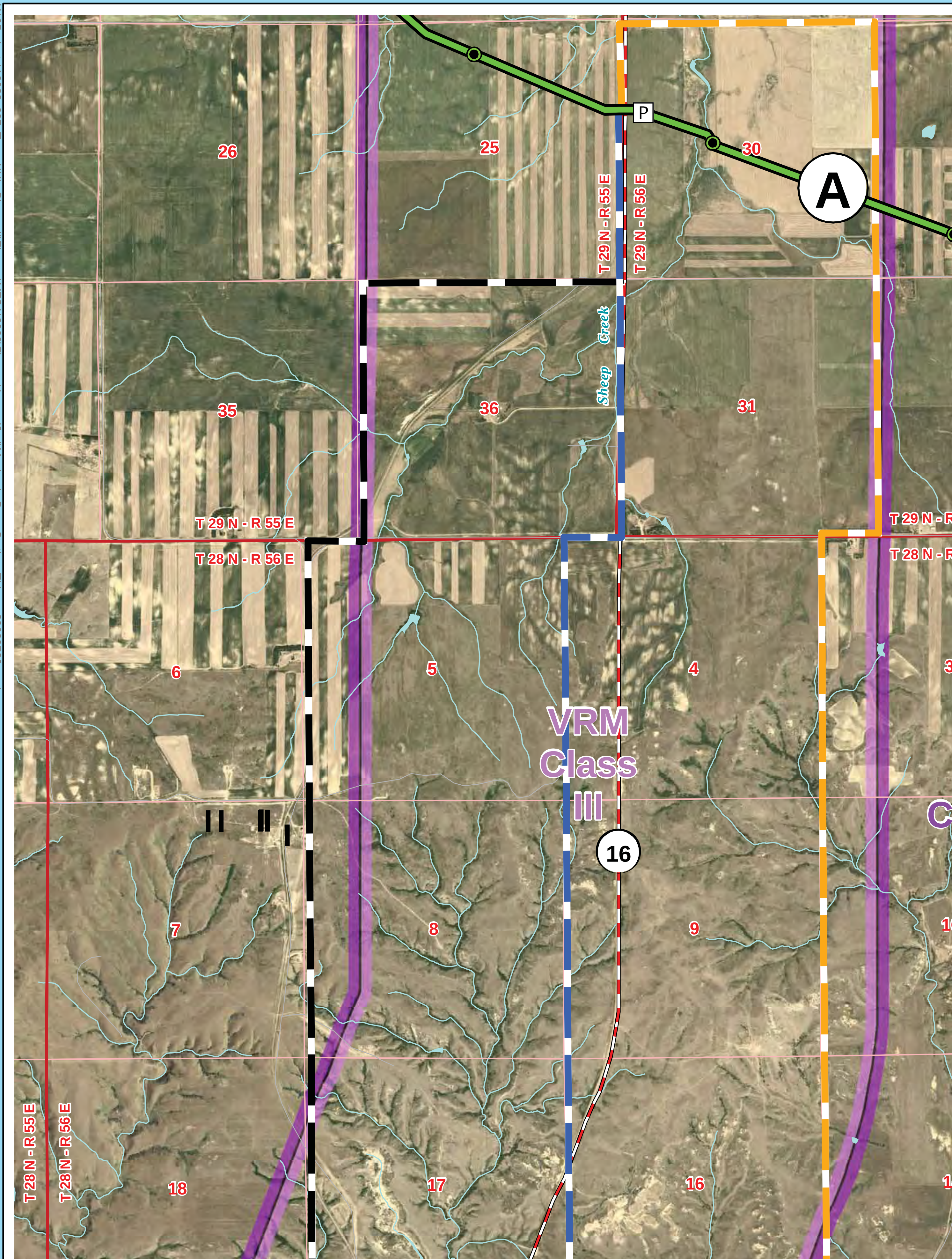

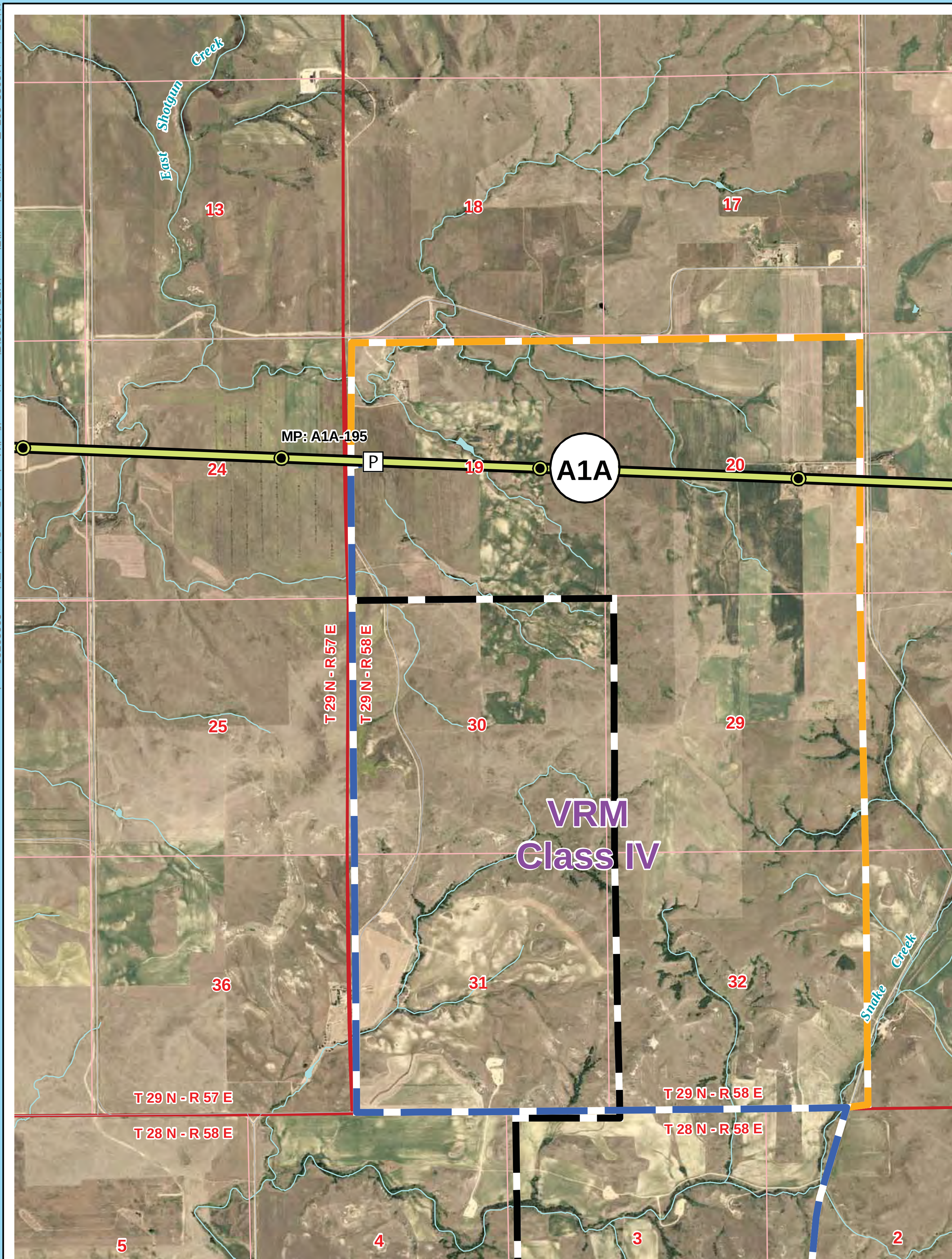
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VRM
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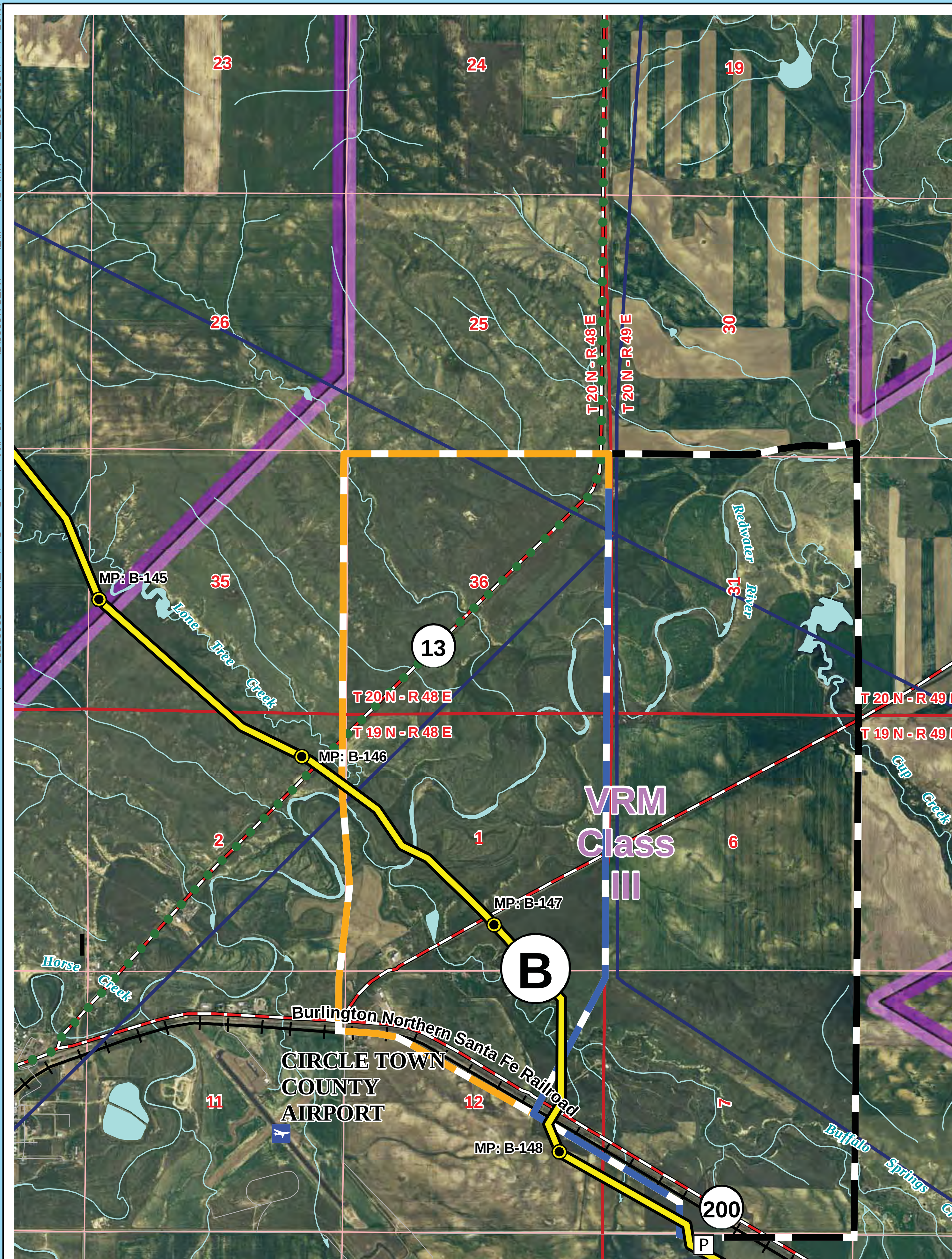

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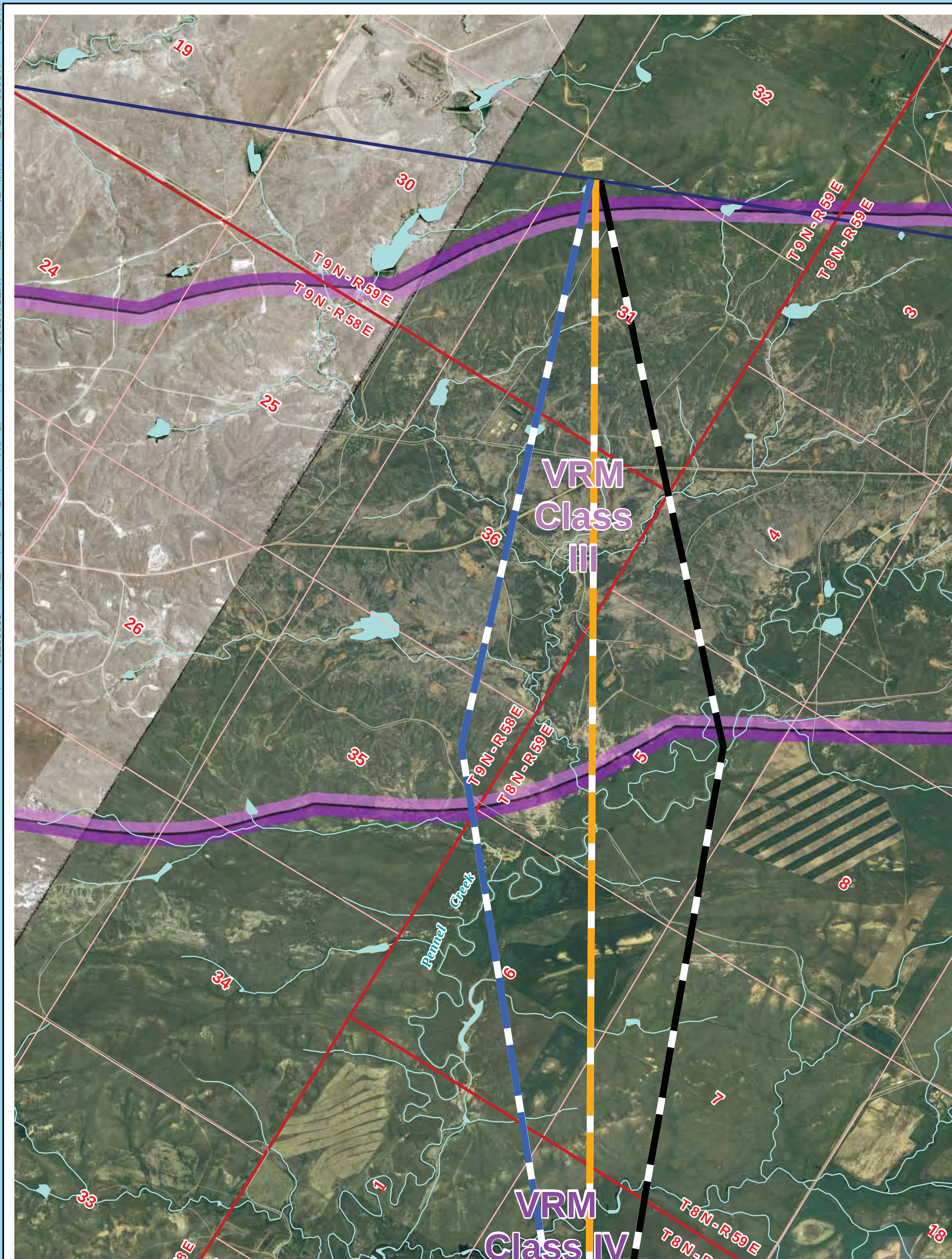

Attachment P

Clarifications and Responses to Supplemental Information Requests

September 2009 Filing

Response to SIR-1, Section 17.20.1511(7)(b and c)

DEQ Request:

b) Estimates of trench width

Provide the width that the burial depth would be carried laterally to account for lateral stream channel migration.

2/23/09 – DEQ Incomplete. Provide the width that the burial depth would be carried laterally to account for lateral stream channel migration. This information is needed for analyses of impacts.

c) Estimates of scour depth

Keystone Response:

Keystone will comply with applicable requirements for trench width/depth and scour depth. If applicable, ARM 36.15.102 requires that within a 100-year designated floodway certain pipelines "be buried to a depth at least twice the calculated maximum depth of scour for the base flood." (Also see ARM 36.15.101 for applicable definitions.)

The design of the pipeline along the preferred route for channel crossings will be completed prior to construction based on preconstruction surveys and calculations. The standard design will be to install the pipeline 5 feet below the channel depth for a distance of 15 feet beyond the normal high water banks. *Trench width would typically range from 15 to 20 feet at the top of trench and range from 5 to 7 feet at the bottom of the trench depending on trench depth. Soil type and conditions, such as cohesiveness and saturation, and the type of excavation equipment used will also affect trench width and the slope of the sides. Wider trench widths of 30 to 40 feet at the top could be required.* Each channel crossing will be evaluated prior to construction in the manner described below and will take into account the hydrologic and hydraulic parameters associated with general scour and channel migration.

Scour - For scour assessment, various methodologies will be applied and are dependant on the composition of the soil and available information at the crossing. The steps are summarized below:

- Every identified crossing will first be screened based on the delineation of the tributary drainage area. Those drainage basins that are less than 10 square miles in area will be determined not to require further evaluation and the minimum pipe burial requirement of 5 feet will be assumed to be adequate for the crossing design.
  - Basin areas will be determined from the available USGS maps, DEM data and aerials. To determine the 100 year return frequency of inflow to rivers and streams, the available National Flood Frequency regression equations will be applied or new projections will be made using the actual USGS Stream Gage data using the Log-Pearson Type III Distribution or Weibell Formula.
- A second screening will include the evaluation for scour to determine if there is potential to require pipe burial below 5 feet in depth.
  - The mean competent velocity methodology will be used for the evaluation of scour for cohesive and non-cohesive soils. This methodology is described fully in Transportation Association of Canada's Guide to Bridge Hydraulics. In addition, the Critical Shear Stress and Maximum Permissible Velocity will be compared for the evaluation of scour for cohesive and non-cohesive soils. These methodologies are outlined in Ven Te Chow's Open Channel Hydraulics. Institutions

such as the FHWA, USACE, USDA consider the same general method albeit the formula may be different.

- The crossings identified with scour potential will undergo a final evaluation, which may require redesign, to conduct a thorough assessment of the hydrologic and hydraulic condition in order to determine proper pipe depth and length. As discussed below, evaluation may include obtaining detailed cross sections by survey, photos, grab samples, and and/or shallow boreholes to determine subsurface geology.

Stream Meander - The evaluation of stream meander migration will be assessed as follows:

- The initial screening criteria will be a visual inspection of historic and present day aerial photos to determine if significant changes in channel alignment have occurred.
- If changes are observed that potentially may exceed 15 feet in a 50 year pipe service period, additional investigations will be conducted using the circle analysis to determine the appropriate design length required for the crossings.
  - For lateral migration assessment, the methodology as described in the National Cooperative Highway Research Program (NCHRP) Report 533: Handbook for Predicting Stream Meander Migration (Transportation Research Board of the National Academies) will be applied to project the degree of lateral migration. This method involves comparisons of historic and present-day aerial photographs. The stream positions from both the historic and present-day photos are overlain in ArcGIS to estimate the rates of change in the stream position. Circles are used to represent the stream curvature.
- Each crossing will be designed based on the findings of the hydrologic and hydraulic assessments to be performed prior to construction.

Evaluation - The evaluation of scour and stream meander will require collection and analysis of a significant amount of data. Examples of this information are identified below:

- Collection and processing data for the actual engineering evaluation may require a significant amount of time not accounted for in the detailed analysis. Each of the following steps will also require acquisition of appropriate permits and access, as well as mobilization of field crews and equipment.
  - Grab samples may be acquired at major crossings (those that have the potential for significant scour in excess of 5 feet).
  - Boreholes may be acquired near crossings.
  - Cross section survey data for major crossings: 40 – 50 ft upstream of crossing, at the crossing, and downstream of the crossing may also be required.
- An average of 8 hours is spent analyzing each crossing based on the complexity of the crossing and required analysis to finalize the depth and length of the pipe for each crossing.

Because of the site-specific nature of the work, it will not commence until precise crossing locations are determined. It is not considered feasible to conduct these investigations, contact landowners, and impact landowners that are not part of the preferred route nor part of the EIS notification and scoping process crossings on alternative routes.

Contents

Clarification for Section 3.4(7)(a)

DEQ Request:

(7) Social characteristics

(a) current land uses to economic & social activities in the areas

No discussion of social opinions, trends, etc.

Keystone Response:

The social structure of the impacted communities is shaped in part by the rural and remote nature of the project area. Many of the residents are socially isolated and typically have interaction within their own community. From this interaction, the result is generally a common set of values towards land and the community.

Residents often have a lifestyle that is tied to the land via ranching and/or farming, and therefore have a strong conservation ethic based around sustainability. Outside of agriculture, economic opportunities are limited as there are not many large population centers in the project area. The largest cities in the project area are Glendive and Glasgow which provide service and government employment opportunities, as well as options for significant shopping purchases. Nashua, Circle, and Baker also provide limited services and shopping opportunities.

Clarification for Section 3.4(9)(d)

DEQ Request:

(8) Landscape aesthetics

(d) overlay of land areas categorized for visual compatibility.

Keystone Response:

The following tables provide scenic quality ratings by route. The map shows these quality ratings spatially.

In the following tables, scenic quality is rated numerically for each of the 7 factors in the columns of the tables prepared for each of the alternatives. The potential range for most of the factors is either 0 to 5 or 1 to 5 (5 being the highest), but, for cultural modifications, which include any man-caused changes to the natural landscape, the range is -4 to +2 (2 being the highest; 0 indicates modifications add little or no visual variety to the area, and introduce no discordant elements). The higher the total score, the higher the scenic quality for an area. A total score of 11 or less = Class C (relatively low public value), 12 to 18 = Class B (moderate public value), 19 or greater = Class A (high public value).

Table 1 Section 3.4(9)(d) Scenic Quality Rating – Alternative A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 24.5	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
24.5 – 25.6	3	3	3	3	3	3	0	18	B	Frenchman Creek
25.6 – 32.4	1	1	0	3	2	1	0	8	C	-
32.4 – 33.3	3	1	2	3	0	2	0	11	C	Rock Creek
33.3 – 39.0	1	1	0	1	2	1	0	6	C	-
39.0 – 41.0	2	1	2	1	0	2	0	8	C	Willow Creek/Chisholm Creek valleys
41.0 – 46.5	1	1	0	1	2	1	0	6	C	-
46.5 – 47.7	3	1	0	1	0	1	0	6	C	Incised drainages
47.7 – 57.4	1	1	0	1	0	1	0	4	C	-
57.4 – 58.7	2	1	1	1	0	2	0	7	C	Porcupine Creek
58.7 – 80.0	1	1	1	3	0	1	0	7	C	Small creeks and coulees
80.0 – 93.7	3	2	2	2	0	1	0	10	C	Low rolling hills and Cottonwood Creek crossings

Table 1 Section 3.4(9)(d) Scenic Quality Rating – Alternative A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
93.7 – 111.4	1	1	0	3	0	1	0	6	C	-
111.4 – 125.1	1	1	0	3	2	1	0	8	C	-
125.1 – 126.4	1	2	1	1	0	1	0	6	C	-
126.4 – 144.0	1	1	0	3	0	1	0	6	C	-
144.0 – 148.4	2	2	2	2	3	2	0	13	B	Big Muddy Creek bottom land
148.4 – 154.5	2	2	1	2	3	1	0	11	C	Low rolling hills
154.5 – 161.5	1	2	0	2	0	1	0	6	C	-
161.5 – 168.1	1	1	0	1	0	1	0	4	C	-
168.1 – 171.0	1	2	0	2	0	1	0	6	C	-
171.0 – 174.5	1	1	0	1	0	1	0	4	C	-
174.5 – 176.1	1	2	1	2	0	1	0	7	C	-
176.1 – 180.7	1	1	0	1	0	1	0	4	C	-

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 24.5	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
24.5 – 25.6	3	3	3	3	3	3	0	18	B	Frenchman Creek
25.6 – 32.4	1	1	0	3	2	1	0	8	C	-
32.4 – 33.3	3	1	2	3	0	2	0	11	C	Rock Creek
33.3 – 39.0	1	1	0	1	2	1	0	6	C	-
39.0 – 41.0	2	1	2	1	0	2	0	8	C	Willow Creek/ Chisholm Creek valleys
41.0 – 46.5	1	1	0	1	2	1	0	6	C	-
46.5 – 47.7	3	1	0	1	0	1	0	6	C	Incised drainages
47.7 – 54.1	1	1	0	1	0	1	0	4	C	-
54.1 – 57.2	2	1	2	1	0	2	0	8	C	West Fork Porcupine Creek valley
57.2 – 61.1	1	1	0	3	0	1	0	6	C	-
61.1 – 65.0	2	2	2	2	0	2	0	10	C	Middle Fork Porcupine Creek and tributaries
65.0 – 69.8	1	1	0	2	0	1	0	5	C	-
69.8 – 71.7	1	3	2	2	0	2	0	10	C	Snow Coulee

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
71.7 – 73.1	1	1	0	1	0	1	0	4	C	-
73.1 – 74.6	1	3	2	2	0	2	0	10	C	East Fork Snow Coulee
74.6 – 83.6	1	1	0	1	0	1	0	4	C	-
83.6 – 85.6	1	2	2	2	0	2	0	9	C	Hell Creek valley
85.6 – 91.6	2	1	0	1	1	1	0	6	C	-
91.6 – 95.8	2	1	1	1	2	1	0	8	C	Hell Creek and Shipstead Coulee valley bottoms
95.8 – 98.2	3	2	3	2	2	2	0	14	B	West Fork Poplar River valley
98.2 – 99.0	1	1	0	1	1	1	0	5	C	-
99.0 – 100.4	2	2	1	2	0	1	0	8	C	Police Creek
100.4 – 106.1	1	1	0	3	0	1	0	6	C	-
106.1 – 109.2	2	1	0	1	1	1	0	6	C	-
109.2 – 111.6	2	2	3	2	0	2	0	11	C	Poplar River
111.6 – 113.2	1	1	0	2	0	1	0	5	C	-
113.2 – 114.8	1	2	2	2	0	2	0	9	C	Line Coulee
114.8 – 119.6	1	1	0	1	0	1	0	4	C	-
119.6 – 120.5	1	2	2	2	0	2	0	9	C	Smoke Creek
120.5 – 130.2	1	1	0	1	0	1	0	4	C	-
130.2 – 135.7	1	2	1	2	0	2	0	8	C	Wolf Creek valley
135.7 – 154.1	1	1	0	1	0	1	0	4	C	-

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
154.1 – 156.3	2	1	1	1	0	2	0	7	C	Big Muddy Creek valley
156.3 – 165.5	1	1	0	1	0	1	0	4	C	-
165.5 – 173.1	1	1	1	1	2	1	0	7	C	Medicine Lake/Big Muddy Creek area
173.1 – 205.1	1	1	0	1	0	1	0	4	C	-

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 25.2	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
25.2 – 26.2	3	3	3	3	3	3	0	18	B	Frenchman Creek
26.2 – 38.9	1	1	0	3	2	1	0	8	C	-
38.9 – 39.6	2	2	2	2	0	3	0	11	C	Rock Creek
39.6 – 40.1	1	1	0	1	0	1	0	4	C	-
40.1 – 41.0	1	3	2	2	0	3	0	11	C	Willow Creek/Chisholm Creek valleys
41.0 – 55.0	1	1	0	1	0	1	0	4	C	-
55.0 – 55.8	1	3	2	3	0	3	0	12	B	Buggy Creek
55.8 – 66.8	1	1	0	1	0	1	0	4	C	-
66.8 – 67.2	1	3	2	3	0	3	0	12	B	Cherry Creek
67.2 – 71.1	1	1	0	1	0	1	0	4	C	-
71.1 – 82.2	1	1	0	3	0	1	0	6	C	-
82.2 – 83.7	2	3	3	3	0	4	0	15	B	Milk River
83.7 – 88.4	1	1	0	2	3	1	0	8	C	-
88.4 – 89.9	3	3	4	3	1	5	0	19	A	Missouri River
89.9 – 100.9	1	1	0	1	0	1	0	4	C	-
100.9 – 116.8	3	1	0	3	0	2	0	9	C	Badlands
100.9 – 116.8	1	1	0	2	1	1	0	6	C	-
122.0 – 123.4	1	2	2	1	0	2	0	8	C	Fig. Eight and

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
										Mid. Fk. Prairie Elk Creeks influence
123.4 – 125.4	1	1	0	2	1	1	0	6	C	-
125.4 – 129.0	1	2	1	1	2	2	0	9	C	Parallel and crossing E. Fork Prairie Elk Creek
129.0 – 131.4	1	1	0	1	0	1	0	4	C	-
131.4 – 144.8	1	1	0	3	0	1	0	6	C	-
144.8 – 146.0	1	1	0	1	0	1	0	4	C	-
146.0 – 147.5	1	3	3	2	0	3	0	12	B	Redwater River and Buffalo Springs Creek
147.5 – 158.8	1	1	0	2	0	1	0	5	C	-
158.8 – 161.0	1	3	2	2	0	3	0	11	C	Berry Creek complex
161.0 – 163.0	1	1	0	2	0	1	0	5	C	-
163.0 – 163.1	1	3	2	2	0	2	0	10	C	Hay Creek
163.1 – 166.0	1	1	0	2	0	1	0	5	C	-
166.0 – 166.3	1	2	2	2	0	2	0	9	C	Upper Sevenmile Creek
166.3 – 174.8	1	1	0	2	0	1	0	5	C	-
174.8 – 175.6	1	3	2	2	0	3	0	11	C	Clear Creek and bottom land
175.6 – 192.0	1	1	0	2	0	1	0	5	C	-
192.0 – 195.5	2	2	0	3	3	2	0	12	B	Valley bottom – Yellowstone River

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
195.5 – 196.8	3	4	4	4	3	4	0	22	A	Yellowstone River
196.8 – 199.5	1	2	0	2	0	1	0	6	C	-
199.5 – 201.3	1	1	0	1	0	1	0	4	C	-
201.3 – 202.3	1	3	2	2	0	3	0	11	C	Cabin Creek and Spring Creek
202.3 – 204.1	1	2	0	2	0	1	0	6	C	-
204.1 – 209.0	1	1	1	1	0	1	0	5	C	-
209.0 – 215.0	3	1	0	1	0	2	0	7	C	Hummocky terrain
215.0 – 217.1	1	1	1	1	0	1	0	5	C	-
217.1 – 217.4	1	2	1	2	0	2	0	8	C	Creek
217.4 – 221.7	1	1	0	1	1	1	0	5	C	-
221.7 – 222.0	1	2	1	2	0	2	0	8	C	Creek
222.0 – 226.5	1	1	0	1	0	1	0	4	C	-
226.5 – 226.9	1	3	2	3	0	3	0	12	B	Dry Fork Creek
226.9 – 229.2	1	1	0	2	0	1	0	5	C	-
229.2 – 230.8	2	3	0	2	3	3	0	13	B	Pine hills parallel to Pennel Creek
230.8 – 234.2	1	1	0	2	2	1	0	7	C	ROW parallels Pennel Creek
234.2 – 234.5	1	2	2	2	2	3	0	12	B	Pennel Creek crossing
234.5 – 243.9	1	1	0	2	0	1	0	5	C	-
243.9 – 244.1	1	2	1	2	0	2	0	8	C	Sandstone Creek
244.1 – 253.2	1	1	0	2	0	1	0	5	C	-

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
253.2 – 256.0	2	1	0	3	0	2	0	8	C	Badlands
256.0 – 257.1	1	1	0	1	0	1	0	4	C	-
257.1 – 258.9	1	2	1	2	0	2	0	8	C	Hidden Water Creek influence
258.9 – 274.9	1	1	0	1	0	1	0	4	C	-
274.9 – 279.1	1	1	1	1	0	1	0	5	C	North and South Forks Coal Bank Creek influence
279.1 – 280.8	1	1	0	1	0	1	0	4	C	-
280.8 – 282.3	1	2	2	2	0	2	0	9	C	Boxelder Creek influence

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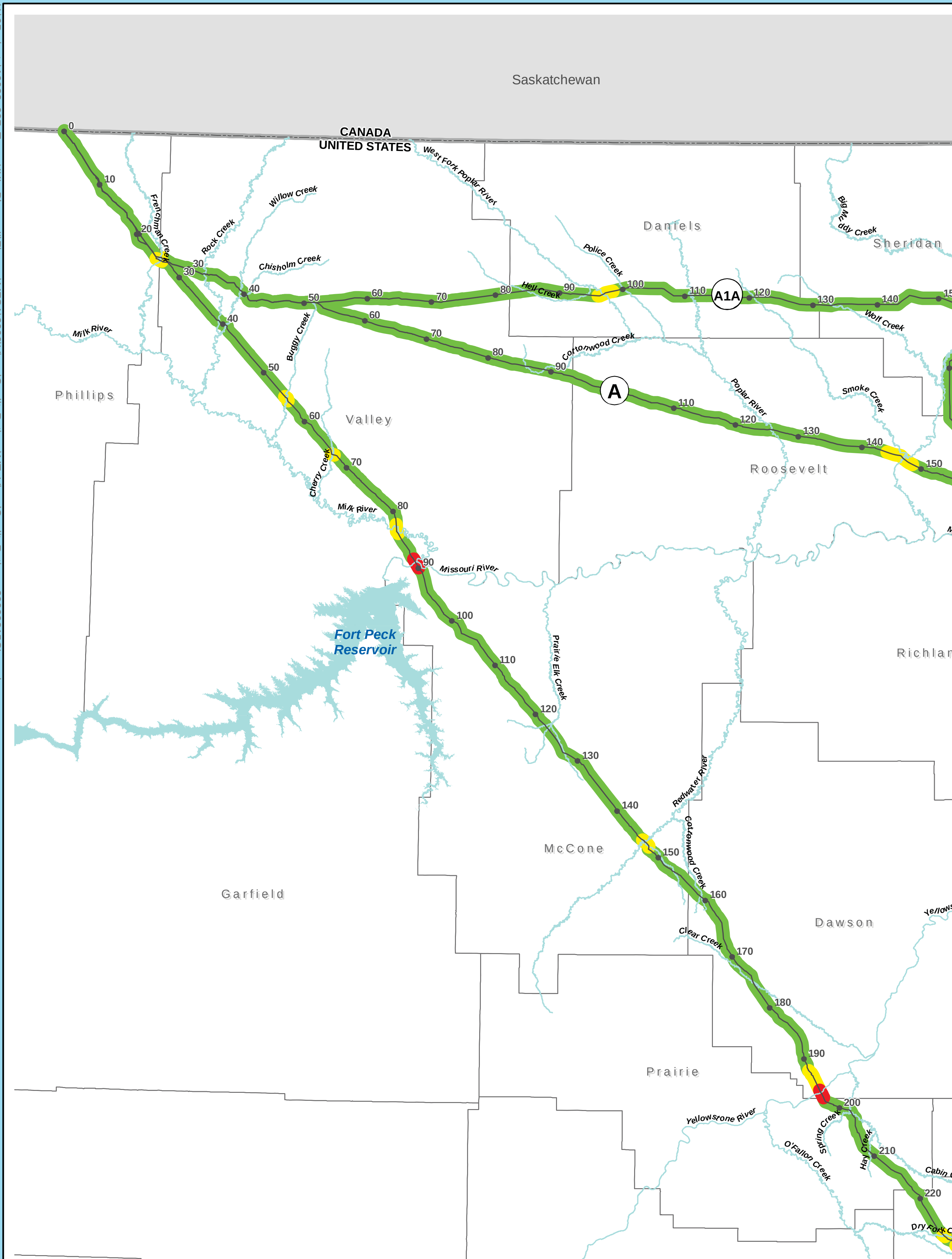

Clarification for Section 3.7(10)(b)

DEQ Request:

(9) Visual resources and viewer information

(b) visual contrast overlay

Keystone Response:

In combination with photos from 3.7(10)(g), Attachment P, page P-32 to P-64, the following tables provide the visual contrast information by Key Observation Point (KOP) for all three routes.

The contrast ratings were conducted to address the short-term time frame of 5 years. That is, to determine if the proposed pipeline would achieve the requisite VRM class objectives within 5 years of construction. It is assumed that there would be substantially greater visual contrast introduced during construction, but that this would be acceptable as long as progress is made and the objectives are met within 5 years of construction.

Alternative A
Visual Contrast Rating

KOP: MT 24 **Direction:** WNW **M.P.:** 60

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Existing pipeline through the same fields is not visible.

KOP: MT 24 **Direction:** ESE **M.P.:** 60

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Existing pipeline through the same fields is not visible.

KOP: MT 13 **Direction:** W **M.P.:** 110.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Existing pipeline not discernible from ground level perspective.

Alternative A
Visual Contrast Rating

KOP: MT 13 **Direction:** E **M.P.:** 110.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective.

KOP: MT 16 **Direction:** WNW **M.P.:** 156.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective.

KOP: MT 16 **Direction:** ESE **M.P.:** 156.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective.

Alternative A
Visual Contrast Rating

KOP: U.S. 2 **Direction:** NNW **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline visible, but doesn't attract attention. Low scenic quality and mottled, irregular vegetation will provide moderate to high visual absorption.

KOP: U.S. 2 **Direction:** N **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline visible, but doesn't attract attention. Low scenic quality and mottled, irregular vegetation will provide moderate to high visual absorption.

KOP: U.S. 2 **Direction:** S **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective. Grass ground cover much healthier than on N side of U.S. 2; will revegetate more readily.

Alternative A
Visual Contrast Rating

KOP: U.S. 2 **Direction:** **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective. Grass ground cover and ag crops much healthier than on N side of U.S. 2; will revegetate more readily.

Alternative A1A
Visual Contrast Rating

KOP: MT 24 **Direction:** W **M.P.:** 60.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with strong existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 24 **Direction:** E **M.P.:** 60.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 13 **Direction:** W` **M.P.:** 109.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Pipeline would parallel existing ag field boundary and two-track.

Alternative A1A
Visual Contrast Rating

KOP: MT 13 **Direction:** E **M.P.:** 109.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** W **M.P.:** 156.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** E **M.P.:** 156.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Crosses existing linear features; rising terrain; good revegetation potential.

Alternative A1A
Visual Contrast Rating

KOP: MT 16 **Direction:** ENE **M.P.:** 163.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class:

Meets VRM Class Objectives?

Notes: Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** WSW **M.P.:** 163.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: Medicine Lake NWR, Diversion Ditch #1 **Direction:** N **M.P.:** 168.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Ditch would be directionally drilled. Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

Alternative A1A
Visual Contrast Rating

KOP: Medicine Lake NWR, Diversion Ditch #1 **Direction:** S **M.P.:** 168.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Ditch would be directionally drilled. Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 16 **Direction:** NW **M.P.:** 179.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Hay/Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** SE **M.P.:** 179.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X		X						X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons, except for shelterbelt.

.

Alternative B
Visual Contrast Rating

KOP: MT 24 **Direction:** NW **M.P.:** 69.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Grassland; visual contrast at 5 years likely to be minimal.

KOP: MT 24 **Direction:** SE **M.P.:** 69.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X		X						X
	Color				X		X						X
	Texture				X			X					X

VRM Class: III
Meets VRM Class Objectives? Y
Notes: Grassland; visual contrast at 5 years likely to be minimal.

KOP: U.S. 2 - BNSF/AMTRAK Crossing **Direction:** N **M.P.:** 82.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y
Notes: Rating assumes a directional drill from atop the ridge approx. 1,000' N of U.S. 2 to approx. 500' S of the Milk River. Pipeline would not be visible from U.S. 2 or RR.

Alternative B
Visual Contrast Rating

KOP: U.S. 2 - BNSF/AMTRAK Crossing **Direction:** S **M.P.:** 82.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Rating assumes directional drilling from top of the ridge approx. 1,000' N of U.S. 2 to approx. 500' S of the Milk River. Pipeline would not be visible from U.S. 2 or RR.

KOP: MT 117 - Ball Rd. - Whatley Rd. **Direction:** NNW **M.P.:** 83.75

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Cultivated ag land with some existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 117 - Ball Rd. - Whatley Rd. **Direction:** SSE **M.P.:** 83.75

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Cultivated ag land with minor form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

Alternative B
Visual Contrast Rating

KOP: Missouri River Crossing **Direction:** SSE **M.P.:** 88.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form			X			X						X
	Line		X				X						X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Views from the river to the NE face of the Milk Hills would be largely screened by existing deciduous groves during river use months, reducing the visual effects.

.

KOP: MT 24 parallel to pipeline at M.P. 99.3 **Direction:** NE **M.P.:** 99.3

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Pipeline would not be visible from this part of MT 24 because of terrain.

KOP: NE of Weldon Rd. (CR 252) **Direction:** NE **M.P.:** 127.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Terrain barriers and distance mitigate any potential for adverse visual contrast; pipeline would not attract attention.

Alternative B
Visual Contrast Rating

KOP: Weldon Rd. (CR 252) parallel to pipeline at M.P. 130 **Direction:** NE **M.P.:** 130.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Distance and superior viewing perspective in panoramic landscape mitigate any potential for adverse visual contrast; pipeline would not attract attention.

KOP: MT 13 **Direction:** NW **M.P.:** 145.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; potentially slow revegetation and rising slope in immediate foreground may continue weak contrast from the pipeline, but it would not dominate the view.

KOP: MT 13 **Direction:** SSE **M.P.:** 145.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; Redwater River and deciduous groves at ~3,000' would be more dominant visual features than any residual pipeline effects.

Alternative B
Visual Contrast Rating

KOP: MT 200 **Direction:** NW **M.P.:** 146.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing structures, linear and landform features would be more visually dominant than the pipeline.

KOP: MT 200 **Direction:** SE **M.P.:** 146.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing linear features and deciduous groves would be more visually dominant than the pipeline.

KOP: MT 200S **Direction:** N **M.P.:** 147.8

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential. Use existing openings in trees to degree possible to minimize visual effects.

Alternative B
Visual Contrast Rating

KOP: MT 200S **Direction:** SW - SE **M.P.:** 147.8

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland & cultivated ag land with very good revegetation potential.

KOP: MT 200 parallel to pipeline at M.P. 155.6 **Direction:** NW **M.P.:** 155.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing linear features (old road alignment) and mottled surface vegetation increases visual absorption potential.

KOP: I-94 **Direction:** NNW **M.P.:** 193.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland; moderate to low revegetation potential may leave weak contrast at 5 years, but topgraphy limits visibility to brief views at interstate speeds.

Alternative B
Visual Contrast Rating

KOP: I-94 **Direction:** SSE **M.P.:** 193.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland; moderate to low revegetation potential may leave weak contrast at 5 years. Sufficient visual features to attract more viewer attention than the pipeline.

KOP: Old Highway U.S. 10 **Direction:** NNW **M.P.:** 194.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland with some structural and linear features sufficient to overshadow possible weak contrast remaining at 5 years. Low traffic roadway.

KOP: Old Highway U.S. 10 **Direction:** SSE **M.P.:** 194.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land with multiple visual features in the landscape; pipeline disturbance would not be visible within one to two growing seasons.

Alternative B
Visual Contrast Rating

KOP: Bad Road (CR 241) **Direction:** NNW **M.P.:** 195.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X		X						X
	Color				X		X						X
	Texture				X			X					X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Hay/grassland with multiple visual features sufficient to overshadow possible weak contrast remaining at 5 years. Very low traffic roadway.

KOP: Bad Road (CR 241) **Direction:** SSE **M.P.:** 195.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Hay/grassland with multiple visual features sufficient to overshadow possible weak contrast remaining at 5 years. Very low traffic roadway.

KOP: Yellowstone River/BNSF RR Crossing **Direction:** NNW **M.P.:** 196.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Rating assumes a directional drill from between tree groves and river approx. 1,000' N of river to ridge top approx. 750' S of the RR.

.

Alternative B
Visual Contrast Rating

KOP: Yellowstone River/BNSF RR Crossing **Direction:** SSE **M.P.:** 196.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Rating assumes a directional drill from between tree groves and river approx. 1,000' N of river to ridge top approx. 750' S of the RR.
.

KOP: U.S. 12 **Direction:** N **M.P.:** 244.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons.

KOP: U.S. 12 **Direction:** S **M.P.:** 244.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons.

Alternative B
Visual Contrast Rating

KOP: MT 7 **Direction:** WNW **M.P.:** 248.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland/sage brush; potentially slow revegetation may extend weak visual contrast from the pipeline. Low viewing angle would reduce visibility.

KOP: MT 7 **Direction:** ESE **M.P.:** 248.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; potentially slow revegetation may extend visual contrast from the pipeline. Existing variation in landform and structural visual features would be more dominant.

KOP: Webster Road (CR 247) **Direction:** NNW **M.P.:** 269.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons. Very low traffic volumes.

Alternative B
Visual Contrast Rating

KOP: Webster Road (CR 247) **Direction:** SSE **M.P.:** 269.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Grassland; low viewing angle would minimize visibility. Very low traffic volumes.

Clarification for Section 3.8(1)(c)(i)(A)&(B)

DEQ Comment:

3.8(1)(c)(i)

Information and mapping based upon 1 or 2 dominant species and 1 or 2 understory species needs to be provided for the impact zones below.

(A) areas within 0.5 mile radius of pump or compressor stations
(B) crossing of streams with fishery value class of I or II or waterways with annual discharge of 1,000 cfs or more.

Keystone Response:

(A) Information and mapping of vegetation within a 0.5 mile buffer of the 12 potential pump station locations along the three proposed routes (A, A1A, and B) were developed following a three-step process.

1) Preliminary boundary delineation using aerial imagery,

2) Helicopter surveys for all three routes followed by ground verification efforts on selected PS sites, and

3) Final mapping.

The first step, preliminary desktop aerial interpretation, occurred during initial land use analysis and identified five plant community types (very low cover grasslands, low/moderate cover grassland, mixed riparian, wetlands and agricultural lands-dry crop) using digital aerial imagery (2006 NAIP 1-meter color imagery and 2005 DOQQ 1-meter color imagery).

Helicopter surveys were conducted in April 2009 for pump stations on all three route alternatives to assign vegetation/land use type. Furthermore, helicopter surveys were also conducted along the major river crossings (Milk River, Missouri River and Yellowstone River). In May 2009, field confirmation of selected sites was performed in order to field check types and develop species lists. Ground verification efforts identified the dominant plants within the upper and lower canopies of the vegetation profile within each plant community. Final mapping followed these efforts.

Very Low Cover and Low/Moderate Cover Grasslands

Within the very low cover and low/moderate cover grasslands graminoids were typically the dominant plants comprising the greatest canopy cover within the potential pump station locations. The dominant species in the very low cover grasslands type include blue grama (*Bouteloua gracilis*), Prairie June grass (*Koeleria macrantha),* western wheatgrass (*Pascopyrum smithii*), and threadleaf sedge *(Carex filifolia*). Associated species include clubmoss (*Saleginella densa*) and Hood's phlox (*Phlox hoodii*). The dominant species encountered within the low/moderate grasslands include western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), green needlegrass (*Nassella viridula*), and Idaho fescue (*Festuca idahoensis*). Other commonly dominant species encountered include Prairie June grass (*Koeleria macrantha),* Sandberg's bluegrass (*Poa secunda*), needle and thread grass (*Hesperostipa comate*), and threadleaf sedge (*Carex filifolia*). Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* and *Artemisia cana* were also encountered.

Wetlands

The vegetation of the wetland community is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex nebrascensis*. Other graminoid species present are *Carex praegracilis, Calamagrostis stricta, Deschampsia caespitosa, Eleocharis palustris, Glyceria striata, Juncus balticus,* and *Schoenoplectus pungens*. This type is shown as emergent wetlands (PEM) or forested wetlands (PFO).

Mixed Riparian

Within the mixed riparian plant community the plains cottonwood (*Populus deltoides*) was the dominant overstory with the shrub species silver sage (*Artemisia cana*) and *Symphoricarpos* spp. occupying the understory. The herbaceous plant community includes the species bluejoint reedgrass (*Calamagrostis Canadensis*), Baltic rush (*Juncus balticus*), and sedges (*Carex spp.*).

Agricultural Lands–Dry Crop

Agricultural lands–dry crop plant community had crested wheatgrass (*Agropyron cristatum)* as the dominant plant species with smooth brome (*Bromus inermis*) also occurring. The agricultural lands-dry crop classification also includes dry-land wheat (*Triticum aestivum*) and other crops. These two types are broken into two classes in the tables below.

Agricultural Lands–Irrigated

Agricultural lands-irrigated is typically planted wheat.

Water

Waterbodies are one of three types: ephemeral (EPH), intermittent (INT), and perennial (PER). These are not shown in the vegetation tables below, but are displayed on the maps.

Developed Lands

Developed lands includes commercial (DCOM), residential (DRES), industrial (DIND) as well as right-of-way (DROW) designations. These are not shown in the vegetation tables below, but are displayed on the maps.

Table 1 Pump Station Vegetation Communities along Route A

Vegetation Cover Type	Pump Station 9	Pump Station 10	Pump Station 11	Pump Station 12
Very Low Cover Grassland		x		
Low/Moderate Cover Grassland				
Agricultural Land-Dry Crop (Hay)	x	x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)			x	x
Mixed Riparian				
Wetland	x			

Table 2 Pump Station Vegetation Communities along Route A1A

Vegetation Cover Type	Pump Station 9	Pump Station 10	Pump Station 11	Pump Station 12	Pump Station 13
Very Low Cover Grassland		x	x		
Low/Moderate Cover Grassland				x	
Agricultural Land-Dry Crop (Hay)	x	x	x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)					
Mixed Riparian					x
Wetland	x				

Table 3 Pump Station Vegetation Communities along Route B

Vegetation Cover Type	Pump Station 9	Pump Station 10	Pump Station 11	Pump Station 12	Pump Station 13	Pump Station 14
Very Low Cover Grassland		x				
Low/Moderate Cover Grassland			x	x	x	x
Agricultural Land-Dry Crop (Hay)	x			x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)					x	
Agricultural Land-Irrigated					x	
Mixed Riparian				x		
Wetland	x					

(B) Only Route B crosses Class 1 or 2 or 1,000 cfs streams. The vegetation/land use data for these crossings were collected in 2008 during on the ground field surveys of the project survey corridor. These data are provided in Table 4 and the following maps.

Table 4 Vegetation Communities along Class 1 or 2 or 1,000 cfs Streams

Vegetation Cover Type	Milk River	Missouri River	Yellowstone River
Low/Moderate Cover Grassland			
Agricultural Land-Dry Crop (Hay)			
Agricultural Land-Dry Crop (Wheat and other crops)		x	
Agricultural Land-Irrigated	x		
Mixed Riparian	x	x	x
Wetland	x	x	

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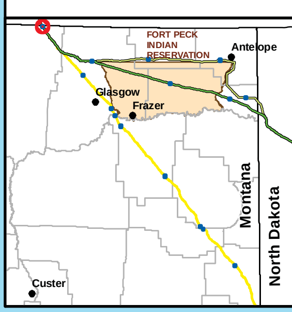

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternatives A, A1A, B: PS-09

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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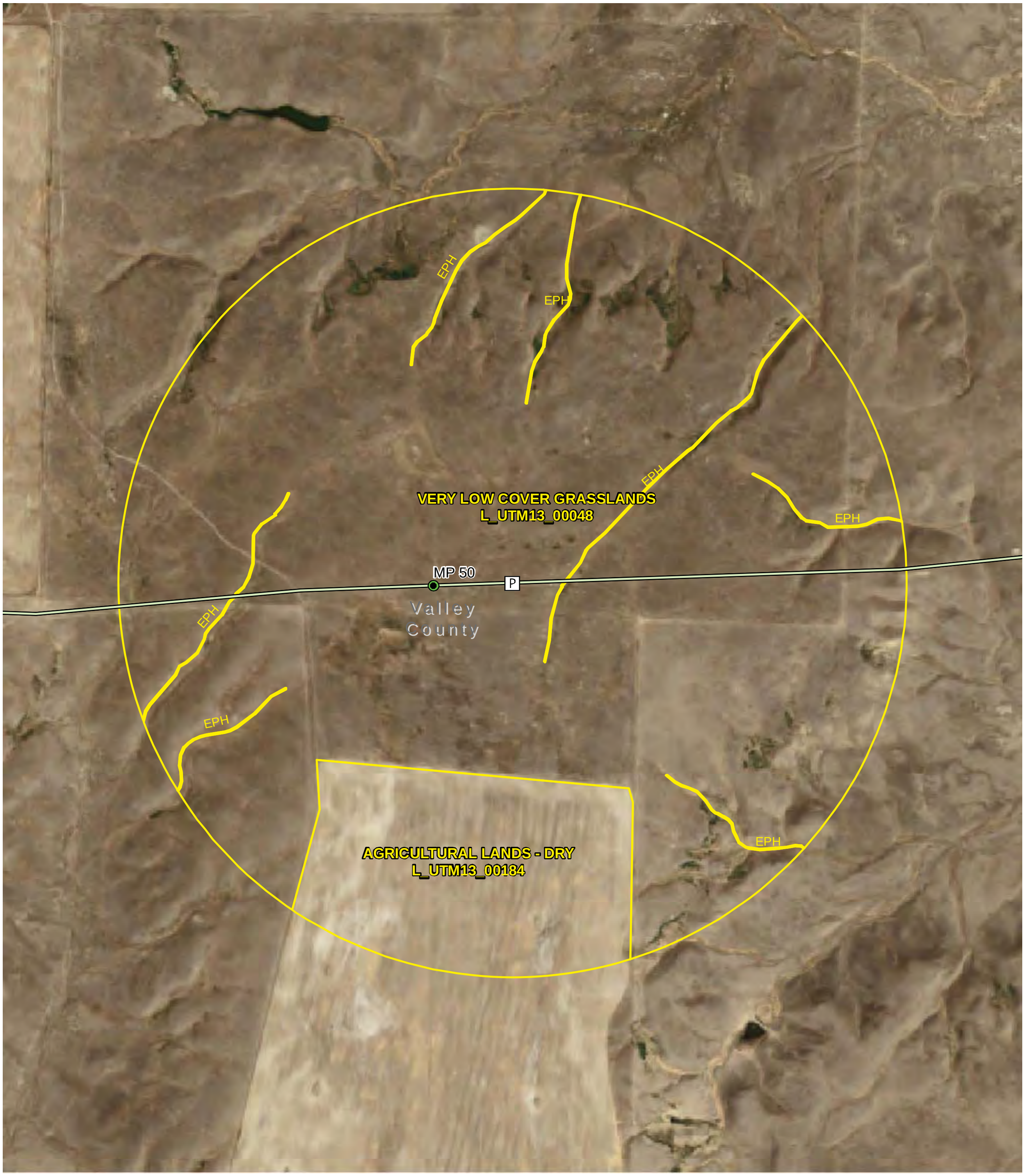
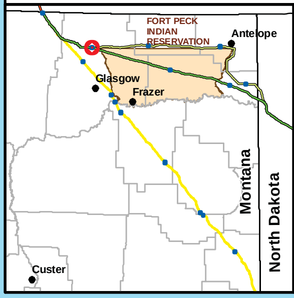




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

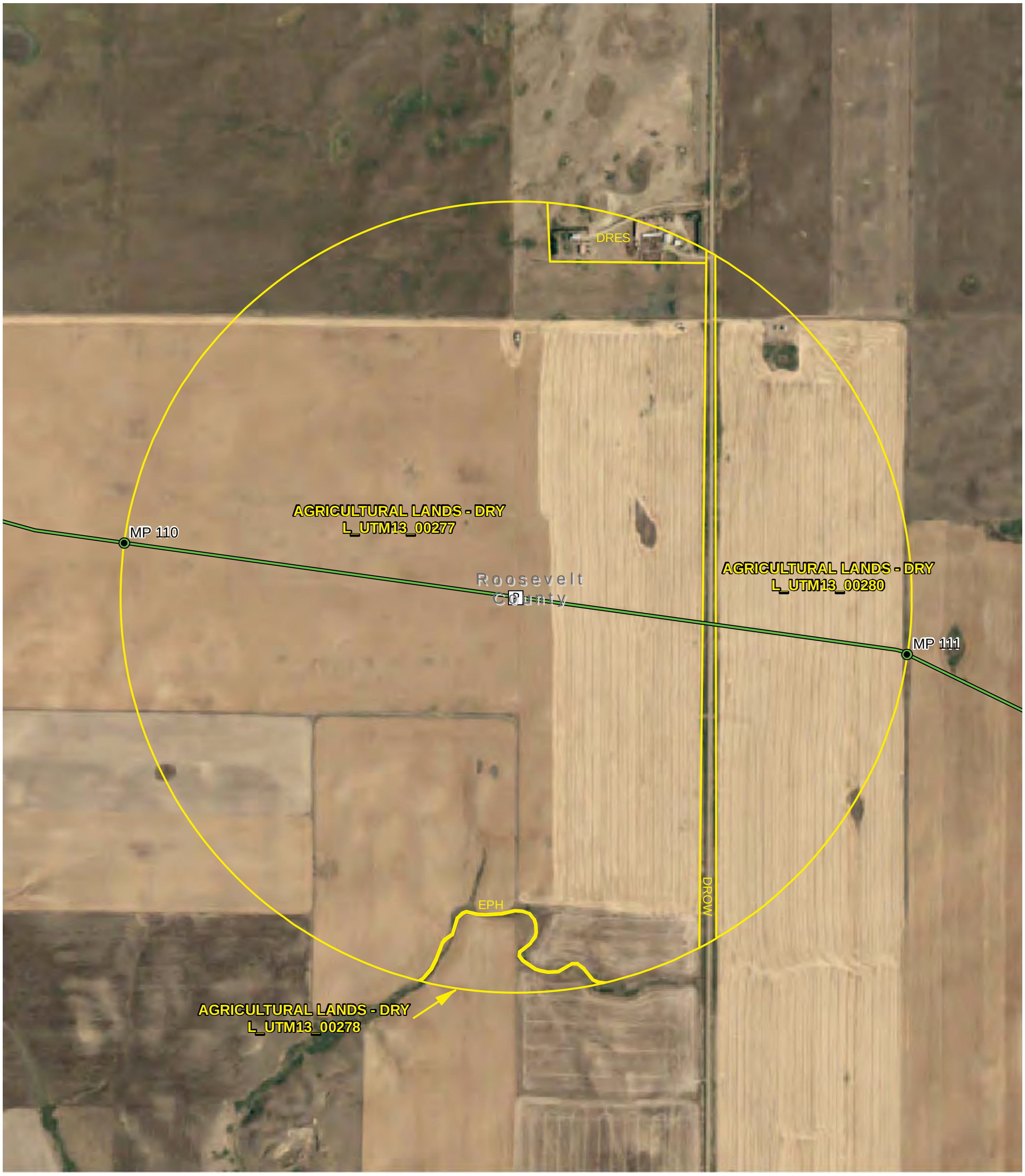
ConocoPhillips TransCanada

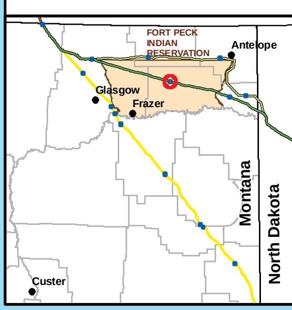
Landcover Types

Alternatives A, A1A: PS-10

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative A: PS-11

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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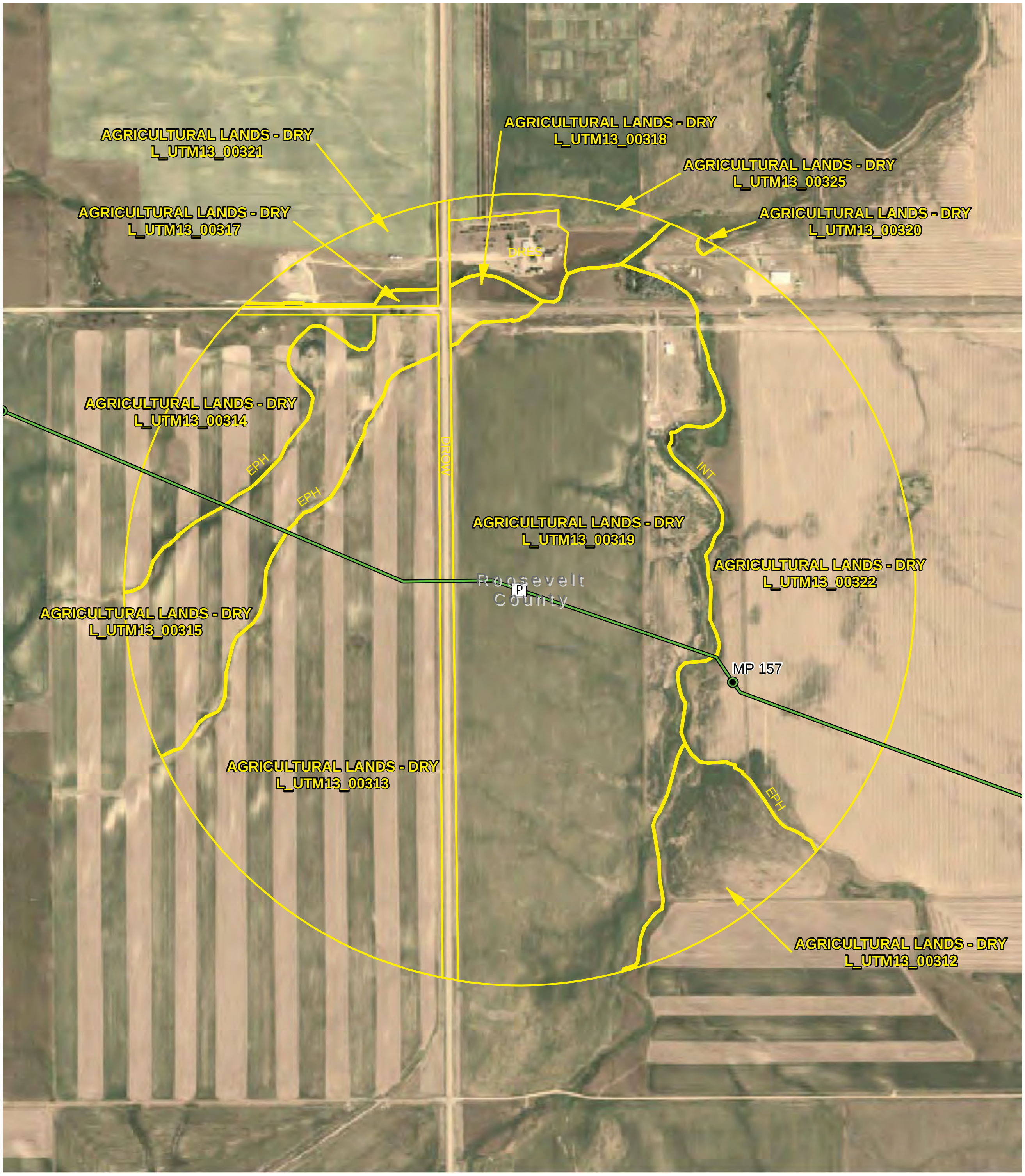
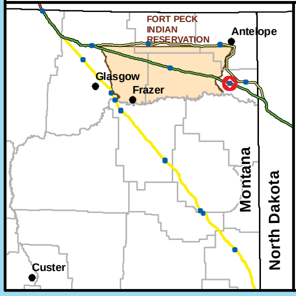




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

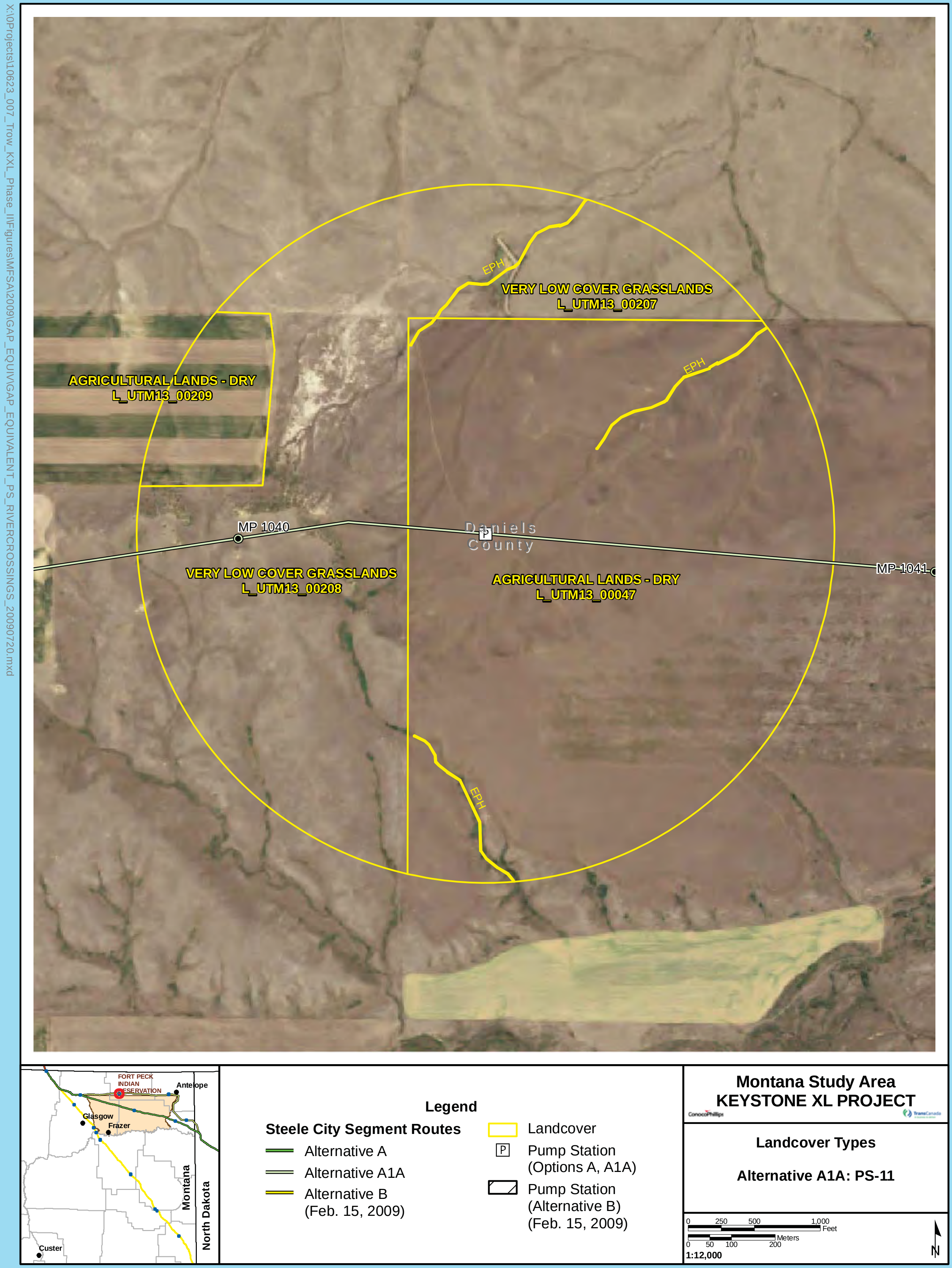
ConocoPhillips TransCanada

Landcover Types

Alternative A: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N



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EPH
VERY LOW COVER GRASSLANDS
L_UTM13_00207
AGRICULTURAL LANDS - DRY
L_UTM13_00209
EPH
MP 1040
Daniels
County
MP 1041
VERY LOW COVER GRASSLANDS
L_UTM13_00208
AGRICULTURAL LANDS - DRY
L_UTM13_00047
EPH
FORT PECK
INDIAN
RESERVATION
Antelope
Glasgow
Frazer
Montana
North Dakota
Custer
Legend
Steele City Segment Routes
Alternative A
Alternative A1A
Alternative B
(Feb. 15, 2009)
Landcover
Pump Station
(Options A, A1A)
Pump Station
(Alternative B)
(Feb. 15, 2009)
Montana Study Area
KEYSTONE XL PROJECT
Landcover Types
Alternative A1A: PS-11
0 250 500 1,000
Feet
0 50 100 200
Meters
1:12,000
N

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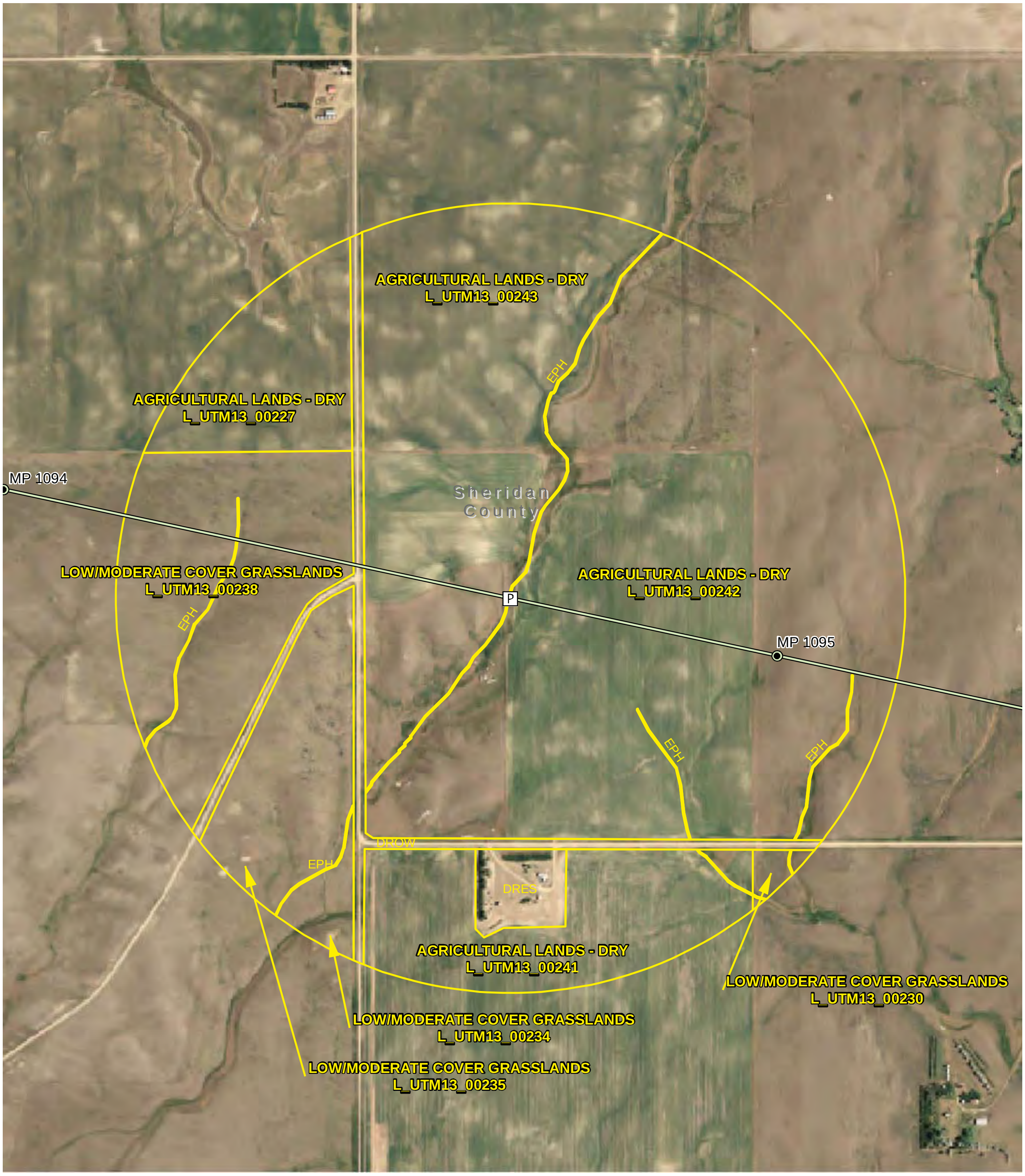
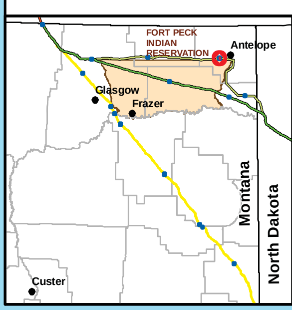




Legend

Steele City Segment Routes
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

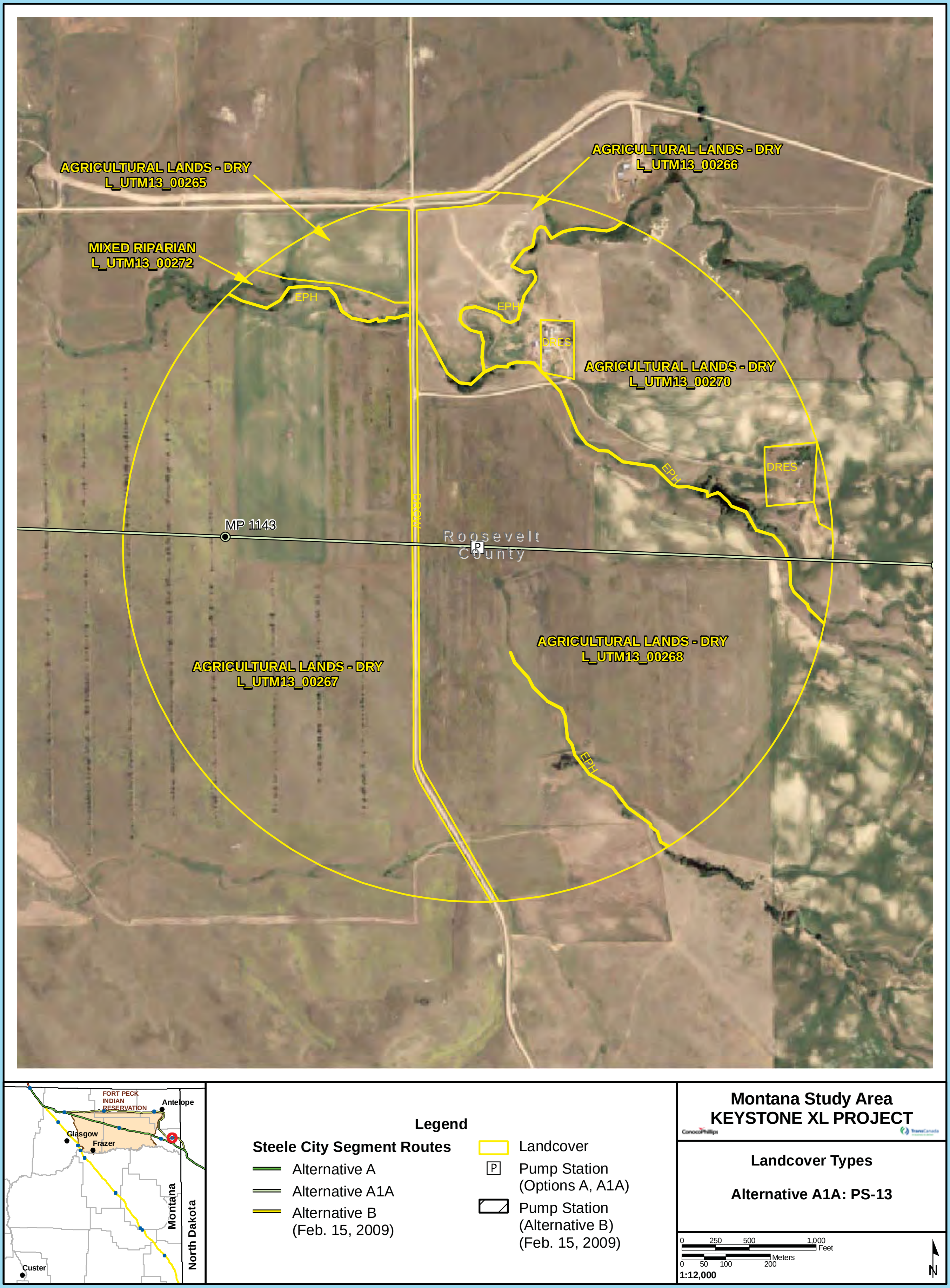
ConocoPhillips TransCanada

Landcover Types

Alternative A1A: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N



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Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative A1A: PS-13

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

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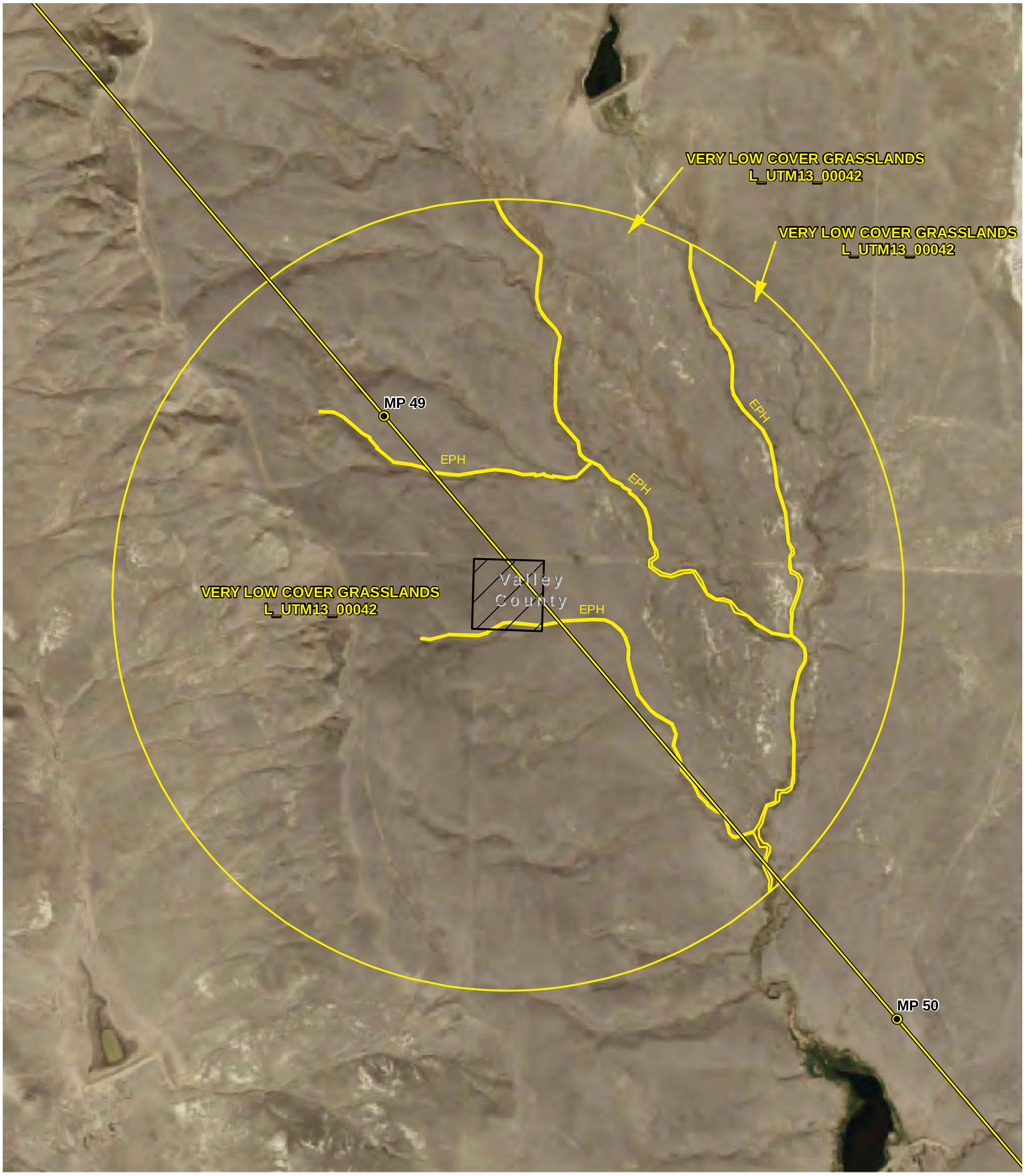

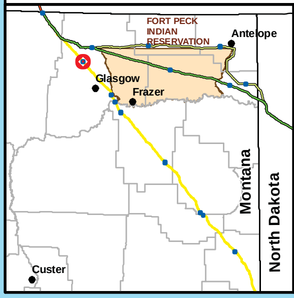

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative B: PS-10

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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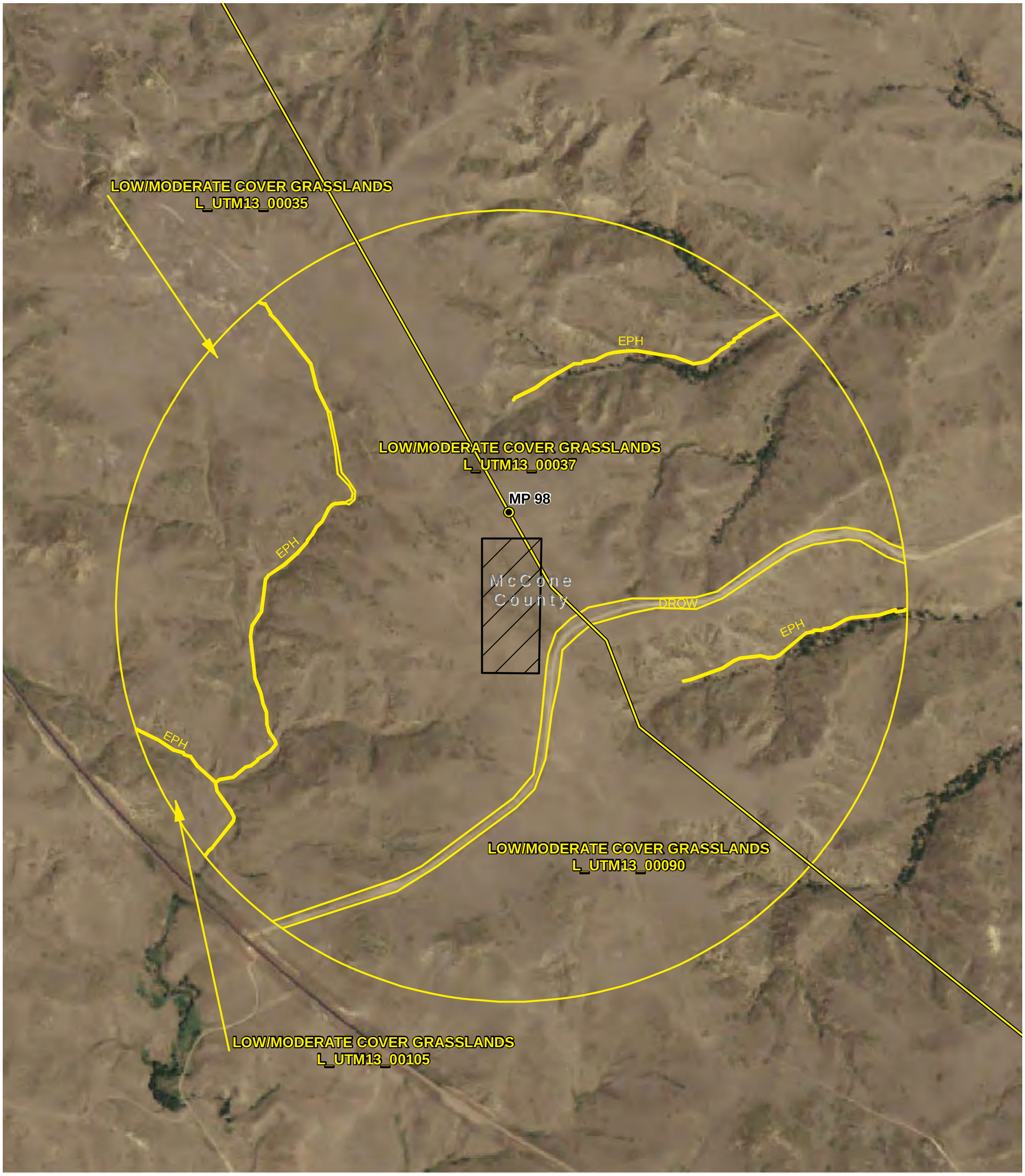

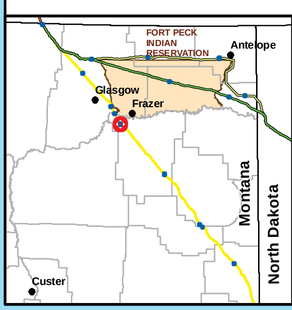

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative B: PS-11

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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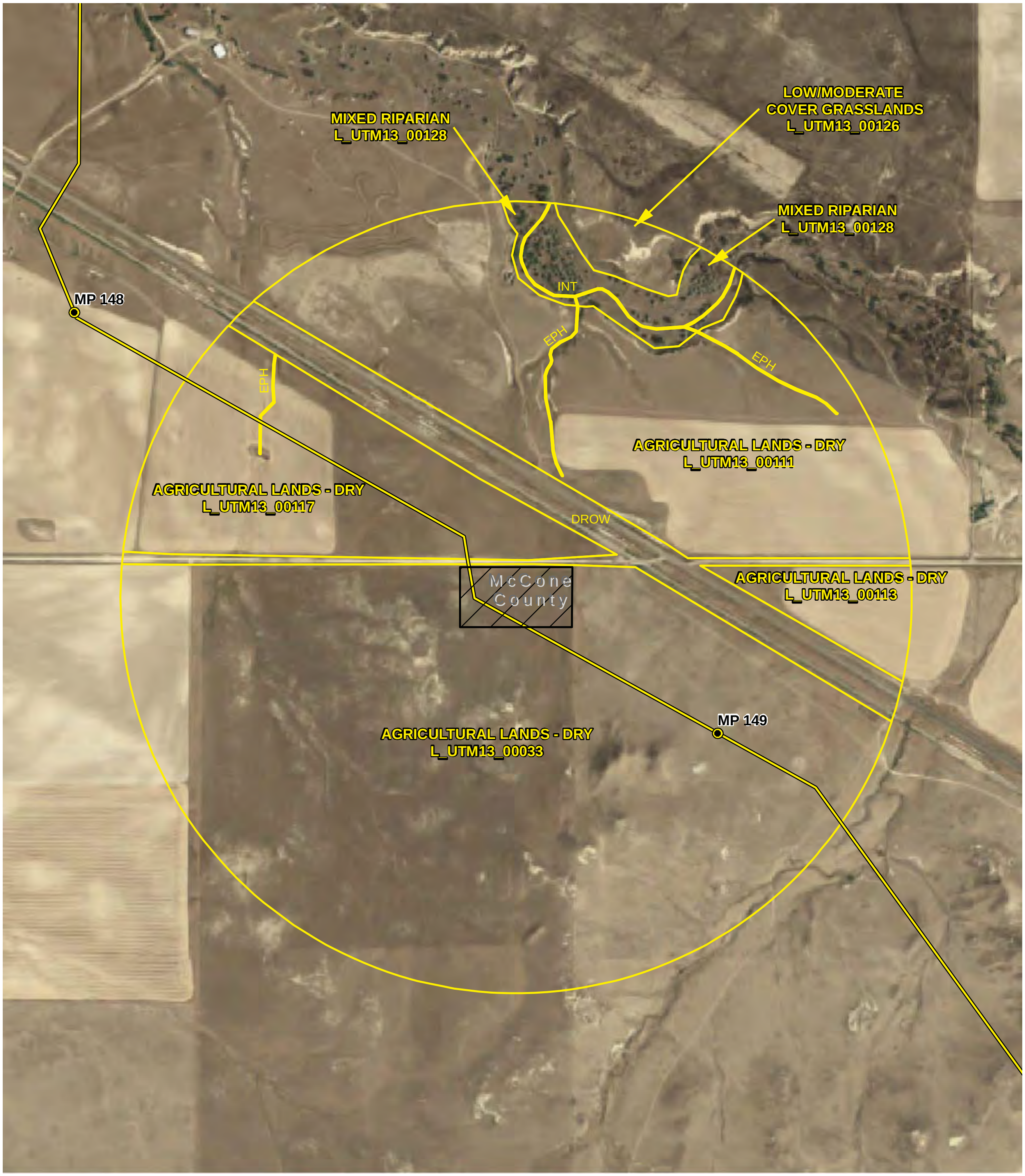
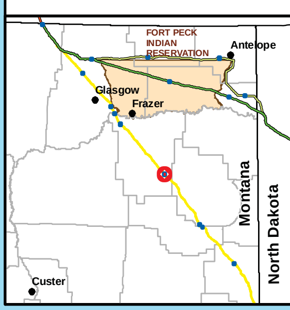




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

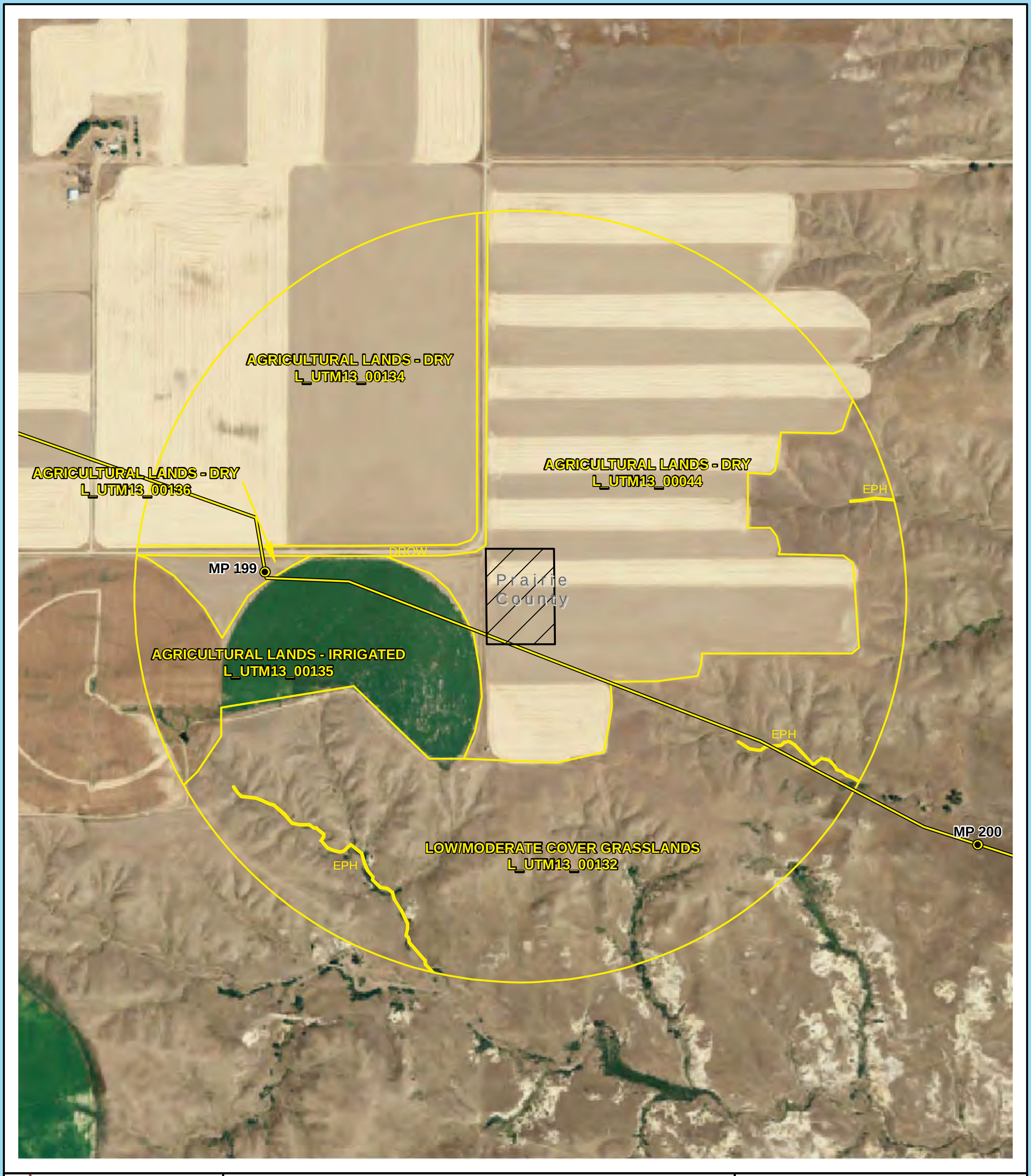
ConocoPhillips TransCanada

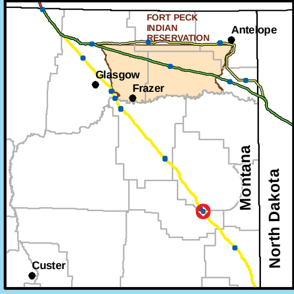
Landcover Types

Alternative B: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative B: PS-13

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000
N

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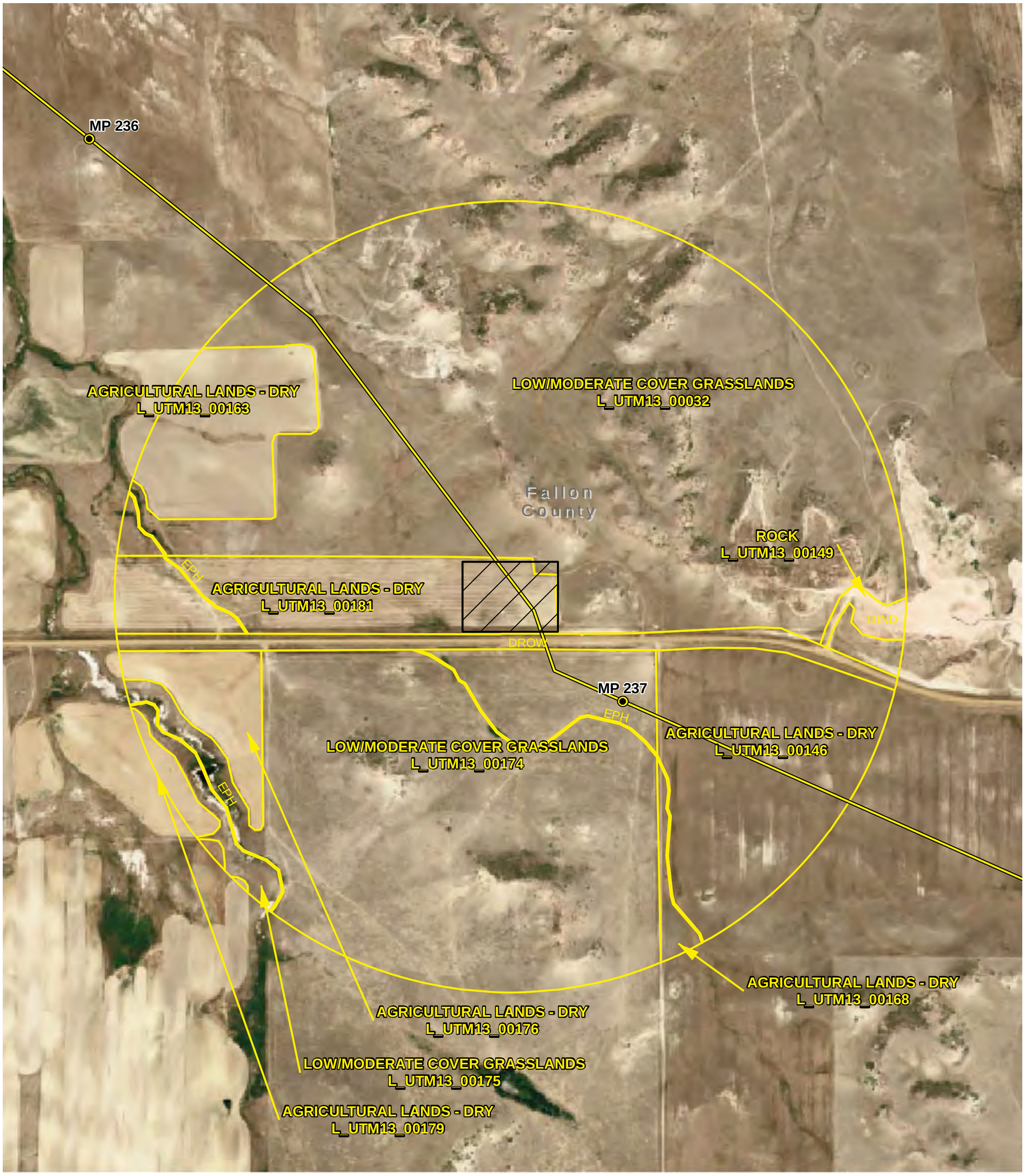

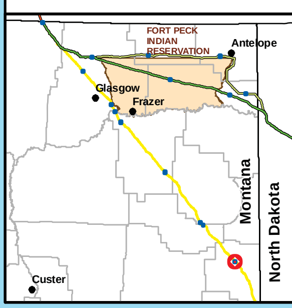

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative B: PS-14

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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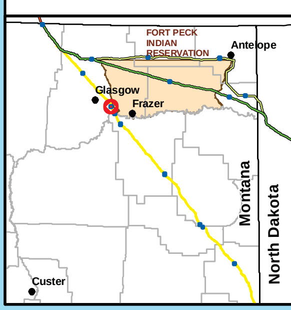

Legend

Steele City Segment Routes
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Milk River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000
N

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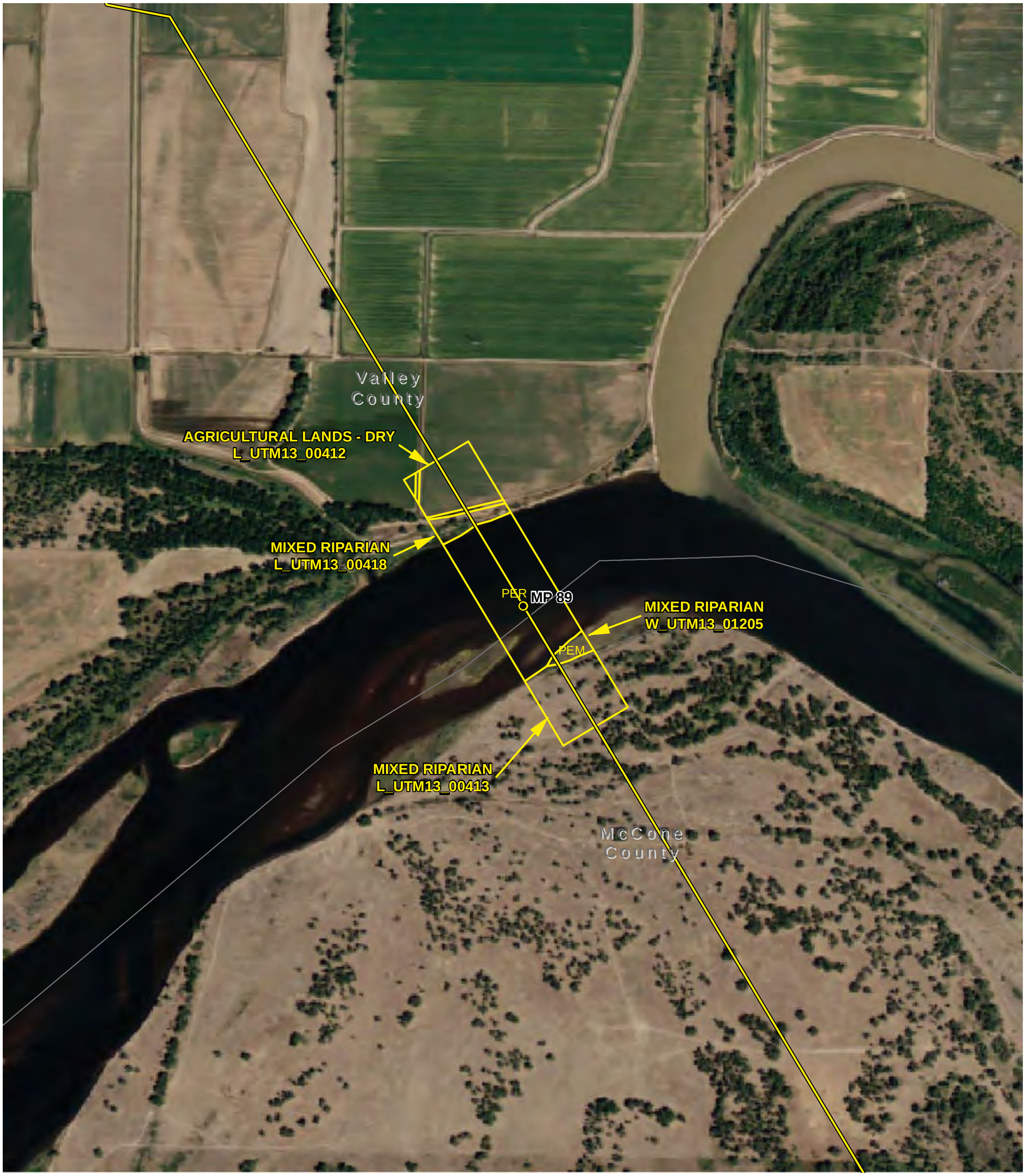
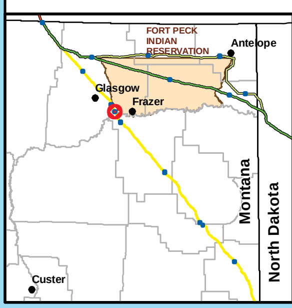




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

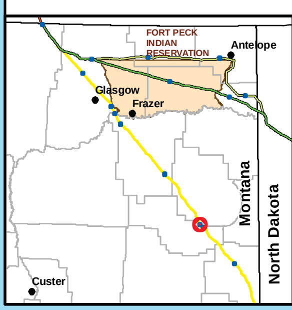
Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Missouri River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N



Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Yellowstone River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

Clarification for Section 3.8(1)(c)(iii)(C)

DEQ Request:

> 3.8(1)(c)(iii)(C) for liquid pipelines, any additional waters where aquatic habitats could be adversely affected by a liquid spill or leak;

Keystone Response:

Attachment D, Section 3 estimates incident frequency conservatively as 1 release in any 1-mile segment every 7,500 years along the Project in Montana. A hypothetical release would have a 50 percent probability of being 3 barrels or less; 35 percent probability of being between 3 and 100 barrels; 10 percent probability of being between 100 and 1,000 barrels; 5 percent probability of being between 1,000 and 10,000 barrels; and a 0.5 percent probability of being more than 10,000 barrels. Please note that an amendment to **Attachment D**, Section 4 is also included in this submittal.

The method used to respond to Section 3.8(1)(c)(iii)(C) accounts for 100 percent of the alternative routes, and categorizes all portions of the pipeline that cross or are located near a National Hydrography Dataset (NHD)-defined waterway within one of the categories indicating where impacts might possibly occur. A 500 foot buffer along the pipeline on either side of waterways crossed was included as part of the crossing. All portions of the pipeline within ¼ mile of waterways were analyzed for surrounding topography. It was assumed that product could only travel over flat ground for 200 yards, or for up to ¼ mile over steep terrain with slopes greater than 5 percent. Buffers of ¼ mile were transposed on the routes, and slopes within the buffer were analyzed. Portions of pipeline in each simulated catchment within 200 yards, excluding areas with slopes greater than 5 percent, were identified as pipeline segments that could impact aquatic habitats (PSAH).

In order for impacts to occur, the following circumstances must all surround a release and happen at the same time and place: 1) be within a segment that could contribute to a stream; 2) be of a sufficient size to travel overland and reach the waterway; 3) have water flow in the waterway for transport; 4) have presence of aquatic habitat at or downstream from the introduction; and 5) have contaminant in a concentration (release size) great enough to impact the aquatic habitat. It is highly unlikely that all these circumstances would occur at the same time causing an impact to aquatic habitat. **Mapbook 8** depicts the reaches of stream that might, although highly unlikely, have aquatic habitat impacted by a release. All these factors are shown in **Table 1,** which lists the length of each route's PSAH as an indication of the aquatic habitats that could be adversely impacted by a hypothetical release. All route alternatives have 1 percent or less contributing by direct flow to a perennial waterway. The postulated occurrence interval for theoretical impacts occurring in each category of PSAH along each alternative route is also noted by incident magnitude. **Table 2** contains examples of calculations used to arrive at the occurrence intervals.

Table 1 Categorization by Contribution Method of Pipeline Segments that Could Impact Aquatic Habitats

Contribution Method	Miles of Route	Percent of Route	Potential Exposure of Aquatic Habitat - Occurrence Interval by Incident Size [1] (years)			
			Very Small	Small	Moderate	Large
Route A						
Does not contribute to waterway	64.2	36%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	65.8	36%	45,707	32,648	38,089	30,471
Direct flow to Intermittent waterway	48.6	27%	3,094	4,420	15,471	30,942
Overland flow to Perennial waterway	1.3	1%	231,348	165,248	192,790	154,232
Direct flow to Perennial waterway	0.8	<1%	18,797	26,853	93,985	187,970
Total	180.7	100%	-	-	-	-
Route A1A						
Does not contribute to waterway	96.3	47%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	64.7	31%	46,484	33,203	38,737	30,989
Direct flow to Intermittent waterway	42.4	21%	3,547	5,067	17,733	35,466
Overland flow to Perennial waterway	0.7	<1%	429,646	306,890	358,038	286,430
Direct flow to Perennial waterway	1.4	1%	10,741	15,344	53,706	107,411
Total	205.5	100%	-	-	-	-

Table 1 Categorization by Contribution Method of Pipeline Segments that Could Impact Aquatic Habitats

Contribution Method	Miles of Route	Percent of Route	Potential Exposure of Aquatic Habitat - Occurrence Interval by Incident Size [1] (years)			
			Very Small	Small	Moderate	Large
	Route B					
Does not contribute to waterway	79.5	28%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	130.8	46%	22,993	16,424	19,161	15,329
Direct flow to Intermittent waterway	69.0	24%	2,179	3,113	10,897	21,794
Overland flow to Perennial waterway	1.4	<1%	214,823	153,445	179,019	143,215
Direct flow to Perennial waterway	2.0	1%	7,519	10,741	37,594	75,188
Total	282.7	100%	-	-	-	-

[1] Incident size: Very small=3 barrels; Small=50 barrels; Moderate=1,000 barrels; Large=10,000 barrels.

Occurrence interval calculations account for probability of each spill size (Att. D, Section 3.2), probability of flow in the waterway (Perennials flow 100%, Intermittent flow 50% of time), probability of resources being present (100% Perennial, 20% Intermittent have resources), and probability of spill size traveling overland to waterway (Very small = 5%, Small = 10%, Moderate = 30%, Large = 75%).

Table 2 Examples of Calculations of the Occurrence Intervals by Incident Size

Very Small Size - Overland flow to Intermittent waterway	One incident divided by the following denominator: Total miles (for Route A, 65.8 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (very small, 0.5) * spill size's assumed probability of reaching the waterway via overland flow (very small, 0.05) * assumed probability of flow in the waterway (intermittent, 0.5) * assumed presence of a resource downstream in the waterway (intermittent, 0.2). 1 incident / (65.8 miles * 0.000133 incidents/mile/year * 0.5 * 0.05 * 0.5 * 0.2) = 45,707 years

Table 2 Examples of Calculations of the Occurrence Intervals by Incident Size

Small Size **Direct flow to Intermittent waterway**	One incident divided by the following denominator: Total miles (for Route A, 48.6 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (small, 0.35) * assumed probability of flow in the waterway (intermittent, 0.5) * assumed presence of a resource downstream in the waterway (intermittent, 0.2). 1 incident / (48.6 * 0. 000133 incidents/mile/year * 0.35 * 0.5 * 0.2) = 4,420 years
Moderate Size Overland flow to Perennial waterway	One incident divided by the following denominator: Total miles (for Route A, 1.3 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (moderate, 0.1) * spill size's assumed probability of reaching the waterway via overland flow (moderate, 0.3) * assumed probability of flow in the waterway (perennial, 1.0) * assumed presence of a resource downstream in the waterway (perennial, 1.0). 1 incident / (1.3 miles * 0. 000133 incidents/mile/year * 0.1 * 0.5 * 1.0 * 1.0) = 192,790 years
Large Size – **Direct flow to Perennial waterway**	One incident divided by the following denominator: Total miles (for Route A, 0.8 miles) * probability of a spill (0.000133 incidents/mile*year) * spill size's probability of occurring (large, 0.05) * assumed probability of flow in the waterway (perennial, 1.0) * assumed presence of a resource downstream in the waterway (perennial, 1.0). 1 incident / (0.8 miles * 0. 000133 incidents/mile/year * 0.05 * 1.0 * 1.0) = 187,970 years

Attachment D, Section 4.2.2.4 discusses the potential impacts to aquatic habitats. **Tables 4-4** through **4-11** of **Attachment D** contain details of potential impacts according to stream size and hypothetical release size. Please refer back to **Tables 1** and **2** in **Attachment P** pages P-71 to P-81 for descriptions of aquatic habitat, special use sites, and fish distribution in perennial streams near the Keystone XL Project Alternatives.

Montana's Comprehensive Fish and Wildlife Conservation Strategy (MCFWCS) emphasized two aquatic focus areas within the project area, the Lower Missouri River and the Lower Yellowstone River. Portions of Routes A and A1A are in the Lower Missouri River area and a portion of Route B is within the Lower Yellowstone River area. These prairie stream drainages include large perennial warmwater rivers, breaks and coulees, pothole lakes, and intermittent streams (MCFWCS 2005). There are a total of 55 aquatic (2 crayfish, 3 mussel, and 50 fish) species that are found within the Lower Missouri River Focus area and 65 aquatic (1 crayfish, 3 mussel, and 60 fish) species within the Lower Yellowstone River Focus Area (MCFWCS 2005). After meetings between Keystone representatives and Montana Fish, Wildlife, and Parks (MFWP) in 2008 and 2009, the northern redbelly dace x finescale dace and pearl dace were the only species of concern that have the potential to occur within intermittent streams with suitable habitat crossed by the Project.

Conclusion

This conservative analysis of the proposed Project alternatives coupled with the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis for Montana (Attachment D) demonstrates that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently risk of a release that would impact aquatic habitats is extremely low. Compliance with regulations, application of Keystone's IMPs and Emergency Response Plan (ERP), as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline.

Clarification for Section 3.8(1)(c)(iv)

DEQ Request:

> 3.8(1)(c)(iv) for a liquid pipelines facility, a detailed assessment of the consequences of a spill or leak downstream of each crossing of a perennial waterway, including a description of the principal resources that would be affected, the magnitude of the impact to fishery resources and habitat, and a description of proposed spill detection, containment, and cleanup techniques;

Keystone Response:

Table 1 below indicates perennial waterway crossings for each route and the associated resources that could be impacted by a hypothetical release at each crossing along with shading that indicates the magnitude of impacts that might be expected from a hypothetical release. Resources were identified through multiple sources. Fisheries that are downstream of potential hypothetical releases at perennial waterway crossings are the same as those listed in **Attachment P**, pages P-71 to P-81. Public water supply system intakes were identified through data from MDEQ (MDEQ 2009). USGS 24K topographic maps were also utilized in the analysis of resources.

Table 2 below lists streamflow statistics for perennial streams crossed by the alternative routes where gaging station records were available. These perennial streams can be classified according to their average annual flow by the stream categories within Table 4-1 in the Project Pipeline Risk Assessment and Environmental Consequences Analysis for Montana (**Attachment D**).

Attachment D, Section 4.2.2.4 provides information regarding the magnitude of possible impacts to aquatic ecosystems. The magnitude of effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of crude oil spilled, the species assemblage present, climate, and the spill response tactics employed. If a hypothetical release were to occur along a PSAH to the streams and rivers referenced in **Table 2**, the magnitude of the impacts can be estimated to those specific streams by referencing the average annual flow at the gage (after considering any necessary adjustment for tributaries and/or distance from gage to crossing) to **Attachment D**, Section 4.2.2.4.

Hypothetical release frequency and size is discussed in Chapter 1, Section 1.5.5 of the MFSA application on page 1-34. Hypothetical release detection is described in Chapter 1, Section 1.5.6 on pages 1-34 and 1-35.

Containment and cleanup will be addressed in the Spill Prevention, Control and Countermeasure (SPCC) Plan for construction and in the Emergency Response Plan (ERP) for operations. A draft SPCC Plan was provided in the April 7, 2009 (green) supplemental filing. An outline of the ERP can be found in **Attachment B**. The Keystone XL ERP, which is based on the previously PHMSA- approved Keystone ERP, is under development and will be filed with PHMSA for review prior to operations.

Conclusion

This conservative analysis of the proposed Project alternatives coupled with the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis for Montana (**Attachment D**) demonstrates that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently, risk of a release that would impact principal resources or fishery resources and habitats is minimal. Compliance with regulations, application of Keystone's Integrity Management Program and ERP, as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline.

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval[2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Route A									
Frenchman Creek	Low	25.0	0.20	Frenchman Reservoir	1.9	73,714	105,305	368,568	737,137
Poplar River	Lower Moderate	125.5	0.21	--	--	71,950	102,786	359,751	719,502
Big Muddy Creek	Low	146.9	0.20	--	--	76,722	109,603	383,612	767,224
Shotgun Creek	Low	168.0	0.19	Reservoir (unknown name, on-channel downstream from Bainville)	9.5	79,5644	113,663	397,820	795,640
Route A1A									
Frenchman Creek	Low	25.0	0.20	Frenchman Reservoir	1.9	73,714	105,305	368,568	737,137
West Fork Poplar River	Low	96.8	0.42	--	--	35,804	51,148	179,019	358,038
Poplar River	Low	110.7	0.24	--	--	63,719	91,027	318,593	637,186

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval [2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Big Muddy Creek	Low	155.7	0.20	--	--	75,566	107,951	377,829	755,658
Lake Creek	Low	172.3	0.20	--	--	75,947	108,496	379,737	759,474
East Shotgun Creek	Low	194.3	0.19	--	--	79,564	113,663	397,820	795,640
Route B									
Frenchman Creek	Low	25.9	0.19	Frenchman Reservoir	0.6	77,127	110,181	385,633	771,265
Rock Creek	Low	39.2	0.18	--	--	83,542	119,346	417,711	835,422
Milk River	Lower Moderate	82.7	0.20	Town of Nashua PWS ID # MT0000297 (alluvial wells)	3.0	73,490	104,986	367,450	734,900
Missouri River	High	88.9	0.25	Important aquatic ecosystem	0.0	60,907	87,010	304,537	609,073
Yellowstone River	Upper Moderate	195.9	0.21	Important aquatic ecosystem	0.0	73,022	104,317	365,109	730,218

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval [2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Cabin Creek	Low	201.3	0.19	--	--	73,134	104,477	365,670	731,340
Cabin Creek	Low	201.9	0.13	--	--	79,433	113,476	397,164	794,329
Sandstone Creek	Low	244.1	0.18	--	--	119,540	170,772	597,702	1,195,405
Little Beaver Creek	Low	262.2	0.18	--	--	82,441	117,773	412,206	824,411
Boxelder Creek	Low	281.2	0.14	--	--	81,982	117,117	409,909	819,818

[1] Based on average annual stream flow after considering any necessary adjustment for tributaries and/or distance from gage to crossing where appropriate, or on stream width when no gage data was available.

[2] Incident size: Very small=3 barrels; Small=50 barrels; Moderate=1,000 barrels; Large=10,000 barrels.

Shading indicates concentrations that could potentially cause acute toxicity to aquatic species according to Attachment D, Table 4-7. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold), lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold), and unshaded areas represent low probability of acute toxicity (< toxicity threshold).

Occurrence interval based on the conservative overall predicted incident frequency of 0. 000133 incidents/mile*year, projected frequencies of each spill volume (Attachment D, Section 3.2), and calculated with miles of CPS per crossing prior to rounding.

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	Approx. MP	USGS Gaging Station Site Number and Name	Gage Direction and Distance from Crossing (miles)	Period of Record	Average Annual Flow (cfs)	Lowest Average Monthly Flow (cfs) [Month]	Highest Average Monthly Flow (cfs) [Month]
Route A							
Frenchman Creek	25.0	Ungaged	-	-	-	- -	- -
Poplar River	125.5	06181000 Poplar River near Poplar MT	downstream 27	1908-2008	115	0.013 [JAN]	4918 [APR]
Big Muddy Creek	146.9	06185110 Big Muddy Creek nr mouth nr Culbertson MT	downstream 21	1982-1992	22	0 [MLT]	778.6 [APR]
Shotgun Creek	168.0	Ungaged	-	-	-	- -	- -
Route A1A							
Frenchman Creek	25.0	Ungaged	-	-	-	- -	- -
West Fork Poplar River	96.9	06180000 West Fork Poplar River near Richland MT	upstream 27	1935-1949 [1]	19 [2]	0 [FEB]	460 [MAR]
Poplar River	110.9	06181000 Poplar River near Poplar MT	downstream 70 [3]	1908-2008	115	0.013 [JAN]	4918 [APR]
		06179000 East Fork Poplar River near Scobey MT	upstream 29	1935-1981 [4]	21 [2]	0 [FEB]	297 [MAR]

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	Approx. MP	USGS Gaging Station Site Number and Name	Gage Direction and Distance from Crossing (miles)	Period of Record	Average Annual Flow (cfs)	Lowest Average Monthly Flow (cfs) [Month]	Highest Average Monthly Flow (cfs) [Month]
Big Muddy Creek	155.8	06183450 Big Muddy Creek near Antelope MT	upstream 12	1979-2008	29	0 [MLT]	850.7 [MAR]
Lake Creek	172.4	Ungaged (below NWR)	-	-	-	- -	- -
East Shotgun Creek	194.4	Ungaged	-	-	-	- -	- -
Route B							
Frenchman Creek	25.9	Ungaged	-	-	-	- -	- -
Rock Creek	39.2	06171000 Rock Creek near Hinsdale MT	downstream 20	1906-1920 [1]	195 [2]	0 [MLT]	1905 [APR]
Milk River	82.7	06174500 Milk River at Nashua MT	downstream 2.2	1940-2008	619	3.42 [AUG]	20930 [APR]
Missouri River	88.9	06132000 Missouri River below Fort Peck Dam MT	upstream 1.9 [3]	1934-2008	9284	832.3 [JUN]	35030 [JUL]
Yellowstone River	195.9	06329500 Yellowstone River near Sidney MT	downstream 90 [3]	1911-2008	12370	1602 [AUG]	77280 [JUN]
Cabin Creek	201.3	Ungaged	-	-	-	- -	- -
Cabin Creek	201.9	Ungaged	-	-	-	- -	- -

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	Approx. MP	USGS Gaging Station Site Number and Name	Gage Direction and Distance from Crossing (miles)	Period of Record	Average Annual Flow (cfs)	Lowest Average Monthly Flow (cfs) [Month]	Highest Average Monthly Flow (cfs) [Month]
Sandstone Creek	244.1	Ungaged	-	-	-	- -	- -
Little Beaver Creek	262.2	Ungaged	-	-	-	- -	- -
Boxelder Creek	281.2	06334630 Box Elder Creek at Webster MT	downstream 2.2	1961-1973	91	0.665 [JUL]	1049 [MAY]

[1] No data for years 1908-1911.

[2] Incomplete data have been used for statistical calculation.

[3] River at Project crossing may be one order of magnitude different than gage indicates due to large tributaries and/or large distance between gage and crossing.

[4] No data for years 1941-1970.

Source: USGS. 2009. National Water Information System: Web Interface. Accessed on May 5, 2009 at http://waterdata.usgs.gov/nwis.

Clarification for Section 3.8(1)(c)(v)

DEQ Request:

> 3.8(1)(c)(v) for any wetlands or other waterfowl habitat downstream from a river crossing that could be adversely affected by a liquid spill or leak, information on seasonal abundance and species composition of waterfowl populations.

Keystone Response:

Wetlands that have the possibility of being affected by a hypothetical release were identified through GIS analysis of the National Land Cover Dataset (NLCD) 2001. Any areas attributed in the NLCD as wetland land cover was considered; "Emergent Herbaceous Wetlands" and "Woody Wetlands" were both present in the area. Any wetlands over 1 acre surface area and intersecting with the hypothetical release paths, along with additional wetlands identified along possibly affected reaches of the Yellowstone and Missouri rivers were categorized and presented to the MFWP in May 2009 for information on waterfowl species composition and seasonal abundance. Based on the response from MFWP, these data are not available and to provide these data, surveys would need to be conducted during three seasons. MFWP advised that specific data on such waterfowl species and seasonal abundance is not available. General information that is available is provided in the discussion below. Based on this discussion, this item should be deemed complete.

Wetland Habitat Downstream of Pipeline Waterway Crossings Along Possible Release Paths

County	Number of wetlands <10 acres	Number of wetlands >10 acres	Mean Size (acres)
Route A			
Phillips	30	6	13
Valley	274	53	9
Roosevelt [1]	279	91	31
Route A Total	583	150	20
Route A1A			
Phillips	30	6	13
Valley	170	57	18
Daniels	93	43	18
Sheridan	98	11	9
Roosevelt	76	13	89
Route A1A Total	467	130	27
Route B			
Phillips	27	6	14

Wetland Habitat Downstream of Pipeline Waterway Crossings Along Possible Release Paths

County	Number of wetlands <10 acres	Number of wetlands >10 acres	Mean Size (acres)
Valley	341	107	23
McCone	208	38	12
Dawson	324	60	8
Prairie	25	1	3
Fallon [2]	280	30	5
Route B Total	1205	242	12

[1] Includes wetlands south of Missouri River actually located in Richland County.

[2] Includes wetlands in Custer County, downstream of Fallon County.

Source: USGS. 2001. National Land Cover Database (NLCD) 2001

The Project is located within the Central Flyway for migrating bird species. Medicine Lake National Wildlife Refuge (NWR), located along and adjacent to routes A and A1A, provides representative information for the seasonal abundance and composition of waterfowl within the Project area. Medicine Lake NWR has long been recognized for it's importance to breeding and migrating waterfowl and was the primary reason for the purchase of the refuge in 1935 (USFWS 2009). Most common nesting ducks are mallard, gadwall, northern pintail, northern shoveler, blue-winged teal, and lesser scaup, with a total of 14 species breeding locally (USFWS 2009). More than 300 pairs of Plains Canada geese breed in the refuge complex (USFWS 2009). Spring and fall migrations bring thousands of waterfowl to the refuge, mostly ducks, Canada and white-fronted geese, and tundra swans, with a smaller number of snow geese (USFWS 2009).

References

Montana Department of Environmental Quality (MDEQ). 2009. Source Water Protection Program - Query System. Website accessed on July 7, 2008 and May 6, 2009: http://nris.state.mt.us/wis/swap/swapquery.asp.

Montana Fish Wildlife and Parks (MFWP). 2005. Montana's Comprehensive Fish and Wildlife Conservation Strategy. Montana Fish, Wildlife, & Parks, 1420 East Sixth Avenue, Helena, MT 59620.

US Environmental Protection Agency (USEPA). 1999. DRAFT Standards for National Hydrography Dataset - High Resolution. Website accessed on June 15, 2009: http://nhd.usgs.gov/techref.html

US Fish and Wildlife Service (USFWS). 2009. Medicine Lake National Wildlife Refuge Complex. Website accessed on June 30, 2009: http://www.fws.gov/medicinelake/Wildlife.htm#Birds.

Clarification for Section 17.20.815(6)

DEQ Request:

Design capacity and operational characteristics.

Describe design capacity and operational characteristics for associated facilities.

Keystone Response:

The proposed service to Project pump stations are 115 kilovolt (kV) transmission lines, with a proposed transmission structure matching the TP-115; a single pole, horizontal post insulator design.

Three factors are considered in designing a power line. The first is the voltage characteristic during load flow, or voltage drop. This is a combination of the load current and the resistance of the conductor. Though the final conductor size has not been determined for Project power lines, the conductor will have a minimum ampacity of 560 amps. Using that, the maximum load at 115 kilovolts would be 110 megawatts. For all locations, source voltage is the determining factor in the circuits to be used, not load flow. For example, initial load flow calculations indicate the 115 kV circuit will be needed to maintain the voltage regulation (spread between no-load and loaded circuit voltage) to select Project pump stations. Using this voltage will be more economical rather than adding transformation costs.

The second factor is the power limit of the line. Bulletin 62-5 "Electrical Characteristics of AC Transmission Line Designs" (USDA 1976) outlines a parameter called Surge Impedance Loading, or SIL. The published SIL value for the TP-115 structure proposed for the Project is 36 megawatts (MW), which is the optimum load for a line of this design with a distance equal to 300 miles. A line shorter than 300 miles can be loaded more heavily than 36 MW, and a longer line should be loaded less than that. The longest proposed power line within Montana is approximately 50 miles in length. The published SIL would indicate that a 115 kV line would be able to very capably serve the 25 MW Project loads.

Theoretically, the stability (or power) limit for a transmission line is calculated using the following equation:

Power Max = (0.75 * Voltage (in kilovolts)^2) / line length (in miles)

For a 115 kV circuit, 50 miles in length, that maximum power would be:

- P max = (.75 * 115^2) / 50
- P max = 9920 / 50
- P max = 198 megawatts.

Based on the above formulas, the optimum load for the proposed 115 kV lines lies between 36 and 200 MW, depending upon the conductor size chosen. The distances for each of the proposed transmission lines are known factors. Therefore, the conductor size will vary. Based on current estimates, the minimum conductor size will be at least 397 aluminum conductor steel reinforced (ACSR) or larger.

The third factor considered is limitation of motor starting, or flicker, seen by other users of the circuits interconnecting to the power lines for Project pump stations. The current is lower for the 115 kV line, in comparison to a lower voltage circuit. This assists in mitigation of any flicker or disturbance to the line with motor starting. Thus, the 115 kV rating is desirable for these loads, especially if other customers are fed from the same circuit.

References:

US Department of Agriculture (USDA), Rural Electrification Administration (REA). 1976. Electrical characteristics of REA alternating current transmission line designs. REA Bulletin No 62-5. July 1976.

Clarification to 75.20.1511(9)

(9) Construction camps

DEQ Comment:

Update requested. Keystone has recently indicated that worked camps are being planned in the areas of Nashua and Baker, Montana. To address this rule, please provide a description of the camps planned for the construction crew, and how they will be operated.

Keystone Response:

Based on an in-depth housing analysis and on updated discussions with construction contractors, Keystone plans to use temporary construction camps. These temporary camps will supplement local housing in remote areas of Montana for the duration of construction in the area. Currently, Keystone is considering two camps in Montana, generally situated at the spread breaks between Spreads 1 and 2 and between Spreads 3 and 4.

Each camp will be designed to house approximately 600 people. Camps will consist of prefabricated, modular, dormitory-style units that include heat and air conditioning systems. Camps typically will include sleeping areas with shared and private baths, craft rooms, recreation facilities, telecommunication/media rooms, kitchen/dining facilities, laundry facilities, security/infirmary unit, offices, and wastewater treatment facilities.

Construction camp sites will be approximately 80 acres each in size, of which 30 acres will be used as a contractor yard and 50 acres will be used as the actual camp site. Within the acreage designated for the camp site, space will also be set aside for RVs. The water, electricity, and wastewater for RVs will be tied into one camp system. Camps will be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations. **Table 1** summarizes the regulations and permits required for construction camps based upon preliminary designs of the camps. Final design will be accomplished after bidding and hiring contractors to build and maintain the camps. Keystone will be responsible for obtaining all permits. Due to the timing of engaging a contractor to build and operate the camps, Keystone will acquire permits based upon a preliminary design for each camp.

Where feasible, potable water will be provided by drilling a well. If an adequate water supply cannot be obtained from the well, water will be provided by municipal sources or trucked to each camp. A wastewater treatment facility will be included in each camp to treat wastewater to meet regulatory standards prior to discharge.

In areas where construction camps are used, camps will include a health, safety and environment program, fire and HAZMAT protection programs (NFPA Level 101), and a vector program. Therefore, strains on the public services in areas where camps are employed would be minimal.

Table 1 Construction Camp Permits and Regulations

Agency/State	**Permit/Discussion**
Montana	
Montana DEQ	Public water and sewer (PWS) laws, Title 75, chapter 6, part 1, MCA. Rules at Administrative Rules of Montana (ARM) 17.38 101, and Department Circulars incorporated by reference. Require plan and spec review before construction of a public water or sewer system. Circulars contain design requirements. Requires water quality monitoring of water supply. Sanitation in subdivisions laws, Title 76, Chapter 4, MCA. Rules at ARM Title 17, Chapter 36. If applicable, requirements would be the same as the PWS laws and Circulars for water supply and wastewater. Would require additional review of stormwater systems and solid waste management. (Likely not applicable unless created "permanent" multiple spaces for mobile homes or RVs. 76-4-102(16), MCA.) Water Quality Act Discharge Permits, Title 75, Chapter 5, MCA. Rules at ARM Title 17, Chapter 30. Groundwater discharge permit would be required if a wastewater drain field had a design capacity over 5,000 gpd. ARM 17.30.1022. Air permit for diesel fired generators.
Department of Public Health and Human Services (DPHHS)	Work Camp licensing laws, Title 50, Chapter 52, MCA. Rules at ARM Title 37, Chapter 111, Subchapter 6. Regulations regarding water, sewer, solid waste, and food service. Incorporates DEQ PWS requirements but has additional water and sewer provisions. Administered by DPHHS, Public Health and Safety Division, Communicable Disease Control and Prevention Bureau, Food and Consumer Safety Section.
Counties	Permit required for wastewater systems, Regulations adopted under Section 50-2-116(1)(k), MCA. Adopting state minimum standards promulgated by Board of Environmental Review at ARM Title 17, chapter 36, Subchapter 9. Generally follow state laws for subdivisions, PWS, DEQ-4. Work camp permit required in some counties.

The Project is in the process of identifying existing electric power infrastructure to supply power to each of the construction camps. However, if existing infrastructure is not available, diesel-fired internal combustion engines may be used to supply primary power to one or more of the construction camps. Additionally, even if power line infrastructure to each of the construction camps is available, the Project may install diesel-fired internal combustion engines as emergency back-up generators, to supply power to the camps if electrical power from the local utility is interrupted. To determine preliminary emissions estimates from the diesel-fired generator engines, a worst-case scenario of four, 400-kilowatt generator engines was assumed for installation per camp. This worst-case scenario would occur if electrical power to one of the construction camps was unavailable. Each of the diesel-fired engines would be “Tier 3” certified engines and are assumed to operate 8,760 hours per year. Preliminary estimates of emissions associated with four primary power generators are included in **Table 2** and preliminary estimates of emissions from one backup generator are included in **Table 3**.

Table 2 Four Power Generators

Compound	Emission Factor	Units	Hourly (lbs/hr)	Annual (tons/year)
NO_X + NMHC	3.0	g/bhp-hr	14.11	61.80
CO	2.6	g/bhp-hr	12.35	54.07
PM	0.15	g/bhp-hr	0.71	3.09
SO_x	0.054	lb/MMBtu	0.98	4.31
Pb	9.0	lb/10^{12} BTU	16e-04	7.2e-04

Table 3 One Back-up Generator

Compound	Emission Factor	Units	Hourly (lbs/hr)	Annual (tons/year)
NO_X + NMHC	3.0	g/bhp-hr	3.53	15.45
CO	2.6	g/bhp-hr	3.09	13.52
PM	0.15	g/bhp-hr	0.18	0.77
SO_x	0.054	lb/MMBtu	0.25	1.08
Pb	9.0	lb/10^{12} BTU	4.1E-05	1.8E-04

The Project also will be subject to air quality regulatory programs in Montana if generator engines are needed to supply power at one or more of the construction camps.

New Source Performance Standard regulations establish a standard of performance for new, modified, or reconstructed sources, which fall into any specified source category, regardless of geographic location or the existing ambient air quality. The standards define emission limitations for a particular source group. The NSPS potentially applicable to the Project, which may apply to the construction camp generator engines, include Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, as discussed below.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

In 2006, USEPA promulgated this rule that applies to stationary diesel-fired internal combustion (IC) engines and that sets standards for oxides of nitrogen (NO_X), CO, PM, and non-methane hydrocarbon (NMHC), along with limiting SO_2 emissions through use of lower sulfur fuel. This regulation may apply to the generator engines at the construction camps, depending upon the manufacture dates of the engines. The primary burden of the proposed regulation falls on IC engine manufacturers, rather than on owners/operators, since engine manufacturers must certify their engines to the emission standards.

The ARM, Title 17, lays the framework for the state air quality laws and regulations in Montana. The ARM establishes the legal authority of the MDEQ to enforce the regulations set forth by the Clean Air Act of Montana, Title 75. Chapter 8 of Title 17 of the ARM identifies the air quality regulations that would apply to the generators at the construction camps, if the generators are installed. Specifically, Subchapter 7 includes provisions for the construction and operating permit requirements of air contaminant sources. These regulations would apply if the construction camp generators are installed at construction camps in Montana.

The diesel-fired generator engines that may be located at one or more of the construction camps in Montana if line power is not acquired will have criteria pollutant emission levels below 100 tpy. Therefore, the construction camps would not be subject to Title V operating permit requirements. However, if the generator engines are located at the construction camps long enough for them to be considered stationary sources, they would be subject to state minor source air permitting requirements. The diesel-fired engines may be subject to Subpart IIII of the NSPS, if the engines are manufactured after the regulatory applicability date as specified in the regulation for that engine power rating. The construction camps will comply with Montana air quality permitting requirements if it is determined that installation of the generator engines at one or more locations is required.

Wastewater will be treated with a system established on the site to handle the anticipated volume of wastewater discharge from the camp and to meet the effluent standards required in each county where the camps are located. The details of the wastewater treatment facilities will be provided once a contractor has been selected.

The camp will require approximately 45,000 gallons of water per day. If water wells cannot be installed or can not provide this volume of water, Keystone will look to nearby municipal systems and purchase the water required.

Clarification for Section 17.20.1512(7)(a-g)

DEQ Request:

7) Detailed Spill Contingency Plan

a. Immediate Notification Procedures

b. Type and Location of Emergency Response Personnel and Equipment

c. Any Mutual Aid Agreements to supply Personnel and Equipment and Respond in the Event of a Spill

d. Response Procedures

e. Equipment Testing Procedures

f. Frequency of Field Training Exercises

g. Plan Update Procedures

Keystone Response:

7) **Detailed Spill Contingency Plan**

As an interstate liquids pipeline, Keystone is required by federal regulation to develop a detailed Emergency Response Plan (ERP or Plan) prior to commencing pipeline operations. The Plan must be filed for review with the US Department of Transportation (US DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA). Keystone developed an ERP for the initial Keystone Pipeline project. That ERP was approved by PHMSA in January 2009. Keystone is now in the process of preparing an ERP specifically for the Keystone XL Pipeline. The Keystone XL ERP will utilize the work done on the Keystone ERP to the extent applicable. The Keystone XL ERP also will be customized to include numerous location- and project-specific elements. The Keystone XL ERP will be filed with PHMSA prior to commencing operations. The ERP cannot be filed until such time as final pipeline design is completed and route approvals received so that site specific information can be developed for incorporation into the Plan. Keystone will liaise with state and local officials to ensure coordination with local and state offices of disaster services as the Plan is further developed.

The Keystone XL Project ERP will have five broad components: the Plan itself; resources (equipment, personnel, and contractors); training; continuous improvement; and public awareness. Each component is integral to the build up and success of the program and needs to proceed collectively once implemented.

The overall strategy behind the ERP is to manage risks and be able to address the potential consequences in the event of a release. The ERP needs to satisfy regulatory requirements and be user friendly and practical for operations. The ERP must be understood and implemented by field operations which will be achieved through training programs.

Emergency management will be built into pipeline operations through a series of training exercises that direct operations to test and maintain the ERP on an on-going basis.

The Plan is being developed using proprietary software called “ePlan”. This will mean that the entire Plan will be electronic and revised on a continual basis making the Plan current all the time. Administratively, the Plan will be part of the corporate Emergency Management System.

The Plan will include Response Zones, notifications, public official listings, contractors, technical response procedures, forms, and other elements.

a. **Immediate Notification Procedures**

Keystone is required by law to notify immediately the National Response Center (NRC) if an event: (1) violates water quality standards; (2) creates a sheen on water; or (3) causes a sludge or emulsion to be deposited beneath the surface of the water on upon adjoining shorelines (40 CFR Part 112). In addition to the NRC notification, Keystone will make timely notifications to other agencies, including the appropriate local emergency planning committee, sheriffs department, US Environmental Protection Agency (USEPA), and affected landowners.

b. **Type and Location of Emergency Response Personnel and Equipment**

The specific locations of Keystone's emergency responders and equipment will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP. Keystone will base Company emergency responders consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195. Keystone's response time to transfer additional resources to a potential leak site will follow an escalating tier system, with Keystone's initial emergency responders capable of reaching all locations within Montana within 6 hours in the event of a spill. Typically, emergency responders will be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings,
- Populated and urbanized areas, and
- Unusually sensitive areas, including drinking water locations, ecological, historical, and archaeological resources.

Consistent with industry practice and in compliance with applicable regulations, the types and amount of emergency response equipment based on worst case discharge volumes that will be pre-positioned for access by Keystone will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP, but prior to commencing line fill.

Emergency response equipment will be strategically situated along the pipeline route. Types of emergency response equipment are detailed below. Keystone will engage a national response contractor who will have access to and be able to provide large quantities of equipment to meet Oil Spill Response Organization (OSRO) requirements. Keystone also will have a number of local contractors available to provide emergency response assistance as required. Finally, Keystone will have a contract Spill Management Team available to respond and assist with incident management in the event of a significant release.

The overall strategy is to purchase and situate enough equipment for a Tier 1 response in each Response Zone. A Tier 1 response means a company leak that can be contained, controlled, and cleaned up using primarily Company personnel within a defined period of time from when a release is discovered, which, according to US Department of Transportation (US DOT) regulations, is 6 to 12 hours, depending on the location. It is important to note that the tiered level of response pertains to time requirements and is completely independent of spill threshold volumes. Although volumes are important for determining the correct amount of equipment needed for the tiered response times, they are not intended to define a spill threshold amount. It is well understood by the US DOT/PHMSA that once a Tier 1 requirement is satisfied, Keystone will cascade equipment to Tiers 2 and 3 until enough equipment is available to respond to the Worst Case Discharge amount.

The equipment will be stored strategically along the pipeline typically in the center of the Response Zone and accessible by Keystone and contract staff.

Consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195, the types of emergency response equipment that will be pre-positioned for access by Keystone are highlighted below:

- Pick-up trucks, one-ton trucks and vans;
- Vacuum trucks;
- Work and safety boats;
- Containment boom;
- Skimmers;
- Pumps, hoses, fittings and valves;
- Generators and extension cords;
- Air compressors;
- Floodlights;
- Communications equipment including cell phones, two way radios and satellite phones;
- Containment tanks and rubber bladders;
- Expendable supplies including absorbent booms and pads;
- Assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws;
- Ropes, chains, screw anchors, clevis and other boom connection devices;
- Personnel Protective Equipment (PPE) including rubber gloves, chest and hip waders and H_2S, O_2, LEL and benzene detection equipment; and
- Wind socks, signage, air horns, flashlights, megaphones and fluorescent safety vests.

Additional equipment including helicopters, fixed wing aircraft, all-terrain vehicles (ATV's), snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders may also be accessed depending upon site-specific circumstances. Other types, numbers and locations of equipment will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP.

c. Any Mutual Aid Agreements to Supply Personnel and Equipment and Respond in the Event of a Spill

Keystone will investigate opportunities to form and participate in mutual aid agreements once the pipeline begins operations.

d. Response Procedures

SCADA System

Keystone will be operated from an Operations Control Center (OCC), which will be manned on a 24 (hrs/day) x 7(days/week) basis. Keystone will utilize a Supervisory Control and Data Acquisition (SCADA) system to remotely monitor and control the pipeline system. Keystone's SCADA system will include:

- Redundant fully functional backup OCC available for service at all times;
- Automatic features installed as integral components within the SCADA system to ensure operation within prescribed pressure limits; and
- Additional automatic features installed at the local pump station level also will be utilized to provide pipeline pressure protection in the event communications with the SCADA host are interrupted.

Leak Detection Systems

Keystone will have a number of complimentary leak detection methods and systems available within the OCC. These methods and systems are overlapping in nature and progress in leak detection thresholds.

- The first leak detection method is remote monitoring performed by the OCC Operator. Remote monitoring consists primarily of pressure and flow data received from pump stations and valve sites fed back to the OCC to detect leaks down to approximately 25 percent – 30 percent of pipeline flow rate.
- Next are software based volume balance systems that monitor injection and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of pipeline flow rate.
- Next are Computational Pipeline Monitoring or model based leak detection systems that break the pipeline system into smaller segments and monitor each of these segments on a mass balance basis. These systems compensate for line pack and are typically capable of detecting leaks down to a level approximately 1.5 percent to 2 percent of pipeline flow rate.
- Finally, we will use direct observation methodologies, which include aerial patrols, ground patrols and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

Emergency Response

In the event Keystone suspects a leak or a leak is reported to the OCC, Keystone would respond with an emergency pipeline shutdown. This would involve stopping all operating pumping units at all pump stations. Depending on the flow rate at the time of the incident this would mean stopping two to three pumping units at each of Keystone's 39 pumping stations in the US and Canada. This line shutdown is estimated to take approximately 9 minutes. Once all the operating pumping units have been shut down, the OCC Operator would close the sectionalizing or isolation valves in the vicinity of the leak to limit any further draindown at the leak site. Closure of these isolation valves would take an additional 3 minutes. Therefore, from when the leak was reported or alarm received, it would take approximately 12 minutes to shut down and isolate the pipeline. For purposes of estimating worst case spill volumes, however, Keystone has assumed an additional 10 minute period, which is the maximum period an operator is allotted to verify the condition and begin to shut down the affected segment of pipe.

The on-call response designate will be required to respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel may elect to dispatch other resources as soon as practical. It is recommended that each truck contain the basic oil spill response equipment such as absorbent boom, rakes, shovels, safety equipment, road barricades etc. The exact first responder equipment strategy is in the developmental stage.

It is anticipated that once the call is received, on-call personnel should respond and arrive on-site within 4 hours. Keystone is required by 49 CFR Part 194 to calculate Worst Case Discharge and address response and mitigative measures within each Response Zone.

Keystone will use environmental information collected during the application process and incorporate response and mitigative measures in the ERP. In addition, an aerial reconnaissance of the route will be completed to verify this information and develop site-specific Tactical Plans for those areas requiring additional details pertaining to an emergency event.

One of the most critical aspects of an emergency is communication and site management. While Keystone will send first responders and verifiers to the site, a mobile command post is recommended to act as a communication link between the site and the Emergency Operations Center. It is envisioned that this will be handled by an outside contractor that can arrive on-site within 12 hours. We have included a very small office inside the 34 foot trailers which would include basic communication equipment including satellite phones.

Keystone will maintain personnel on-call on a 24(hrs/day) x 7(days/week) basis. These first responders will consist of both employees and contract personnel and will be based at various locations along the length of the pipeline.

The number of emergency responders comprising specific response teams will be determined upon completion of Keystone's ERP. Emergency responders will meet or exceed the requirements of 49 CFR Part 194.115.

Typically, emergency response teams would be comprised of Hazardous Waste Operations and Emergency Response (HAZWOPER) trained personnel as follows:

Tier 1: 8 HAZWOPER trained personnel (includes Emergency Site Manager and Command Post Safety Officer).

Tier 2: 12 HAZWOPER trained personnel.

Tier 3: 24 HAZWOPER trained personnel.

Responders will be dispatched from multiple locations and will have access to alternative means of transportation if weather or other conditions limit access. Alternative means of transportation will include fixed wing aircraft, helicopter, boats and other watercraft, all terrain vehicles, and snowmobiles.

Following execution of the emergency pipeline shutdown, the OCC operator will perform internal notifications as described in the ERP and dispatch first responders to the location identified. Key individuals would then be notified and Keystone's ERP activated as follows:

First Responder

- Notification of potential spill and dispatch received from OCC;
- Spill verified;
- Notification of Emergency Services, if required; and
- Verify with OCC:
  - Pipeline shutdown and status;
  - Pipeline segment isolation; and
- Regional EOC Manager and Qualified Individual (QI) notified.

Regional EOC Manager (QI)

- Notification received from OCC;
- Notification of spill details received from First Responder;
- Oil spill response plan activated;
- Emergency Site Manager (QI) notified;
- Regional EOC activated
- Mobilize response resources requested by Emergency Site Manager (QI);
- Corporate EOC Manager contacted; and
- Agency contacts including the National Response Center and other state and local agencies contacted.

Incident Commander

- Notification received from Regional EOC Manager (QI);
- On-site First Responder contacted to obtain briefing on spill;
- On-site Command Post activated;
- Regional EOC advised of resource requirements; and
- First Responder relieved.

Response efforts are first directed to preventing or limiting any further contamination of the waterway, once any concerns with respect to health and safety of the responders have been addressed. This is typically accomplished primarily with containment booms and berms. The Incident Commander assumes responsibility for selecting the appropriate locations for construction of berms and deployment of booms as well as communicating any additional resource requirements to the EOC Manager.

Efforts are initially directed toward containing any spilled product on land prior to it reaching the waterway. With the approval of authorities having jurisdiction, activities such as digging ditches and building berms would be undertaken on the down slope of the spill site, to prevent any overland flow of spilled product from entering the waterway. In some cases it may be possible to use a combination of ditches and berms to divert the overland flow of spilled product to a collection point.

To contain the spilled product once it has reached the waterway, efforts are typically directed toward the deployment of containment boom as close as practical and safe downstream of the spill location. With the approval of the authorities having jurisdiction, the Incident Commander assumes responsibility and a tactical plan is developed for selecting a suitable location for the deployment of containment booms, based upon the waterway site-specific conditions, including flow velocity and avoidance of rapids and falls to ensure the effectiveness of the containment booms.

Product is typically recovered from the surface of water and transferred to containment facilities by a combination of mechanical skimming, vacuum recovery, and sorbent materials. Typical methods for the recovery and transfer to containment facilities for product spilled on land include vacuum recovery and sorbent materials.

The cleaning of shorelines and other affected natural or manmade structures is typically performed by traditional methods including wiping, hot water and low or high pressure wash down and the use of surfactants and emulsifiers or other agents. Water and other liquids used for wash down purposes for onshore applications are typically contained and collected using a combination of ditches and berms as described above. All site-specific cleaning methods and materials to be utilized are subject to the approval of the authorities having jurisdiction.

Product laden soils are typically either removed or treated with bioremediation in the event such intrusive cleanup techniques are not appropriate. These and other methods of cleanup including natural recovery, burning, dispersants, and other chemical usage can be considered in accordance with and at the discretion of the authorities having

Consistent with industry practice and in accordance with regulations including 49 CFR Part 194.115, Keystone's response time to transfer such additional resources to a potential leak site will follow an escalating or tier system. Dependant upon the nature of site specific conditions and resource requirements, Keystone will meet or exceed the following requirements, along the entire length of the pipeline system:

49 CFR Part 194	Tier 1 Resources	Tier 2 Resources	Tier 3 Resources
High volume area[1]	6 hours	30 hours	54 hours
All other areas	12 hours	36 hours	60 hours

[1] High volume area means an area with an oil pipeline having a nominal outside diameter of 20 inches or more, crosses a major river or other navigable waters, which, because of the velocity of the river flow and vessel traffic on the river, would require a more rapid response in the case of a worst-case discharge or the substantial threat of such a discharge.

Tier 1, 2, and 3 resources will typically include equipment as described above, along with additional HAZWOPER trained response personnel, as required to effectively respond to site specific conditions and as directed by the Incident Commander.

The primary task of the Tier 1 response team is to minimize the spread of product on the ground surface or water in order to protect the public and unusually sensitive areas, including ecological, historical, and archaeological resources and drinking water locations. The Incident Commander will make an assessment of the site-specific conditions, such as:

- The nature of the spilled product;
- Source of the spill;
- Direction(s) of spill migration;
- Known or apparent impact of subsurface geophysical feature that may be affected;
- Overhead and buried utility lines, pipelines, etc.;
- Nearby population, property or environmental feature that may be affected; and
- Concentration of wildlife and breeding areas.

The Incident Commander will request additional resources in terms of personnel, equipment and materials, from the Tier 2 and, if necessary, the Tier 3 response teams. Once containment activities have been successfully concluded efforts are directed toward the recovery and transfer of free product. Site cleanup and restoration activities follow, all of which are conducted in accordance with the authorities having jurisdiction.

Keystone will utilize both employees and contractors as emergency responders within its initial response efforts in the event of a pipeline spill. In the case of contractors and other spill response organizations, Keystone will have agreements in place identifying and ensuring the availability of the specified personnel, consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195.

e. **Equipment Testing Procedures**

Emergency response equipment will be maintained and tested in accordance with manufacturers recommendations. Problems and deficiencies will be immediately corrected.

f. Frequency of Field Training Exercises

Emergency Response Program training will include a combination of regulatory compliance and technical training. To achieve regulatory compliance, Keystone will ensure its employees have all mandatory training, including becoming Qualified Individuals and HAZWOPER compliant. Other regulatory requirements will be included in a regular training schedule for operations personnel.

From a technical training perspective, field technicians and managers will be participating in water-based spill response scenarios on an annual basis. Other training elements will be documented in the ERP and be implemented according to the prescribed regulatory agenda. Emergency response agencies and public officials will be invited to observe the field exercises. Staff also will be trained on Incident Command System levels 100/200 and some key staff also will be trained in ICS 300. The Incident Command System is a prescriptive system of responding and managing incidents. Technical staff will be completing ICS 100/200, while management will be completing ICS 300. Training includes class room lectures, table top exercises, on-call drills, field deployment on both land and water, and mutual aid participation.

It is recommended that each region complete at least five exercises per response zone annually. These include a water based drill, table top exercises, dry land deployments, attendance at mutual aid events, etc.

The positions and training requirement for on-site personnel have been identified as follows:

Position	**Specialized Training to Meet Oil Spill Response Duties**
First Responders	Hazardous Waste Operations and Emergency Response (HAZWOPER) training to Hazmat Technician Level 3 with annual refresher, as required Keystone Emergency Management System (EMS) training National Fire Protection Association (NFPA) training
Emergency Site Manager – Qualified Individual	HAZWOPER training to Hazmat Level 4 Specialist with annual refresher, as required ICS Communication training Keystone EMS training NFPA training
Command Post Media	Keystone EMS training Keystone Media Relations training
Command Post Safety	Keystone EMS training Advanced safety related training
Command Post Documentation	Keystone EMS training
Command Post Site Security	Keystone EMS training
Command Post Resource Mobilization	Keystone EMS training
Command Post Technical	Keystone EMS training
Command Post Staging Leader	Keystone EMS training
Regional EOC Resource Mobilization	Keystone EMS training

Position	Specialized Training to Meet Oil Spill Response Duties
Regional EOC Community Evacuation Leader	Keystone EMS training
Regional EOC Administration Support	Keystone EMS training

g. **Plan Update Procedures**

The Plan is being developed using proprietary software called ePlan. This will mean that the entire Plan will be electronic and revised on a continual basis making the Plan current all the time. Administratively, the Plan will be part of the corporate IMS System.

Response to SIR-1.42

DEQ Request:

(xii) noise, radio, and television interference and electric effects

SIR-1.42: How many residences are located within 500 feet of the associated power lines? Would noise, radio, and television interference, and electrical effects be an issue?

Keystone Response:

See revised Attachment O for the number of residences within 500 feet of the alternative power line routes.

Power Provider Practices – Routing and siting information related to electromagnetic and inductive mitigation on the 115 kV power lines and radio communication serving the Keystone XL Pipeline is provided below.

Electromagnetic induction does occur from power lines. The potential radio and television interference, as well as, noise interference, is mitigated by keeping the power line located away from residences (500 feet minimum, if possible). The routing of the power line is done to keep parallel metallic plant (pipelines, metallic cable, fences) at a minimum. On fences, when paralleling the power line, the metallic wire is grounded (driven ground electrode) at least four times per mile. When crossing fences, the metallic wire is grounded using a 5 foot (minimum) ground electrode. Whenever possible a 100 foot right-of-way for the 115 kV power line will be obtained to minimize any future installation of facilities that could be affected by induction.

There are three potential influences on a communication (metallic) plant in the vicinity of a power line. These are inductive influence, coupling, and susceptiveness. The power providers will work closely with sister utilities to determine the route of existing cable plant. Routing takes into account other utilities and keeps separation between the two different types of plant. Montana state law requires that the project engineer obtain as-built information from other utilities. This allows the design engineer the ability to mitigate inductive influences, to the best of their ability. Avoiding paralleling facilities for long distances (over ten miles) is one method of reducing the susceptiveness to communication plant. Shielded telephone cables reduce coupling with nearby power lines. This helps to reduce coupling caused by close spacings.

Harmonic and waveform distortion may occur due to rectifier action of solid-state motor speed controllers. Harmonic mitigation measures are required on all large loads. Experience with the Express Pipeline indicates that when the harmonic filters tripped off line, noise built to levels that effectively shut down the telephone communications. Close cooperation between the consumers (large motor loads) and the power providers will mitigate such harmonic potential. Harmonic filters will be required, based upon measured system harmonic influence levels.

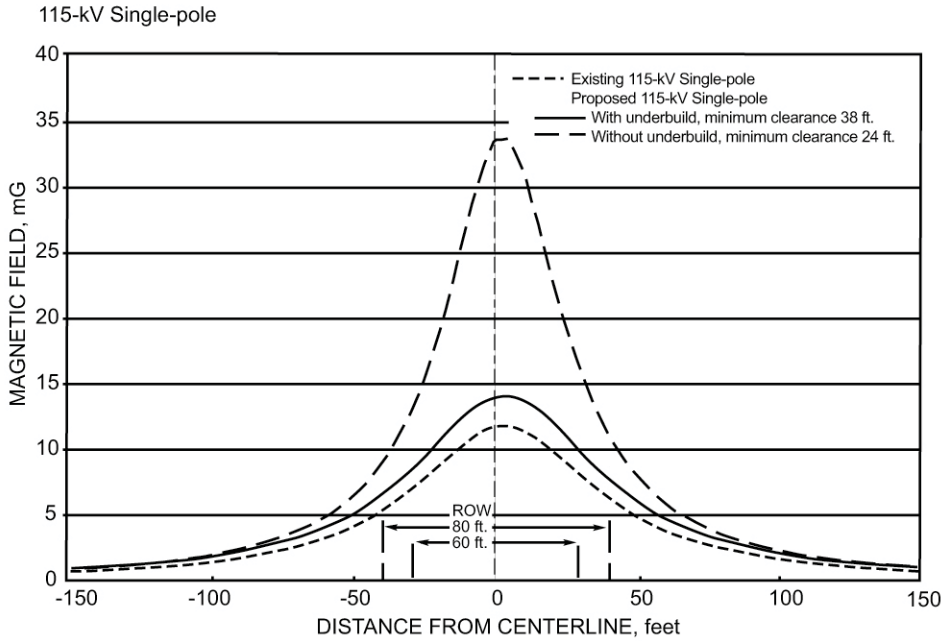
No impacts are expected from the radio communication systems at the Project facilities with regards to electrical and magnetic fields. The only electromagnetic field emitted from the radio antenna is the normal radio frequency signal as licensed by the FCC.

The C-filter on communication systems eliminates the 60 Hz induced noise, but not the harmonics on a telephone system. The system is terminated in delta – wye configurations. This keeps the phase currents relatively balanced. Mitigation efforts on the distribution circuits will include phase balancing.

Power line Radio Frequency Interference (RFI) is usually caused by sparking (arcs). Typically this is caused by loose hardware.

Power lines associated with the Project will have with similar specifications as those analyzed for the Bonneville Power Administration EIS for the construction of a 115 kV circuit from Libby to Troy, Montana (BPA

2008). The cooperative's proposed electric service facilities for the Keystone XL pipeline will be nearly identical to the BPA single-pole construction. For their transmission line, BPA calculated typical magnetic and electric field strengths. Because no national standards for EMF are in place, industry practice is to limit EMF exposure at or below those in a typical house. As shown in the following figure, at 40 feet from the power centerline, the electric and magnetic field levels calculated for that 115 kV transmission line are equal to or less than this level; therefore, based on power lines with similar specifications, EMF levels will be at or below acceptable values at 40 feet from the transmission centerline. If required by DEQ, the cooperatives can commit to calculate the EMF fields using the BPA Corona and Field Effects Program (USDOE).



2008. Bonneville Power Administration (BPA). 2008. Rebuild of the Libby (FEC) to Troy Section of Bonneville Power Administration's Libby to Bonners Ferry 115-kilovolt Transmission Line Project; Final Environmental Impact Statement. DOE/EIS - 0379. May 2008.

As stated in the Clarification for Section 3.6(7)(c), every effort is made to maintain a minimum clearance of 500 feet to the extent practical, but never less than 100 feet at these locations. Maintaining a minimum of 100 feet from residences will ensure there will be no EMF effects noticed by residents within their homes.

The power provider design uses spring washers to keep hardware tight. Conductor supports use trunion clamps and AGS factory preformed clamps to keep the conductor and support clamps with a firm contact between the two entities at all times, to mitigate arcing sources. At the 115 kV level, corona is usually not a major issue. Corona in itself is not a major source of RFI. Defective lightning arrestors also contribute to RFI. The power providers use a static conductor at the top of the pole to mitigate lightning caused flashovers. Lightning arrestors are limited to the stations where major equipment is located.

These are some of the measures that are incorporated in the line design to minimize the inductive and noise causing potential to communication and other affected facilities.

The radio communication systems at the Project Facilities will operate on specific frequencies licensed by the FCC. This minimizes the risk of any interference with radio, television or any other communication system in the area as well as providing for a process if any interference should occur.

References:

Bonneville Power Administration (BPA). 2008. Rebuild of the Libby (FEC) to Troy Section of Bonneville Power Administration's Libby to Bonners Ferry 115-kilovolt Transmission Line Project; Final Environmental Impact Statement. DOE/EIS - 0379. May 2008.

Response to SIR-1.43

DEQ Request:

SIR-1.43: Text on page 4-181, section 4.5.1.6 says one of the avoidance areas was state land. For what reason did you avoid state land?

Keystone Response:

The reference to avoiding state land was inadvertently included in the paragraph in question. A significant amount of state lands are crossed by the proposed routes. Consistent with MCA 75-20-301(1)(h), the use of public lands for the location of the facility was evaluated by Keystone, and public lands were selected where their use was as economically practicable as the use of private lands. Routing was developed through processes identified in Section 4.0. Public lands were crossed by route alternatives; however, consistent with the "economically practicable" provision, preferentially crossing public lands for the sole purpose of maximizing presence on these lands was considered to be less crucial than producing the most constructible and direct route. Crossing public lands in some areas offered more potential for environmental effects or constructability issues, or resulted in a longer route. Therefore, in these cases, opportunities to avoid private lands by 'stitching' across public lands were not preferable.

While Keystone believes it has appropriately considered public lands in route development, at DOS and MDEQ's request, Keystone has generated additional alternatives using a GIS model and associated data layers as outlined in DOS DR #1. These alternatives along with the previous alternatives were reevaluated utilizing the same level of data on each route alternative so an equal comparison was made to each alternative and the preferred route selected. This information was provided to MDEQ August 17, 2009.

Clarification for Section 3.8(1)(i)

DEQ Request:

(i) Overlay to map and electronic equivalent required by section 3.6(2) indicating discharge points.

Specified discharge points for hydrostatic discharges were not listed nor were landowners, water supply wells, and the information describing existing ground water quality and uses within 1 miles of the discharge.

Keystone Response:

Table 1: Potential Sites for Discharge of Hydrostatic Test Water in Montana, provides a listing of probable areas for dewatering. These locations are based on best available information at this time. Final dewatering locations will be determined once the hydrostatic test contractor is selected and presents a hydrostatic test plan to Keystone. **Table 2:** Wells, Ground Water Quality and Water Uses within One Mile of Potential Hydrostatic Test Dewatering Locations, provides water supply wells within one mile of sites. It also provides information on ground water quality and groundwater uses where available. Keystone submits that data provided herewith should be adequate to justify a completeness determination with respect to this item.

Following **Table 2** are two sets of ground water quality reports. The ground water quality well identification numbers listed in **Table 2** were entered into web databases and the reports downloaded where available. Where groundwater quality reports are available, these wells are in bold and italics in **Table 2**. USGS ground water quality reports are first and the Montana Groundwater Information Center (GWIC) water quality reports follow. Where specific ground water quality data is not available, it has been more generally discussed in Chapter 4, Section 4.3.5 of the KXL MFSA application.

Background:

In order to create **Table 2**, the following data sets were downloaded:

Point of Diversion (POD) wells and Water Rights - Place of Use (POU) data was available from the Montana Department of Natural Resources and Conservation: Water Resources Division. Data were downloaded from: ftp://nris.mt.gov/dnrc/

Well information was downloaded from a number of sources:

National Water Information System (NWIS) wells were downloaded from a web database with latitude/longitude and converted into a shapefile: http://waterdata.usgs.gov/nwis/gw#top_of_page

GWIC well data was downloaded from: http://nris.mt.gov/nsdi/nris/shape/gwicwells.zip

Other wells were downloaded for a web database by downloading by county, combining tables and converting into a shapefile. This site has well data from several agencies: http://nris.mt.gov/Apps/WQProject/watermain.asp

USGS Groundwater quality reports were downloaded from:http://waterdata.usgs.gov/mt/nwis/annual?referred_module=gw&search_criteria=search_site_no&search_criteria=site_tp_cd&submitted_form=introduction

GWIC ground water quality reports were downloaded from: http://mbmggwic.mtech.edu/sqlserver/v11/help/go/signin.asp

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Route A		
Boxelder Creek	BUZZARDS GLORY FARMS INC FORT PECK INDIAN RESERVATION	T31NR48ES30 T31NR47ES25
Middle Fork Porcupine Creek	USA IN TRUST	T33NR41ES31
	USA IN TRUST	T33NR40ES25
Poplar River	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
Big Muddy Creek	BIG MUDDY GRAZING ASSOCIATION	T29NR54ES3
	DAMM GEORGE & ALMA MAE	T29NR54ES3
	UNITED STATES OF AMERICA IN TR	T29NR54ES4
Shotgun Creek	LARSEN FARMS	T27NR58ES1
	STATE OF MONTANA	T28NR58ES36
	STATE OF MONTANA	T28NR58ES36
	STATE OF MONTANA	T28NR58ES36
	ROMO BROTHERS	T28NR58ES35
	HARRELSON MARION	T28NR58ES26
	GRANLEY DAVE A	T28NR58ES22
	ROMO BROTHERS A	T28NR58ES22
Little Muddy Creek	NELSON DENNIS D	T27NR59ES6
	NELSON DENNIS D	T27NR59ES6
Frenchman Creek	BERGTOLL DARREL & RHONDA	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	CARROLL STERLING C	T33NR37ES6
	CARROLL STERLING	T34NR37ES31
Route A1A		
West Fork Poplar River	WILCOXON BAR 14 RANCH	T34NR46ES33
	WILCOXON BAR 14 RANCH	T34NR46ES33
Lake Creek	NORBO FARMS A PARTNERSHIP	T31NR55ES11
	FRENCH FARMS INC	T31NR55ES2
East Shotgun Creek	HUSTAD BETTY LOU	T29NR57ES24
	BARR LOWELL L & JANICE M	T29NR57ES23

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Frenchman Creek	BERGTOLL LEO & ALDON	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	CARROLL STERLING	T33NR37ES6
	CARROLL STERLING	T34NR37ES31
Middle Fork Porcupine Creek	STATE OF MONTANA	T33NR40ES1
	STATE OF MONTANA	T33NR40ES1
Poplar River	Tribal Land	T34NR48ES35
	DRURY ALTON G REV TRUST	T34NR48ES35
	DRURY ALTON G REV TRUST	T34NR48ES34
Big Muddy Creek	EIDSNESS BETTY J	T33NR56ES6
	BREKKE IVAR S & ELAINE	T33NR55ES1
Route B		
Frenchman Creek	BERGTOLL DARREL & RHONDA	T34NR35ES18
	BERGTOLL DARREL & RHONDA	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	BERGTOLL DARREL & RHONDA	T32NR37ES6
	BERGTOLL DARREL & RHONDA	T33NR36ES35
Milk River	VALLEY COUNTY	T27NR41ES2
	NICOL GEORGE R JR & JESSIE M	T27NR41ES2
Missouri River	HARMASH ROBERT V & LANETTE G	T27NR42ES33
	USDI BUREAU OF LAND MANAGEMENT	T27NR42ES32
Redwater River	MASSAR RANCH INC	T19NR48ES1
	MASSAR RANCH INC	T19NR48ES1
	JAMES WESLEY P & KAREN T	T19NR48ES2
	JAMES WESLEY P & KAREN T	T19NR48ES2
Yellowstone River	OLLERMAN ALLEN D	T13NR53ES14
Cabin Creek	ULRICH DONALD & JUDITH	T12NR54ES1
	ALLEN LILY M	T13NR54ES34
	HAIDLE FREDA R	T13NR54ES33
Sandstone Creek	ESTES AUDELLE SCHNEIDER	T7NR59ES9
Little Beaver Creek	U HANGING SEVEN RANCH INC	T5NR60ES35
	U HANGING SEVEN RANCH INC	T5NR60ES26

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Boxelder Creek	KNIPFER VIRGINIA L	T2NR62ES32
	KNIPFER VIRGINIA L	T2NR62ES30

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Route A							
Boxelder Creek							
Water Wells (within 1 mile)	43016	Stai Mrs. Albert	48.40770000	-105.53630000	Roosevelt	T31NR48ES30	-
	42997	Ft. Peck Tribes	48.41103300	-105.54997100	Roosevelt	T31NR47ES25	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***482428105321101***	31N48E30CBCD01	48.4078	-105.536	Roosevelt	Houg Farms Inc	-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Poplar River							
Water Wells (within 1 mile)	42242	Price Laurence	48.36945200	-105.15677800	Roosevelt	T30NR50ES12	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Big Muddy Creek							
Water Wells (within 1 mile)	41328	Hekkel Duane	48.27894300	-104.67381400	Roosevelt	T29NR54ES10	-
	41327	Hekkel David	48.28305100	-104.67312700	Roosevelt	T29NR54ES10	-
	132730	Unknown	8731.000000	7855.000000	Roosevelt	T29NR54ES10	-
	83946	Unknown	8822.000000	7745.000000	Roosevelt	T29NR54ES10	-
	196415	Unknown	9652.000000	8478.000000	Roosevelt	T29NR54ES11	-
	185660	Smith Wade	48.28694200	-104.66441700	Roosevelt	T29NR54ES11	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	132730	Unknown	-	-	Roosevelt	29N54E10	Stock
	83946	Unknown	-	-	Roosevelt	29N54E10	Stock
	132730	Unknown	-	-	Roosevelt	29N54E10	Stock
Shotgun Creek							
	39471	Larson Farms	48.11849600	-104.16992200	Roosevelt	T27NR58ES1	-
	704251	Clark Lundquist	48.12250000	-104.17250000	Roosevelt	T27NR58ES1	-
	704254	Clark Lindquist	48.12610000	-104.18300000	Roosevelt	T27NR58ES2	-
	704255	Clark Lindquist	48.12610000	-104.18300000	Roosevelt	T27NR58ES2	-
	704660	Paul Panasuk	48.13380000	-104.19330000	Roosevelt	T28NR58ES35	-
	190335	MSCA*RO-62-07	48.13158400	-104.13710000	Roosevelt	T28NR59ES32	-
	40342	Nelson Dean	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	137014	Nelson Dean (Test Hole B)	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	40316	Granley Albert	48.14489100	-104.21192800	Roosevelt	T28NR58ES27	-
	3484	Simard John * 2.1 Mi E Bainville	48.14440000	-104.19720000	Roosevelt	T28NR58ES26	-
	704645	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
	704646	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
	704647	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
Water Wells (within 1 mile)	3483	Landtech Water Disposal Service	48.14630000	-104.19690000	Roosevelt	T28NR58ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	225693	MDOT* Bainville - East & West (2145M)* 4-71-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225705	MDOT*Bainville - East & West (2145M)* 4-72-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225719	MDOT* Bainville - East & West (2145M)* 4-70-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225738	MDOT* Bainville - East & West (2145M)* 4-69-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	40312	City of Bainville #1	48.15035700	-104.21463600	Roosevelt	T28NR58ES27	-
	40313	City of Bainville #2	48.15035700	-104.21463600	Roosevelt	T28NR58ES27	-
	704644	Andrew Simonson	48.14830000	-104.16630000	Roosevelt	T28NR58ES25	-
	40314	Granley Albert	48.15110000	-104.20910000	Roosevelt	T28NR58ES27	-
	190328	MSCA*RO-69-07	48.15172300	-104.20854200	Roosevelt	T28NR58ES27	-
	40310	Romo Ranch	48.15122300	-104.19431500	Roosevelt	T28NR58ES26	-
	190327	MSCA*RO-69-05	48.15263400	-104.20448000	Roosevelt	T28NR58ES27	-
	190326	MSCA*RO-69-06	48.15445600	-104.20583400	Roosevelt	T28NR58ES27	-
	40307	Granley Albert 01	48.15801700	-104.21525000	Roosevelt	T28NR58ES22	-
	40308	Granley Albert 02	48.15801700	-104.21525000	Roosevelt	T28NR58ES22	-
	704639	Mrs C Evans	48.15910000	-104.23610000	Roosevelt	T28NR58ES21	-
	704640	Albert Granley	48.15910000	-104.21470000	Roosevelt	T28NR58ES22	-
	704641	Albert Granley	48.15910000	-104.20940000	Roosevelt	T28NR58ES22	-
	196659	Harrelson Charles	48.15983800	-104.21933700	Roosevelt	T28NR58ES22	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	3482	Bainville City Well #3* 1 Mi NE Bainville	48.16520000	-104.21440000	Roosevelt	T28NR58ES22	-
	40305	City of Bainville 01	48.16575900	-104.21593200	Roosevelt	T28NR58ES22	-
	40306	City of Bainville 02	48.16575900	-104.21593200	Roosevelt	T28NR58ES22	-
	195774	Granley Dave*Test Hole #1	48.16803600	-104.22737500	Roosevelt	T28NR58ES21	-
	40304	Granley Albert R.	48.16803600	-104.22478700	Roosevelt	T28NR58ES22	-
	195772	Granley Dave	48.16894700	-104.23011100	Roosevelt	T28NR58ES21	-
	215456	Berwick Keith	48.17182000	-104.24768500	Roosevelt	T28NR58ES20	-
	3481	Harmon Dave * Irrigation Well * Bainville	48.17130000	-104.23610000	Roosevelt	T28NR58ES21	-
	199339	Romo Brothers	48.17023500	-104.19566200	Roosevelt	T28NR58ES23	-
	200759	Romo Brothers LLP	48.17023500	-104.19566200	Roosevelt	T28NR58ES23	-
	40309	Crusch Everett	48.17069100	-104.19771900	Roosevelt	T28NR58ES23	-
	211987	Hanson Chris *Test Hole 1	48.17580000	-104.28410000	Roosevelt	T28NR58ES18	-
	704590	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704591	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704592	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704635	Unknown	48.17690000	-104.27380000	Roosevelt	T28NR58ES18	-
	704633	S Runningen Est	48.17690000	-104.25770000	Roosevelt	T28NR58ES17	-
	704634	S Runningen Est	48.17690000	-104.25770000	Roosevelt	T28NR58ES17	-
	704632	O Granley	48.17690000	-104.21470000	Roosevelt	T28NR58ES15	-
	211974	Hanson Chris *Test Hole 2	48.17940000	-104.26390000	Roosevelt	T28NR58ES17	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	182273	MSCA -Dick Hansen *RO-47	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	195334	Petroleum Nance	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	195336	Petroleum Nance	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	198466	Nance Petroleum	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	480721104102101	Unknown	48.122521	-104.172996	Roosevelt	T27NR58ES1	-
	480734104105901	Unknown	48.126132	-104.183552	Roosevelt	T27NR58ES2	-
	480734104105902	Unknown	48.126132	-104.183552	Roosevelt	T27NR58ES2	-
	480802104113601	Unknown	48.133910	-104.193830	Roosevelt	T28NR58ES35	-
	480841104113602	Unknown	48.144743	-104.193830	Roosevelt	T28NR58ES26	-
	480841104113603	Unknown	48.144743	-104.193830	Roosevelt	T28NR58ES26	-
	480854104095901	Unknown	48.148355	-104.166884	Roosevelt	T28NR58ES25	-
	480904104123301	Unknown	48.151132	-104.209664	Roosevelt	T28NR58ES27	-
	480933104125301	Unknown	48.159188	-104.215220	Roosevelt	T28NR58ES22	-
	480933104123401	Unknown	48.159188	-104.209942	Roosevelt	T28NR58ES22	-
	481039104173401	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481039104173402	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481039104173403	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481037104162601	Unknown	48.176966	-104.274389	Roosevelt	T28NR58ES18	-
	481037104152801	Unknown	48.176966	-104.258277	Roosevelt	T28NR58ES17	-
	481037104152802	Unknown	48.176966	-104.258277	Roosevelt	T28NR58ES17	-
	481037104125301	Unknown	48.176966	-104.215220	Roosevelt	T28NR58ES15	-
	482428105321101	Unknown	48.407800	-105.536941	Roosevelt	T31NR48ES30	-
	128510	Unknown	3363.000000	6370.000000	Roosevelt	T27NR58ES1	-
	108659	Unknown	6434.000000	4151.000000	Roosevelt	T28NR58ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	36915	Unknown	6807.000000	3105.000000	Roosevelt	T28NR58ES27	-
	324611	Unknown	6855.000000	4310.000000	Roosevelt	T28NR58ES26	-
	348063	Unknown	8318.000000	2198.000000	Roosevelt	T28NR58ES22	-
	55631	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	111834	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	55633	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	337492	Unknown	8724.000000	1554.000000	Roosevelt	T28NR58ES21	-
	348486	Unknown	8832.000000	124.000000	Roosevelt	T28NR58ES20	-
	141094	Unknown	190.000000	6474.000000	Roosevelt	T28NR57ES13	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***3481***	Harmon Dave * Irrigation Well * Bainville	48.1713	-104.236	Roosevelt	Harmon David W	-
	40305	City of Bainville 01	48.166	-104.215	Roosevelt	Granley Lloyd & Dave	-
	3482	Bainville City Well #3* 1 Mi NE Bainville	48.1652	-104.214	Roosevelt	Harrelson Marion	-
	3483	Landtech Water Disposal Service *	48.1463	-104.196	Roosevelt	Romo Brothers	-
	480840104115001	28N58E26CDCD01	48.1443	-104.197	Roosevelt	Romo Brothers	-
Existing Groundwater Uses (within 1 mile)	128510	Unknown	-	-	Roosevelt	27N58E1	Stock
	55633	Unknown	-	-	Roosevelt	28N58E27	Municipal
	55631	Unknown	-	-	Roosevelt	28N58E27	Municipal
	306153	Unknown	-	-	Roosevelt	28N58E27	Municipal
	218117	Unknown	-	-	Roosevelt	28N58E27	Municipal
	108659	Unknown	-	-	Roosevelt	28N58E26	Commercial

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	36915	Unknown	-	-	Roosevelt	28N58E27	Stock
	324611	Unknown	-	-	Roosevelt	28N58E26	Stock
	348063	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	108344	Unknown	-	-	Roosevelt	28N58E21	Irrigation
	337492	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E20	Irrigation
	337492	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E20	Irrigation
	108344	Unknown	-	-	Roosevelt	28N58E21	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E17	Irrigation
	141094	Unknown	-	-	Roosevelt	28N57E13	Stock
Little Muddy Creek							
Water Wells (within 1 mile)	39471	Larson Farms	48.11849600	-104.16992200	Roosevelt	T27NR58ES1	-
	704251	Clark Lundquist	48.12250000	-104.17250000	Roosevelt	T27NR58ES1	-
	704292	Oscar Nelson	48.12270000	-104.12360000	Roosevelt	T27NR59ES5	-
	190335	MSCA*RO-62-07	48.13158400	-104.13710000	Roosevelt	T28NR59ES32	-
	40342	Nelson Dean	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	137014	Nelson Dean (Test Hole B)	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	190337	MSCA*RO-62-02	48.13158400	-104.13305600	Roosevelt	T28NR59ES32	-
	480721104102101	Unknown	48.122521	-104.172996	Roosevelt	T27NR58ES1	-
	480722104072501	Unknown	48.122799	-104.124105	Roosevelt	T27NR59ES5	-
	128510	Unknown	3363.000000	6370.000000	Roosevelt	T27NR58ES1	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Uses (within 1 mile)	128510	Unknown	-	-	Roosevelt	27N58E1	Stock
Middle Fork Porcupine Creek							
Water Wells (within 1 mile)	96655	Unknown	4329.000000	7951.000000	Valley	T33NR41ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	44989	Fuhrman Harry & Earl	48.56900800	-106.41705100	Valley	T33NR40ES36	-
Existing Groundwater Uses (within 1 mile)	83946	Unknown	-	-	Roosevelt	29N54E10	Stock
Willow Creek							
Water Wells (within 1 mile)	44966	Hinsdale Livestock	48.64198200	-106.93671100	Valley	T33NR37ES6	-
	44965	Echart Gene	48.65197800	-106.93806400	Valley	T33NR37ES6	-
	45596	Hinsdale Livestock	48.66096200	-106.93536000	Valley	T34NR37ES31	-
	45594	Hinsdale Livestock#2	48.66459700	-106.92993700	Valley	T34NR37ES31	-
	45595	Hinsdale Livestock	48.66823200	-106.93536000	Valley	T34NR37ES31	-
	45593	Hinsdale Livestock#1	48.66823200	-106.92993700	Valley	T34NR37ES31	-
	210044	Hinsdale Livestock	48.66910000	-106.92780000	Valley	T34NR37ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Route A1A							
Middle Fork Porcupine Creek							
Water Wells (within 1 mile)	44974	Fauth Gilbert	48.63235400	-106.44059600	Valley	T33NR40ES11	-
	44993	Fuhrman Lillie #1	48.63321500	-106.41285200	Valley	T33NR41ES7	-
	44994	Fuhrman Lillie #2	48.63321500	-106.41285200	Valley	T33NR41ES7	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	248906	Unknown	1546.000000	7461.000000	Valley	T33NR41ES7	-
	60189	Unknown	1584.000000	5179.000000	Valley	T33NR40ES11	-
	85512	Unknown	1584.000000	5179.000000	Valley	T33NR40ES11	-
	105292	Unknown	3912.000000	5407.000000	Valley	T34NR40ES35	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Uses (within 1 mile)	248906	Unknown	-	-	Valley	33N41E7	Stock
	85512	Unknown	-	-	Valley	33N40E11	Stock
	60189	Unknown	-	-	Valley	33N40E11	Stock
	105292	Unknown	-	-	Valley	34N40E35	Commercial
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Big Muddy Creek							
Water Wells (within 1 mile)	3846	Brekke Bayard & Antelope MT	48.62940000	-104.43380000	Sheridan	T33NR56ES7	-
	45245	Brekke Erling A.	48.63459700	-104.42150600	Sheridan	T33NR56ES8	-
	45244	Sundsted Erick	48.64361400	-104.44881800	Sheridan	T33NR56ES6	-
	175334	Murray Farms	48.64453100	-104.45277000	Sheridan	T33NR55ES1	-
	483746104260201	Unknown	48.629471	-104.434396	Sheridan	T33NR56ES7	-
	108404	Unknown	9361.000000	3954.000000	Sheridan	T33NR56ES8	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	193130	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
	310829	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
	248693	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	483746104260201	33N56E07ACDA01	48.6293	-104.433	Sheridan	Eidsness Betty J	-
	3846	Brekke Bayard & Antelope MT	48.6294	-104.433	Sheridan	Eidsness Betty J	-
Existing Groundwater Uses (within 1 mile)	108404	Unknown	-	-	Sheridan	33N56E8	Stock
	310829	Unknown	-	-	Sheridan	33N55E1	Multiple Domestic
	248693	Unknown	-	-	Sheridan	33N55E1	Stock
	193130	Unknown	-	-	Sheridan	33N55E1	Stock
Middle Fork Poplar River							
Water Wells (within 1 mile)	No specific data available from sources searched.[A]						-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Lake Creek							
Water Wells (within 1 mile)	No specific data available from sources searched.[A]						-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
East Shotgun Creek							
Water Wells (within 1 mile)	14028	Unknown	7357.000000	8221.000000	Roosevelt	T29NR57ES23	-
	14030	Unknown	7357.000000	8221.000000	Roosevelt	T29NR57ES23	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	14028	Unknown	-	-	Roosevelt	29N57E23	Domestic
	14030	Unknown	-	-	Roosevelt	29N57E23	Domestic
West Fork Poplar River							
Water Wells (within 1 mile)	146234	Wilcoxon James	48.65803800	-105.72557300	Daniels	T34NR46ES32	-
	45744	Wilcoxon Ross	48.65938900	-105.72216200	Daniels	T34NR46ES32	-
	121130	Wilcoxon James	48.66000000	-105.71910000	Daniels	T34NR46ES32	-
	45745	Wilcoxon Ross 01	48.66029000	-105.72079800	Daniels	T34NR46ES32	-
	162625	Unknown	6545.000000	7901.000000	Daniels	T34NR46ES32	-
	254651	Unknown	6775.000000	8287.000000	Daniels	T34NR46ES32	-
	162627	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	162623	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	311740	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	254653	Unknown	6976.000000	8273.000000	Daniels	T34NR46ES32	-
	45746	Wilcoxon Ross 02	48.66029000	-105.72079800	Daniels	T34NR46ES32	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	162625	Unknown	-	-	Daniels	34N46E32	Stock
	254651	Unknown	-	-	Daniels	34N46E32	Stock
	162623	Unknown	-	-	Daniels	34N46E32	Stock
	162627	Unknown	-	-	Daniels	34N46E32	Domestic
	311740	Unknown	-	-	Daniels	34N46E32	Stock
	254653	Unknown	-	-	Daniels	34N46E32	Domestic
Poplar River							

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	45786	Hellickson Luella 02	48.65073200	-105.41454200	Daniels	T34NR48ES34	-
	45787	Hellickson Luella 01	48.65073200	-105.41454200	Daniels	T34NR48ES34	-
	45788	Hellickson Luella	48.65073200	-105.41180300	Daniels	T34NR48ES34	-
	45785	Manternach Clare	48.65164100	-105.43097900	Daniels	T34NR48ES34	-
	206405	Drury Lane	48.65207700	-105.39051700	Valley	T34NR48ES35	-
	45792	Drury Kent & Jesse	48.65253100	-105.38843900	Daniels	T34NR48ES35	-
	45784	Morrison James	48.65436700	-105.42276100	Daniels	T34NR48ES34	-
	703476	Larson G	48.65440000	-105.42250000	Daniels	T34NR48ES34	-
	703479	Drury K	48.65360000	-105.38750000	Daniels	T34NR48ES35	-
	45791	Hellickson Luella	48.65434900	-105.40367800	Daniels	T34NR48ES35	-
	146047	Drury Lane	48.65662200	-105.38913100	Daniels	T34NR48ES35	-
	703477	Drury J C	48.65970000	-105.38770000	Daniels	T34NR48ES35	-
	45789	Drury Jesse C. 01	48.65980400	-105.38843900	Daniels	T34NR48ES35	-
	45790	Drury Jesse C. 02	48.65980400	-105.38843900	Daniels	T34NR48ES35	-
	703478	Drury J C	48.66000000	-105.38750000	Daniels	T34NR48ES35	-
	45779	Shaw Alvah	48.66437200	-105.43367600	Daniels	T34NR48ES33	-
	45778	Shaw Alvah	48.66437200	-105.43229900	Daniels	T34NR48ES33	-
	483916105252101	Unknown	48.654468	-105.423048	Daniels	T34NR48ES34	-
	483913105231501	Unknown	48.653635	-105.388047	Daniels	T34NR48ES35	-
	483935105231601	Unknown	48.659746	-105.388325	Daniels	T34NR48ES35	-
	483936105231502	Unknown	48.660024	-105.388047	Daniels	T34NR48ES35	-
	358058	Unknown	7092.000000	9462.000000	Daniels	T34NR48ES33	-
	162604	Unknown	7640.000000	2661.000000	Daniels	T34NR48ES35	-
	187238	Unknown	8041.000000	2630.000000	Daniels	T34NR48ES35	-
Water Wells (within 1 mile)	187235	Unknown	8041.000000	2630.000000	Daniels	T34NR48ES35	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	15597	Unknown	8295.000000	9368.000000	Daniels	T34NR48ES33	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	358058	Unknown	-	-	Daniels	34N48E35	Stock
	162604	Unknown	-	-	Daniels	34N48E35	Domestic
	187235	Unknown	-	-	Daniels	34N48E35	Stock
	187238	Unknown	-	-	Daniels	34N48E35	Domestic
	15597	Unknown	-	-	Daniels	34N48E33	Domestic
Willow Creek							
Water Wells (within 1 mile)	44966	Hinsdale Livestock	48.64198200	-106.93671100	Valley	T33NR37ES6	-
	44965	Echart Gene	48.65197800	-106.93806400	Valley	T33NR37ES6	-
	45596	Hinsdale Livestock	48.66096200	-106.93536000	Valley	T34NR37ES31	-
	45594	Hinsdale Livestock#2	48.66459700	-106.92993700	Valley	T34NR37ES31	-
	45595	Hinsdale Livestock	48.66823200	-106.93536000	Valley	T34NR37ES31	-
	45593	Hinsdale Livestock#1	48.66823200	-106.92993700	Valley	T34NR37ES31	-
	210044	Hinsdale Livestock	48.66910000	-106.92780000	Valley	T34NR37ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Route B							
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Quality	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
(within 1 mile) Aquifers, TDS							
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Willow Creek							
Water Wells (within 1 mile)	180125	MDOT * Willow Creek N. of Hinsdale	48.56401600	-106.98216100	Valley	T32NR36ES1	-
	180126	MDOT * Willow Creek N. of Hinsdale	48.56401600	-106.98216100	Valley	T32NR36ES1	-
	44962	Craig Albert Jr #3	48.57180500	-107.00423100	Valley	T33NR36ES34	-
	44963	Craig Albert Jr #4	48.57180500	-107.00423100	Valley	T33NR36ES34	-
	44964	Craig Albert Jr #5	48.57180500	-107.00423100	Valley	T33NR36ES34	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Milk River							
Water Wells (within 1 mile)	82690	Unknown	4263.000000	2439.000000	Valley	Novak Melvin J & Linda A	-
	327077	Unknown	4472.000000	2565.000000	Valley	Novak Melvin J & Linda A	-
	156299	Unknown	5494.000000	2806.000000	Valley	Lauckner William W & Peggy S	-
	182940	Unknown	5494.000000	2806.000000	Valley	Lauckner William W & Peggy S	-
	92154	Unknown	5506.000000	3007.000000	Valley	Lauckner William W & Peggy S	-
	96805	Unknown	5834.000000	1177.000000	Valley	Bellon Farm & Ranch Inc	-

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	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	159044	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	332576	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	159041	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	38971	Hill Lewis	48.12446400	-106.37169400	Valley	T27NR41ES1	-
	38979	Bellon John H & L	48.12641000	-106.39072800	Valley	T27NR41ES2	-
	139222	Lauckner Will W	48.12718400	-106.37033100	Valley	T27NR41ES1	-
	167598	Lauckner William W.	48.12718400	-106.37033100	Valley	T27NR41ES1	-
	3295	Turner Kenneth	48.12830000	-106.39800000	Valley	T27NR41ES2	-
	38975	Jarrell Ray	48.13081100	-106.38123400	Valley	T27NR41ES1	-
	38977	Davis Lyle C.	48.13090700	-106.38389400	Valley	Not Available	-
	38978	Davis Glenn & W. #1	48.13135600	-106.38321100	Valley	Not Available	-
	3413	Stebins Mary	48.13190000	-106.39190000	Valley	T28NR41ES35	-
	40059	Ersland Mrs. Levi	48.13350600	-106.36894400	Valley	T28NR41ES36	-
	40060	Ersland Levi&Shirley	48.13350600	-106.36894400	Valley	T28NR41ES36	-
	40056	Davis Glen&Winnie #2	48.13488600	-106.39399100	Valley	Not Available	-
	225364	Riverside Contractors	48.13780000	-106.40750000	Valley	T28NR41ES34	-
	225359	Riverside Contractors	48.14110000	-106.40060000	Valley	T28NR41ES35	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***3295***	Turner Kenneth	48.1283	-106.398	Valley	Turner Steven K	-
	480742106235301	27N41E02BBDD01	48.1283	-106.398	Valley	Turner Steven K	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	480755106233101	28N41E35DCCC01	48.1319	-106.391	Valley	Not Available	-
	3413	Stebins Mary	48.1319	-106.391	Valley	Not Available	-
Existing Groundwater Uses (within 1 mile)	82690	Unknown	-	-	Valley	27N41E12	Stock
	327077	Unknown	-	-	Valley	27N41E1	Domestic
	96805	Unknown	-	-	Valley	27N41E2	Stock
	182940	Unknown	-	-	Valley	27N41E1	Stock
	156299	Unknown	-	-	Valley	27N41E1	Stock
	92154	Unknown	-	-	Valley	27N41E1	Domestic
	159044	Unknown	-	-	Valley	28N41E36	Lawn and Garden
	332576	Unknown	-	-	Valley	28N41E36	Stock
	159041	Unknown	-	-	Valley	28N41E36	Stock
Missouri River							
Water Wells (within 1 mile)	143084	Unknown	7311.000000	7841.000000	McCone	USDI Bureau of Land Management	-
	267205	Unknown	7676.000000	7215.000000	Valley	-	-
	253649	Unknown	7676.000000	7215.000000	Valley	-	-
	143081	Unknown	7688.000000	7415.000000	McCone	Westland Robert	-
	39056	Mattingly Eugene	48.05463900	-106.34660200	Valley	T27NR42ES31	-
	39057	Mattingly Eugene	48.05735000	-106.33725000	Valley	T27NR42ES32	-
	39055	Garwood Ronald & Pat	48.05831300	-106.34393700	Valley	T27NR42ES31	-
	39054	Peters Homer	48.07084500	-106.32238000	Valley	T27NR42ES29	-
	57864	Unknown	9380.000000	6633.000000	Valley	Harmash Robert V & Lanette G	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	143084	Unknown	-	-	McCone	27N42E33	Stock
	253649	Unknown	-	-	Valley	27N42E33	Irrigation
	267205	Unknown	-	-	Valley	27N42E33	Irrigation
	143081	Unknown	-	-	McCone	27N42E33	Wildlife
	57864	Unknown	-	-	Valley	27N42E29	Domestic
Redwater River							
	231933	Unknown	9929.000000	8483.000000	McCone	James Judith A	-
	360233	Unknown	9944.000000	8683.000000	McCone	James Judith A	-
	91887	Unknown	160.000000	8869.000000	McCone	James Judith A	-
	3320	Unknown	331.000000	6738.000000	McCone	Stans Auto Inc	-
	65532	Unknown	364.000000	7543.000000	McCone	Mid Rivers Telephone Co Op Inc	-
	68044	Unknown	471.000000	7636.000000	McCone	James Judith A	-
	231923	Unknown	501.000000	8037.000000	McCone	James Judith A	-
	231922	Unknown	501.000000	8037.000000	McCone	James Judith A	-
	231925	Unknown	516.000000	8237.000000	McCone	James Judith A	-
	115749	Unknown	673.000000	5940.000000	McCone	Brost Deanna M	-
	80988	Unknown	786.000000	7751.000000	McCone	Eissinger Equip Co Inc	-
	96590	Unknown	981.000000	6018.000000	McCone	James Wesley Pearce et al	-
	43800	Unknown	1197.000000	6203.000000	McCone	Circle Veterinary Clinic Inc	-
	123127	Unknown	1227.000000	6604.000000	McCone	James Wesley P & Karen T	-
Water Wells (within 1 mile)	32484	James Mathew	47.42213700	-105.53623400	McCone	T19NR48ES12	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	224837	Wahl Grant	47.42570000	-105.56294800	McCone	T19NR48ES11	-
	32477	Rittal Samuel L.	47.42570000	-105.55760000	McCone	T19NR48ES11	-
	32485	Mid Rivers Telephone	47.42581700	-105.55235800	McCone	T19NR48ES12	-
	32478	Youngquist Kenneth & Norma L	47.42661800	-105.56161100	McCone	T19NR48ES11	-
	2379	James Mat* 1.2 Mi E Circle*	47.42690000	-105.54520000	McCone	T19NR48ES12	-
	32461	Curtis Francis	47.42924500	-105.57371000	McCone	T19NR48ES2	-
	32462	Idland Oddvar	47.42924500	-105.56834300	McCone	T19NR48ES2	-
	2378	James Matthew * 7 Mi NE of Circle*	47.43190000	-105.57130000	McCone	T19NR48ES2	-
	199315	Circle Vet Clinic	47.43291700	-105.56834300	McCone	T19NR48ES2	-
	32458	James Anna	47.43383600	-105.56968500	McCone	T19NR48ES2	-
	32459	Fladland Allen	47.43383600	-105.56968500	McCone	T19NR48ES2	-
	33977	James Anna	47.44651100	-105.55365600	McCone	T20NR48ES36	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	2379	James Mat* 1.2 Mi E Circle*	47.4269	-105.545	McCone	James Wesley Pearce et al	-
	472537105324300	19N48E12BAAB01	47.4269	-105.545	McCone	James Wesley Pearce et al	-
	472555105341700	19N48E02CBDA01	47.4318	-105.571	McCone	James Wesley Pearce et al	-
	2378	James Matthew * 7 Mi NE of Circle*	47.4319	-105.571	McCone	James Wesley Pearce et al	-
Existing Groundwater Uses (within 1 mile)	360233	Unknown	-	-	McCone	19N48E12	Domestic
	91887	Unknown	-	-	McCone	19N48E12	Domestic
	3320	Unknown	-	-	McCone	19N48E11	Domestic

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	65532	Unknown	-	-	McCone	19N48E12	Commercial
	68044	Unknown	-	-	McCone	19N48E12	Commercial
	231923	Unknown	-	-	McCone	19N48E12	Stock
	231922	Unknown	-	-	McCone	19N48E12	Domestic
	231925	Unknown	-	-	McCone	19N48E12	Stock
	115749	Unknown	-	-	McCone	19N48E2	Domestic
	80988	Unknown	-	-	McCone	19N48E1	Domestic
	96590	Unknown	-	-	McCone	19N48E2	Stock
	43800	Unknown	-	-	McCone	19N48E2	Domestic
	123127	Unknown	-	-	McCone	19N48E2	Commercial
	152822	Unknown	-	-	McCone	19N48E2	Municipal
Yellowstone River							
	465232104592401	Unknown	46.875564	-104.990527	Dawson	Armstrong Lyle D	-
	465245104593301	Unknown	46.879175	-104.993028	Dawson	Armstrong Lyle D	-
	465245104592402	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104592404	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104592405	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104585501	Unknown	46.879176	-104.982471	Dawson	Ollerman Allen D	-
	465245104584501	Unknown	46.879176	-104.979694	Dawson	Ollerman Allen D	-
	465251104593304	Unknown	46.880842	-104.993028	Dawson	Armstrong Lyle D	-
	465251104592403	Unknown	46.880842	-104.990527	Dawson	Ollerman Allen D	-
	465251104591401	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
	465251104591402	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
	465251104591403	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
Water Wells (within 1 mile)	465251104590401	Unknown	46.880842	-104.984972	Dawson	Ollerman Allen D	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	465251104590402	Unknown	46.880842	-104.984972	Dawson	Ollerman Allen D	-
	465251104580701	Unknown	46.880842	-104.969138	Dawson	Ollerman Allen & Joleen	-
	465254104585601	Unknown	46.881676	-104.982749	Dawson	Siegle Inc	-
	465258104592401	Unknown	46.882787	-104.990527	Dawson	Ollerman Allen D	-
	465258104592402	Unknown	46.882787	-104.990527	Dawson	Ollerman Allen D	-
	465258104585503	Unknown	46.882787	-104.982471	Dawson	Siegle Inc	-
	465258104583601	Unknown	46.882787	-104.977193	Dawson	Ollerman Allen D	-
	465304104584501	Unknown	46.884453	-104.979694	Dawson	Siegle Inc	-
	465311104593301	Unknown	46.886398	-104.993028	Dawson	Haas Mark A & Barbara R	-
	465311104591401	Unknown	46.886398	-104.987750	Dawson	Frost Keith E & Doris	-
	465311104584502	Unknown	46.886398	-104.979694	Dawson	Frost Keith E & Doris	-
	465317104592401	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592402	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592403	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592404	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592405	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592406	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104584501	Unknown	46.888064	-104.979694	Dawson	Siegle Inc	-
	465324104592401	Unknown	46.890009	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465324104592402	Unknown	46.890009	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465324104584501	Unknown	46.890009	-104.979694	Dawson	Siegle Inc	-
	465339104574501	Unknown	46.894176	-104.963026	Dawson	Bouchard Arthur W & Verna M Li	-
	472507105321400	Unknown	47.418620	-105.537775	McCone	James Judith A	-
	472507105321400	Unknown	47.418620	-105.537775	McCone	James Judith A	-

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	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	472537105324300	Unknown	47.426953	-105.545831	McCone	James Judith A	-
	472537105324300	Unknown	47.426953	-105.545831	McCone	James Judith A	-
	472537105324100	Unknown	47.426953	-105.545276	McCone	James Wesley Pearce et al	-
	472555105341700	Unknown	47.431953	-105.571943	McCone	James Wesley Pearce et al	-
	472603105341700	Unknown	47.434175	-105.571943	McCone	James Wesley Pearce et al	-
	472700105325800	Unknown	47.450009	-105.549998	McCone	State of Montana	-
	480742106235301	Unknown	48.128353	-106.398645	Valley	Turner Steven K	-
	480753106225501	Unknown	48.131409	-106.382533	Valley	Walberg Ruth M	-
	480755106233101	Unknown	48.131964	-106.392534	Valley	Bellon Farm & Ranch Inc	-
	63	Unknown	266.000000	4075.000000	Dawson	Bloom William Lane	-
	702015	Unknown	46.87550000	-104.99000000	Dawson	T13NR53ES22	-
	702018	Unknown	46.87720000	-104.99000000	Dawson	T13NR53ES22	-
	702028	Unknown	46.87910000	-104.99250000	Dawson	T13NR53ES22	-
	702023	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702024	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702025	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702026	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702027	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702022	Unknown	46.87910000	-104.98190000	Dawson	T13NR53ES14	-
	702021	Unknown	46.87910000	-104.97910000	Dawson	T13NR53ES14	-
	702039	Unknown	46.88080000	-104.99250000	Dawson	T13NR53ES22	-
	702037	Unknown	46.88080000	-104.99000000	Dawson	T13NR53ES14	-
	702038	Unknown	46.88080000	-104.99000000	Dawson	T13NR53ES14	-
	140761	Field III P2	46.88080000	-104.98720000	Dawson	T13NR53ES14	-

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	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	702035	Unknown	46.88080000	-104.98720000	Dawson	T13NR53ES14	-
	702036	Unknown	46.88080000	-104.98720000	Dawson	T13NR53ES14	-
	702033	Unknown	46.88080000	-104.98440000	Dawson	T13NR53ES14	-
	702034	Unknown	46.88080000	-104.98440000	Dawson	T13NR53ES14	-
	702032	Unknown	46.88080000	-104.96860000	Dawson	T13NR53ES12	-
	25457	Rein Carl	46.88160000	-104.98220000	Dawson	T13NR53ES14	-
	702047	Unknown	46.88270000	-104.99000000	Dawson	T13NR53ES14	-
	702048	Unknown	46.88270000	-104.99000000	Dawson	T13NR53ES14	-
	702046	Unknown	46.88270000	-104.98720000	Dawson	T13NR53ES14	-
	702045	Unknown	46.88270000	-104.98440000	Dawson	T13NR53ES14	-
	702043	Unknown	46.88270000	-104.98190000	Dawson	T13NR53ES14	-
	702044	Unknown	46.88270000	-104.98190000	Dawson	T13NR53ES14	-
	702042	Unknown	46.88270000	-104.97660000	Dawson	T13NR53ES14	-
	702054	Unknown	46.88440000	-104.99250000	Dawson	T13NR53ES15	-
	702053	Unknown	46.88440000	-104.98720000	Dawson	T13NR53ES15	-
	702052	Unknown	46.88440000	-104.97910000	Dawson	T13NR53ES14	-
	702059	Unknown	46.88630000	-104.99250000	Dawson	T13NR53ES10	-
	702058	Unknown	46.88630000	-104.98720000	Dawson	T13NR53ES10	-
	702057	Unknown	46.88630000	-104.97910000	Dawson	T13NR53ES10	-
	140760	Field III P1	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702064	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702065	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702066	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702067	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702068	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	702063	Unknown	46.88800000	-104.97910000	Dawson	T13NR53ES11	-
	702062	Unknown	46.88800000	-104.96050000	Dawson	T13NR53ES12	-
	702072	Unknown	46.89000000	-104.99000000	Dawson	T13NR53ES10	-
	702073	Unknown	46.89000000	-104.99000000	Dawson	T13NR53ES10	-
	702071	Unknown	46.89000000	-104.97910000	Dawson	T13NR53ES11	-
	702078	Unknown	46.89160000	-104.98190000	Dawson	T13NR53ES10	-
	702077	Unknown	46.89160000	-104.96580000	Dawson	T13NR53ES11	-
	1852	Siegle William *	46.89220000	-104.97630000	Dawson	T13NR53ES11	-
	151965	EERC-UND * G-11	46.89288300	-104.96780400	Dawson	T13NR53ES11	-
	702083	Unknown	46.89360000	-104.98190000	Dawson	T13NR53ES10	-
	702086	Bouchard Donald	46.89410000	-104.96250000	Dawson	T13NR53ES12	-
	8116	Not Available	2669.000000	3124.000000	Dawson	Haas Mark A & Barbara R	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***151965***	EERC-UND * G-11	46.8931	-104.969	Dawson	Siegle Inc	-
Existing Groundwater Uses (within 1 mile)	8116	Unknown	-	-	Dawson	13N53E15	Domestic
Cabin Creek							
Water Wells (within 1 mile)	50945	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	50953	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	294448	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	70852	Unknown	6961.000000	2261.000000	Prairie	Urlich Donald & Judith	-
	65087	Unknown	6961.000000	2261.000000	Prairie	Urlich Donald & Judith	-
	71879	Unknown	6995.000000	2661.000000	Prairie	Urlich Donald & Judith	-
	67930	Unknown	6995.000000	2661.000000	Prairie	Urlich Donald & Judith	-
	700064	G Ulrick	46.82860000	-104.88250000	Prairie	T12NR54ES2	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	151481	Ulrich Donald & Kurt	46.82860000	-104.87440000	Prairie	T12NR54ES1	-
	24808	Ulrich Rudolph	46.82860000	-104.87190000	Prairie	T12NR54ES1	-
	24809	Ulrich Donald & Kurt	46.82910000	-104.87410000	Prairie	T12NR54ES1	-
	24810	Ulrich Gottlieb	46.82987600	-104.88270600	Prairie	T12NR54ES2	-
	25506	Ulrich Gottlieb	46.83300000	-104.87580000	Prairie	T13NR54ES34	-
	25494	Farmers Union Oil	46.83905800	-104.86876300	Prairie	T13NR54ES34	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	50945	Unknown	-	-	Prairie	12N54E1	Stock
	294448	Unknown	-	-	Prairie	12N54E1	Stock
	50953	Unknown	-	-	Prairie	12N54E1	Domestic
	65087	Unknown	-	-	Prairie	12N54E1	Domestic
	70852	Unknown	-	-	Prairie	12N54E1	Stock
	67930	Unknown	-	-	Prairie	12N54E1	Stock
	71879	Unknown	-	-	Prairie	12N54E1	Stock
Sandstone Creek							
Water Wells(within 1 mile)	462255104192001	Unknown	46.381950	-104.322720	Fallon	T7NR59ES10	-
	185137	Unknown	7884.000000	5727.000000	Fallon	Croy Alvin L & Becky A	-
	92969	Unknown	7955.000000	6942.000000	Fallon	State of Montana	-
	358750	Unknown	8017.000000	8154.000000	Fallon	Fallon County	-
	319668	Unknown	8944.000000	8203.000000	Fallon	Randash William L & Phyllis	-
	11779	Unknown	9122.000000	7576.000000	Fallon	Estes Audelle Schneider	-
	185214	Unknown	9525.000000	7945.000000	Fallon	Hanley William D & Rita F	-
	80752	Unknown	124.000000	5806.000000	Fallon	Engesser Roberta J	-
	136044	Hitchcock Vern	46.35902400	-104.32077100	Fallon	T7NR59ES15	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	20519	Moline F R	46.36888900	-104.32221300	Fallon	T7NR59ES10	-
	20515	Beckers Leonard	46.37145200	-104.34981300	Fallon	T7NR59ES8	-
	20518	Kellner Jerry	46.37163600	-104.31827900	Fallon	T7NR59ES10	-
	700293	H Wyrack	46.37410000	-104.34660000	Fallon	T7NR59ES8	-
	20517	Beckers Leonard	46.37345400	-104.32605300	Fallon	T7NR59ES9	-
	167838	Handley Bill	46.37712900	-104.32090100	Fallon	T7NR59ES10	-
	223989	Wiseman Terry	46.37712900	-104.31565600	Custer	T7NR59ES10	-
	20513	Engessor Charles	46.38066400	-104.34717200	Fallon	T7NR59ES8	-
	700294	Engesser Charles	46.38190000	-104.32220000	Fallon	T7NR59ES10	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	358750	Unknown	-	-	Fallon	7N59E15	Other Purpose
	185137	Unknown	-	-	Fallon	7N59E17	Lawn and Garden
	92969	Unknown	-	-	Fallon	7N59E16	Stock
	319668	Unknown	-	-	Fallon	7N59E10	Stock
	11779	Unknown	-	-	Fallon	7N59E9	Domestic
	185214	Unknown	-	-	Fallon	7N59E10	Lawn and Garden
	80752	Unknown	-	-	Fallon	7N59E5	Stock
Little Beaver Creek							
Water Wells (within 1 mile)	460900104110501	Unknown	46.150003	-104.185216	Fallon	T5NR60ES34	-
	48927	Unknown	5081.000000	168.000000	Fallon	U Hanging Seven Ranch Inc	-
	700233	Johnson Darrell	46.15000000	-104.18470000	Fallon	T5NR60ES34	-
	221944	Johnson, Cody	46.15080000	-104.19830000	Fallon	T5NR60ES33	-
	221942	Johnson, Cody	46.15070000	-104.19070000	Fallon	T5NR60ES34	-
	17603	Beck Frederick	46.16197900	-104.16140000	Fallon	T5NR60ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	**Site Name**	**Latitude**	**Longitude**	**County**	**Owner or Township, Range, Section**	**Purpose**
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***895356***	Montana- Dakota Util. * Well No. 357	46.1561	-104.194	Fallon	U Hanging Seven Ranch Inc	-
Existing Groundwater Uses (within 1 mile)	48927	Unknown	-	-	Fallon	5N60E34	Stock
Boxelder Creek							
Water Wells (within 1 mile)	256993	Not Available	8936.000000	1686.000000	Fallon	T2NR62ES30	-
	256994	Not Available	8936.000000	1686.000000	Fallon	T2NR62ES30	-
	229020	Bart Bundic Ranch, Inc.	45.90903100	-104.05966600	Fallon	T2NR62ES30	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	256993	Unknown	-	-	Fallon	2N62E30	Domestic
	256994	Unknown	-	-	Fallon	2N62E30	Stock

Note: There is little groundwater information available for Routes A and A1A due to the high porosity of underlying strata. Groundwater along both of these routes will likely be found very deep and it is unlikely that aquifers are present due to high porosity. Discharge of hydrostatic test water shall be conducted at least a half mile from all streams to allow for recharge. However, if dewatering is conducted too far from the source it will filter down into the groundwater table. A buffer will be needed to allow for test water to seep into the ground and recharge adjacent streams. The discharge of test water will be left to the discretion of the Environmental Inspector.

Note: Well ID numbers in bold and italics indicate those wells for which groundwater quality reports are available from USGS and/or GWIC. These reports follow Table 2.

USGS Ground Water Quality Reports

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The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 472537105324300 19N48E12BAAB01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.72537E+14
Begin date	11/18/1975
Begin time	12:05
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	1781
Temperature, water, degrees Celsius	10
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	1230
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00002
pH, water, unfiltered, field, standard units	7.8
Carbon dioxide, water, unfiltered, milligrams per liter	11
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	352
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	429
Nitrate, water, filtered, milligrams per liter as nitrogen	0.32
Hardness, water, milligrams per liter as calcium carbonate	320

Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	56
Magnesium, water, filtered, milligrams per liter	44
Sodium, water, filtered, milligrams per liter	162
Sodium adsorption ratio, water, number	3.9
Sodium fraction of cations, water, percent in equivalents of major cations	52
Potassium, water, filtered, milligrams per liter	3.8
Chloride, water, filtered, milligrams per liter	6.3
Sulfate, water, filtered, milligrams per liter	308
Fluoride, water, filtered, milligrams per liter	0.5
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	< 10
Manganese, water, filtered, micrograms per liter	50
Residue, water, filtered, sum of constituents, milligrams per liter	803
Residue, water, filtered, tons per acre-foot	1.09
Nitrate, water, filtered, milligrams per liter	1.4

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U.S. Geological Survey

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Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 472555105341700 19N48E02CBDA01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.72555E+14
Begin date	11/18/1975
Begin time	10:09
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	1788
Temperature, water, degrees Celsius	10.5
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	2320
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	12
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	977
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	1190
Nitrate, water, filtered, milligrams per liter as nitrogen	0.14
Hardness, water, milligrams per liter as calcium carbonate	62
Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0

Calcium, water, filtered, milligrams per liter	9.4
Magnesium, water, filtered, milligrams per liter	9.4
Sodium, water, filtered, milligrams per liter	584
Sodium adsorption ratio, water, number	32
Sodium fraction of cations, water, percent in equivalents of major cations	95
Potassium, water, filtered, milligrams per liter	3.2
Chloride, water, filtered, milligrams per liter	17.2
Sulfate, water, filtered, milligrams per liter	344
Fluoride, water, filtered, milligrams per liter	1.7
Silica, water, filtered, milligrams per liter as SiO2	7.9
Iron, water, unfiltered, recoverable, micrograms per liter	50
Manganese, water, filtered, micrograms per liter	< 10
Residue, water, filtered, sum of constituents, milligrams per liter	1560
Residue, water, filtered, tons per acre-foot	2.13
Nitrate, water, filtered, milligrams per liter	0.6

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Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd:
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
Data for the following sites are included: USGS 480742106235301 27N41E02BBDD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.80742E+14
Begin date	8/19/1978
Begin time	
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	385
Temperature, water, degrees Celsius	15.3
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	5870
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	8.6
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	700
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	850
Nitrate, water, filtered, milligrams per liter as nitrogen	0.1
Sulfide, water, unfiltered, milligrams per liter	0.1
Hardness, water, milligrams per liter as calcium carbonate	20

Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	5.5
Magnesium, water, filtered, milligrams per liter	1.6
Sodium, water, filtered, milligrams per liter	1100
Sodium adsorption ratio, water, number	110
Sodium fraction of cations, water, percent in equivalents of major cations	99
Potassium, water, filtered, milligrams per liter	3
Chloride, water, filtered, milligrams per liter	1200
Sulfate, water, filtered, milligrams per liter	48
Fluoride, water, filtered, milligrams per liter	1.5
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	50
Iron, water, filtered, micrograms per liter	20
Manganese, water, filtered, micrograms per liter	< 10
Lithium, water, filtered, micrograms per liter	170
Residue, water, filtered, sum of constituents, milligrams per liter	2790
Residue, water, filtered, tons per acre-foot	3.79
Nitrate, water, filtered, milligrams per liter	0.4

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Description of sample_start_time_datum_cd:MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 480755106233101 28N41E35DCCC01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.80755E+14
Begin date	8/19/1978
Begin time	
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	384
Temperature, water, degrees Celsius	14.8
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	5700
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	8.4
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	680
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	800
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, field, milligrams per liter	14
Nitrate, water, filtered, milligrams per liter as nitrogen	0.1

Sulfide, water, unfiltered, milligrams per liter	1.4
Hardness, water, milligrams per liter as calcium carbonate	21
Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	5.7
Magnesium, water, filtered, milligrams per liter	1.6
Sodium, water, filtered, milligrams per liter	1100
Sodium adsorption ratio, water, number	100
Sodium fraction of cations, water, percent in equivalents of major cations	99
Potassium, water, filtered, milligrams per liter	3
Chloride, water, filtered, milligrams per liter	1200
Sulfate, water, filtered, milligrams per liter	19
Fluoride, water, filtered, milligrams per liter	1.4
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	50
Iron, water, filtered, micrograms per liter	30
Manganese, water, filtered, micrograms per liter	< 10
Lithium, water, filtered, micrograms per liter	170
Residue, water, filtered, sum of constituents, milligrams per liter	2750
Residue, water, filtered, tons per acre-foot	3.74
Nitrate, water, filtered, milligrams per liter	0.4

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Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey-Water Resources Discipline
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:
Data for the following sites are included:USGS 480840104115001 28N58E26CDCD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.8084E+14
Begin date	10/13/1947
Begin time	
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	35
Temperature, water, degrees Celsius	9.4
Agency analyzing sample, code	1028
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	2920
pH, water, unfiltered, laboratory, standard units	8.3
Nitrate, water, filtered, milligrams per liter as nitrogen	0.57
Hardness, water, milligrams per liter as calcium carbonate	67
Calcium, water, filtered, milligrams per liter	7
Magnesium, water, filtered, milligrams per liter	12
Sodium, water, filtered, milligrams per liter	740
Sodium adsorption ratio, water, number	39
Sodium fraction of cations, water, percent in equivalents of major cations	95
Potassium, water, filtered, milligrams per liter	10
Chloride, water, filtered, milligrams per liter	52

Sulfate, water, filtered, milligrams per liter	6.8
Fluoride, water, filtered, milligrams per liter	1.4
Silica, water, filtered, milligrams per liter as SiO2	7
Boron, water, filtered, micrograms per liter	190
Iron, water, filtered, micrograms per liter	20
Residue, water, filtered, sum of constituents, milligrams per liter	1810
Residue, water, filtered, tons per acre-foot	2.47
Nitrate, water, filtered, milligrams per liter	2.5
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, laboratory, milligrams per liter	1720
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, laboratory, milligrams per liter	130

File created on 2009-05-11 13:31:35 EDT
U.S. Geological Survey

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The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey-Water Resources Discipline
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
Data for the following sites are included:USGS 482428105321101 31N48E30CBCD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.82428E+14
Begin date	9/26/1994
Begin time	10:40
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Temperature, water, degrees Celsius	8
Agency analyzing sample, code	80020
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	355
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	7.9
Nitrite, water, filtered, milligrams per liter as nitrogen	< 0.010
Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	2.6

File created on 2009-05-11 13:36:03 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.
To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T- Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey - Water Resources Discipline
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
M - Presence verified but not quantified.
Data for the following sites are included: USGS 483746104260201 33N56E07ACDA01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file

Agency Code	USGS
Station number	4.83746E+14
Begin date	8/8/1983
Begin time	6:00
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	842
Temperature, water, degrees Celsius	8
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	1600
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00003
pH, water, unfiltered, field, standard units	7.5
pH, water, unfiltered, laboratory, standard units	7.8
Carbon dioxide, water, unfiltered, milligrams per liter	32
Nitrate, water, filtered, milligrams per liter as nitrogen	0.04
Hardness, water, milligrams per liter as calcium carbonate	150
Calcium, water, filtered, milligrams per liter	29
Magnesium, water, filtered, milligrams per liter	19
Sodium, water, filtered, milligrams per liter	323
Sodium adsorption ratio, water, number	11

Sodium fraction of cations, water, percent in equivalents of major cations	82
Potassium, water, filtered, milligrams per liter	0.4
Chloride, water, filtered, milligrams per liter	3.1
Sulfate, water, filtered, milligrams per liter	318
Fluoride, water, filtered, milligrams per liter	0.4
Silica, water, filtered, milligrams per liter as SiO2	13
Iron, water, filtered, micrograms per liter	< 2
Manganese, water, filtered, micrograms per liter	M
Residue, water, filtered, sum of constituents, milligrams per liter	1020
Residue, water, filtered, tons per acre-foot	1.38
Specific conductance, water, unfiltered, laboratory, microsiemens per centimeter.	1720
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	633
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, laboratory, milligrams per liter	0

Montana Groundwater Information Center (GWIC) Ground Water Quality Reports

Ground-Water Information Center Water Quality Report

Site Name: JAMES MATTHEW * 7 MI NE OF CIRCLE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1975Q1788 / 2378	Sample Date:	11/18/1975 10:09:00 AM
Location (TRS):	19N 48E 02 CBDA	Agency/Sampler:	USGS / WRC
Latitude/Longitude:	47° 25' 54" N 105° 34' 16" W	Field Number:	MC-114
Datum:	NAD27	Lab Date:	1/19/1976
Altitude:	2500	Lab/Analyst:	MBMG / LAW
County/State:	MCCONE / MT	Sample Method/Handling:	PUMPED / 3120
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	125TGRV	Total Depth (ft):	109
USGS 7.5' Quad:	GLENDIVE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	86
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	9.300	0.464	Bicarbonate (HCO3)	1,191.200	19.524
Magnesium (Mg)	9.300	0.765	Carbonate (CO3)	0.000	0.000
Sodium (Na)	584.000	25.404	Chloride (Cl)	17.250	0.487
Potassium (K)	3.200	0.082	Sulfate (SO4)	344.000	7.166
Iron (Fe)	0.050	0.003	Nitrate (as N)	0.100	0.007
Manganese (Mn)	0.010	0.000	Fluoride (F)	1.000	0.053
Silica (SiO2)	7.900		Orthophosphate (OPO4)	NR	0.000
	Total Cations	26.749		Total Anions	27.236

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	<10.	Strontium (Sr):	600.000
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	<30.	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	180.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	<50.	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	30.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	<2.0	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,562.300	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	2,166.600	Hardness as CaCO3:	61.500	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2350	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2321	Akalinity as CaCO3 (mg/L):	976.82	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.933	Field Nitrate (mg/L):	NR
Lab pH:	8.15	Sodium Adsorption Ratio:	32.402	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	10.5	Langlier Saturation Index:	0.608	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition: SHALLOW GW 048*WATER WAS BROWN*

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

Ground-Water Information Center Water Quality Report

Site Name: JAMES MAT* 1.2 MI E CIRCLE*

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1975Q1781 / 2379	Sample Date:	11/18/1975 12:05:00 PM
Location (TRS):	19N 48E 12 BAAB	Agency/Sampler:	USGS / WRC
Latitude/Longitude:	47° 25' 36" N 105° 32' 42" W	Field Number:	MC-106
Datum:	NAD27	Lab Date:	1/20/1976
Altitude:	2480	Lab/Analyst:	MBMG / LAW
County/State:	MCCONE / MT	Sample Method/Handling:	GRAB / 1000
Site Type:	WELL	Procedure Type:	
Geology:	125TGRV	Total Depth (ft):	80.2
USGS 7.5' Quad:	GLENDIVE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	55.700	2.779	Bicarbonate (HCO3)	429.400	7.038
Magnesium (Mg)	43.500	3.580	Carbonate (CO3)	0.000	0.000
Sodium (Na)	162.000	7.047	Chloride (Cl)	6.300	0.178
Potassium (K)	3.800	0.097	Sulfate (SO4)	307.800	6.411
Iron (Fe)	0.010	0.001	Nitrate (as N)	0.300	0.021
Manganese (Mn)	0.050	0.002	Fluoride (F)	NR	0.000
Silica (SiO2)	10.900		Orthophosphate (OPO4)	NR	0.000
	Total Cations	13.506		Total Anions	13.648

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	801.530	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,019.200	Hardness as CaCO3:	318.130	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1150	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1234	Akalinity as CaCO3 (mg/L):	351.85	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.646	Field Nitrate (mg/L):	NR
Lab pH:	7.77	Sodium Adsorption Ratio:	3.952	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	10	Langlier Saturation Index:	0.562	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition: SHALLOW GW048* WELL BEGINS IN 110ALVM*

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

Ground-Water Information Center Water Quality Report

Site Name: TURNER KENNETH

Report Date: 5/14/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1979Q0385 / 3295	Sample Date:	8/19/1978
Location (TRS):	27N 41E 02 BBDD	Agency/Sampler:	USGS / KPK
Latitude/Longitude:	48° 7' 41" N 106° 23' 52" W	Field Number:	NGP307
Datum:	NAD27	Lab Date:	10/27/1978
Altitude:	2060	Lab/Analyst:	MBMG / FNA
County/State:	VALLEY / MT	Sample Method/Handling:	GRAB / 5320
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211JDRV	Total Depth (ft):	695
USGS 7.5' Quad:	LINDEKE COULEE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	5.500	0.274	Bicarbonate (HCO3)	848.000	13.899
Magnesium (Mg)	1.600	0.132	Carbonate (CO3)	0.000	0.000
Sodium (Na)	1,070.000	46.545	Chloride (Cl)	1,166.000	32.893
Potassium (K)	2.700	0.069	Sulfate (SO4)	48.000	1.000
Iron (Fe)	0.020	0.001	Nitrate (as N)	<.1	0.000
Manganese (Mn)	<.01	0.000	Fluoride (F)	1.500	0.079
Silica (SiO2)	10.500		Orthophosphate (OPO4)	NR	0.000
	Total Cations	47.021		Total Anions	47.870

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	170.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	<.1	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	2,724.830	Field Hardness as $CaCO_3$ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	3,155.100	Hardness as $CaCO_3$:	20.320	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	5870	Field Alkalinity as $CaCO_3$ (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	4737	Akalinity as $CaCO_3$ (mg/L):	695.51	Phosphate, TD (mg/L as P):	NR
Field pH:	8.23	Ryznar Stability Index:	7.845	Field Nitrate (mg/L):	NR
Lab pH:	7.99	Sodium Adsorption Ratio:	103.291	Field Dissolved O_2 (mg/L):	NR
Water Temp (°C):	15.3	Langlier Saturation Index:	0.073	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Tr (mg/L-Fe)	0.050	Sulfide Total(mg/L-S)	L.10

Notes

Sample Condition:

Field Remarks: NGP-307 * FLOWING WELL * SAMPLE TAKEN IN BARN AFTER SUB. PUMP AND TANK * WELL SOUTH OF HOUSE AND BARN *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO_3, CO_3, SO_4, Cl, SiO_2, NO_3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: STEBINS MARY

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1979Q0384 / 3413	Sample Date:	8/19/1978
Location (TRS):	28N 41E 35 DCCC	Agency/Sampler:	USGS / KPK
Latitude/Longitude:	48° 7' 54" N 106° 23' 30" W	Field Number:	NGP306
Datum:	NAD27	Lab Date:	10/27/1978
Altitude:	2060	Lab/Analyst:	MBMG / FNA
County/State:	VALLEY / MT	Sample Method/Handling:	GRAB / 5320
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211JDRV	Total Depth (ft):	685
USGS 7.5' Quad:	LINDEKE COULEE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	105
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	5.700	0.284	Bicarbonate (HCO3)	800.000	13.112
Magnesium (Mg)	1.600	0.132	Carbonate (CO3)	14.400	0.774
Sodium (Na)	1,090.000	47.415	Chloride (Cl)	1,226.000	34.585
Potassium (K)	2.700	0.069	Sulfate (SO4)	18.600	0.387
Iron (Fe)	0.030	0.002	Nitrate (as N)	<.1	0.000
Manganese (Mn)	<.01	0.000	Fluoride (F)	1.400	0.074
Silica (SiO2)	10.500		Orthophosphate (OPO4)	NR	0.000
	Total Cations	47.902		Total Anions	48.932

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	170.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.150	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	2,765.390	Field Hardness as $CaCO_3$ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	3,171.300	Hardness as $CaCO_3$:	20.820	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	5700	Field Alkalinity as $CaCO_3$ (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	4800	Akalinity as $CaCO_3$ (mg/L):	679.49	Phosphate, TD (mg/L as P):	NR
Field pH:	8.21	Ryznar Stability Index:	7.384	Field Nitrate (mg/L):	NR
Lab pH:	8.44	Sodium Adsorption Ratio:	103.953	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	14.8	Langlier Saturation Index:	0.528	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Tr (mg/L-Fe)	0.050	Sulfide Total(mg/L-S)	1.430

Notes

Sample Condition:

Field Remarks: NGP-306 * FLOWING WELL * WELL IN SHED * WATER SMELLS LIKE SEWAGE OR SWAMPY *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO_3, CO_3, SO_4, Cl, SiO_2, NO_3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report   Site Name: HARMON DAVE * IRRIGATION WELL* BAINVILLE

Report Date: 5/6/2009   Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0732 / 3481	Sample Date:	6/24/1985 5:30:00 PM
Location (TRS):	28N 58E 21 BAAA	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 10' 16" N 104° 14' 9" W	Field Number:	HARMON
Datum:	NAD27	Lab Date:	8/20/1985
Altitude:	2005	Lab/Analyst:	MBMG / WO
County/State:	ROOSEVELT / MT	Sample Method/Handling:	PUMPED / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	200
USGS 7.5' Quad:	WOLF POINT	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	170
Project:	GWAAMON		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	75.600	3.772	Bicarbonate (HCO3)	727.000	11.916
Magnesium (Mg)	31.700	2.609	Carbonate (CO3)	0.000	0.000
Sodium (Na)	463.000	20.141	Chloride (Cl)	7.400	0.209
Potassium (K)	4.800	0.123	Sulfate (SO4)	701.000	14.602
Iron (Fe)	2.060	0.111	Nitrate (as N)	0.800	0.057
Manganese (Mn)	0.059	0.002	Fluoride (F)	1.300	0.068
Silica (SiO2)	25.900		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	26.782		Total Anions	26.852

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	270.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	<100.	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,671.430	Field Hardness as $CaCO_3$ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	2,040.300	Hardness as $CaCO_3$:	319.250	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2250	Field Alkalinity as $CaCO_3$ (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2334	Akalinity as $CaCO_3$ (mg/L):	596.26	Phosphate, TD (mg/L as P):	NR
Field pH:	7.45	Ryznar Stability Index:	6.052	Field Nitrate (mg/L):	NR
Lab pH:	7.64	Sodium Adsorption Ratio:	11.276	Field Dissolved O_2 (mg/L):	NR
Water Temp (°C):	9.9	Langlier Saturation Index:	0.794	Field Chloride (mg/L):	NR
Air Temp (°C):	22	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	2.190	Manganese Bio (mg/L - Mn)	0.063

Notes

Sample Condition: WATER CLEAR * SLIGHT TRACE OF SAND PALE YELLOW OXIDE COLOR ON FILTER* ON FILTER

Field Remarks: 2 MILES NW OF BAINVILLE * FILTERS EASILY * SAMPLE COLLECTED AFTER 90 MINUTES PUMPING AT 900 GPM *

Lab Remarks: NO2 PRESENT

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: BAINVILLE CITY WELL #3* 1 MI NE BAINVILLE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0446 / 3482	Sample Date:	5/26/1985 12:30:00 PM
Location (TRS):	28N 58E 22 BDDD	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 9' 54" N 104° 12' 51" W	Field Number:	BAINVIL
Datum:	NAD27	Lab Date:	7/9/1985
Altitude:	2000	Lab/Analyst:	MBMG / FNA
County/State:	ROOSEVELT / MT	Sample Method/Handling:	GRAB / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	50
USGS 7.5' Quad:	WOLF POINT	SWL-MP (ft):	NR
PWS Id:	00020004	Depth Water Enters (ft):	NR
Project:	PWSINV		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	53.700	2.680	Bicarbonate (HCO3)	344.000	5.638
Magnesium (Mg)	21.700	1.786	Carbonate (CO3)	0.000	0.000
Sodium (Na)	67.100	2.919	Chloride (Cl)	2.200	0.062
Potassium (K)	3.100	0.079	Sulfate (SO4)	81.500	1.698
Iron (Fe)	0.004	0.000	Nitrate (as N)	0.160	0.011
Manganese (Mn)	0.480	0.017	Fluoride (F)	0.300	0.016
Silica (SiO2)	26.100		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	7.495		Total Anions	7.425

Trace Element Results (µg/L)

Aluminum (Al):	<30.	Cesium (Cs):	NR	Molybdenum (Mo):	<20.	Strontium (Sr):	220.000
Antimony (Sb):	NR	Chromium (Cr):	<2.	Nickel (Ni):	<10.	Thallium (Tl):	NR
Arsenic (As):	0.400	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	6.000	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	<1.
Boron (B):	90.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	<100.	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	<2.	Lithium (Li):	8.000	Silver (Ag):	<2.	Vanadium (V):	<1.
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.400	Zinc (Zn):	26.000
						Zirconiuim (Zr):	<4.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	424.890	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	599.430	Hardness as CaCO3:	223.410	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	638	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	664	Akalinity as CaCO3 (mg/L):	282.14	Phosphate, TD (mg/L as P):	NR
Field pH:	7.4	Ryznar Stability Index:	7.159	Field Nitrate (mg/L):	NR
Lab pH:	7.48	Sodium Adsorption Ratio:	1.951	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	8.8	Langlier Saturation Index:	0.160	Field Chloride (mg/L):	NR
Air Temp (°C):	16	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	L.002	Phosphate T Dis (mg/L - P)	L.1

Notes

Sample Condition: CLEAR FILTERS EASILY

Field Remarks: SWL AT WELL #1: 26.77 FEET BELOW GROUND WHILE WELL #3 PUMPING

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: LANDTECH WATER DISPOSAL SERVICE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0444 / 3483	Sample Date:	5/25/1985 3:00:00 PM
Location (TRS):	28N 58E 26 CDBB	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 8' 46" N 104° 11' 48" W	Field Number:	LANDTEC
Datum:	NAD27	Lab Date:	6/20/1985
Altitude:	1975	Lab/Analyst:	MBMG / FNA
County/State:	ROOSEVELT / MT	Sample Method/Handling:	GRAB / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211FHHC	Total Depth (ft):	1380
USGS 7.5' Quad:	BAINVILLE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	1340
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	2.300	0.115	Bicarbonate (HCO3)	1,121.000	18.373
Magnesium (Mg)	0.600	0.049	Carbonate (CO3)	14.600	0.784
Sodium (Na)	595.000	25.883	Chloride (Cl)	242.000	6.827
Potassium (K)	1.400	0.036	Sulfate (SO4)	<.2	0.000
Iron (Fe)	0.080	0.004	Nitrate (as N)	0.080	0.006
Manganese (Mn)	0.002	0.000	Fluoride (F)	5.200	0.274
Silica (SiO2)	15.700		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	26.322		Total Anions	26.264

Trace Element Results (µg/L)

Aluminum (Al):	<20.	Cesium (Cs):	NR	Molybdenum (Mo):	180.000	Strontium (Sr):	100.000
Antimony (Sb):	NR	Chromium (Cr):	19.000	Nickel (Ni):	130.000	Thallium (Tl):	NR
Arsenic (As):	0.200	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	<2.	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	<1.
Boron (B):	2,520.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	3,600.000	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	18.000	Lithium (Li):	96.000	Silver (Ag):	<2.	Vanadium (V):	<1.
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.100	Zinc (Zn):	3.000
						Zirconiuim (Zr):	<4.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,429.120	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,997.900	Hardness as CaCO3:	8.210	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2295	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2428	Akalinity as CaCO3 (mg/L):	944.43	Phosphate, TD (mg/L as P):	NR
Field pH:	8.4	Ryznar Stability Index:	7.946	Field Nitrate (mg/L):	NR
Lab pH:	8.38	Sodium Adsorption Ratio:	90.346	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	17.9	Langlier Saturation Index:	0.217	Field Chloride (mg/L):	NR
Air Temp (°C):	22	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	0.029	Phosphate T Dis (mg/L - P)	L.1

Notes

Sample Condition: CLEAR* CO2-RICH* EFFERVESCES VIOLENTLY* WHITE PRECIP CACO3 OR SI02?

Field Remarks: 1 MILE EAST OF BAINVILLE * WELL DRILLED BY SIDNEY GENDRON IN 1983 * REPORTED YIELD 75 GPM BY PUMPING * ADJACENT DISPOSAL WELL IN DEEP FM *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: BREKKE BAYARD & ANTELOPE MT

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1983Q0842 / 3846	Sample Date:	8/8/1983 6:00:00 AM
Location (TRS):	33N 56E 07 ACDA	Agency/Sampler:	USGS / KAD
Latitude/Longitude:	48° 37' 45" N 104° 26' 1" W	Field Number:	MBC-11
Datum:	NAD27	Lab Date:	11/1/1983
Altitude:	1980	Lab/Analyst:	MBMG / FNA
County/State:	SHERIDAN / MT	Sample Method/Handling:	/ 3120
Site Type:	WELL	Procedure Type:	
Geology:	125FRUN	Total Depth (ft):	80
USGS 7.5' Quad:	ANTELOPE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	29.200	1.457	Bicarbonate (HCO3)	633.000	10.375
Magnesium (Mg)	19.100	1.572	Carbonate (CO3)	0.000	0.000
Sodium (Na)	323.000	14.051	Chloride (Cl)	3.100	0.087
Potassium (K)	0.400	0.010	Sulfate (SO4)	318.000	6.624
Iron (Fe)	<.002	0.000	Nitrate (as N)	0.040	0.003
Manganese (Mn)	0.003	0.000	Fluoride (F)	0.400	0.021
Silica (SiO2)	13.400		Orthophosphate (OPO4)	NR	0.000
	Total Cations	17.090		Total Anions	17.110

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,017.120	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,338.300	Hardness as CaCO3:	151.530	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1600	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1716	Akalinity as CaCO3 (mg/L):	519.17	Phosphate, TD (mg/L as P):	NR
Field pH:	7.5	Ryznar Stability Index:	6.809	Field Nitrate (mg/L):	NR
Lab pH:	7.83	Sodium Adsorption Ratio:	11.417	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	0.511	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition:

Field Remarks: SEND ANALYSIS TO: BAYARD BREKKE BOX 40 ANTELOPE MT 59211

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

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Ground-Water Information Center

Isotope Tracer Report

Site Name: CITY OF BAINVILLE 01

Report Date: 5/6/2009

Location Information

Sample Id/Site Id:	1997R0278 / 40305	Sample Date:	9/11/1996 3:30:00 PM
Location (TRS):	28N 58E 22 BDD	Agency/Sampler:	MBMG / KS
Latitude/Longitude:	48° 9' 56" N 104° 12' 57" W	Field Number:	M:40305
Datum:	NAD83	Lab Date:	9/12/1996
Altitude:	2002	Lab/Analyst:	MBMG / TSH
County/State:	ROOSEVELT / MT	Sample Method/Handling:	/ 1000
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	46
USGS 7.5' Quad:	BAINVILLE	SWL-MP (ft):	NR
PWS Id:	00020	Depth Water Enters (ft):	32
Project:	RADON, PWSINV		

Radon (Rn222 - pC/L):	670.000	Argon (Ar39):	NR
Carbon (C13):	NR	Silicon (Si32):	NR
Carbon (C14):	NR	Chlorine (Cl36):	NR
Tritium (H3 - TU):	NR	Lithium (Li6):	NR
H3/He3 Ratio:	NR	Krypton (Kr85):	NR
Deuterium (H2):	NR	Boron (B11)	NR
Oxygen (O18):	NR	Strontium (Sr87)	NR
Sulphur (S34):	NR	Chloro-fluorocarbon (CFC-11):	NR
Iodine (I129):	NR	Chloro-fluorocarbon (CFC-12):	NR
Nitrogen (N15):	NR	Chloro-fluorocarbon (CFC-113):	NR

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: pC/L = picocuries per Liter; TU = Tritium Units; NR = No Reading in GWIC

Disclaimer

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Ground-Water Information Center Water Quality Report

Site Name: EERC-UND * G-11

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1995Q5010 / 151965	Sample Date:	8/9/1994
Location (TRS):	13N 53E 11 DDB	Agency/Sampler:	/
Latitude/Longitude:	46° 53' 34" N 104° 58' 4" W	Field Number:	46558
Datum:	NAD83	Lab Date:	8/24/1994
Altitude:	2173.2	Lab/Analyst:	/
County/State:	DAWSON / MT	Sample Method/Handling:	/
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	110ALVM	Total Depth (ft):	27.6
USGS 7.5' Quad:		SWL-MP (ft):	18.33
PWS Id:		Depth Water Enters (ft):	17.5
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	96.900	4.835	Bicarbonate (HCO3)	667.000	10.932
Magnesium (Mg)	117.000	9.628	Carbonate (CO3)	0.000	0.000
Sodium (Na)	90.400	3.932	Chloride (Cl)	19.900	0.561
Potassium (K)	6.300	0.161	Sulfate (SO4)	325.000	6.770
Iron (Fe)	<.2	0.000	Nitrate (as N)	NR	0.000
Manganese (Mn)	<.1	0.000	Fluoride (F)	<1.	0.000
Silica (SiO2)	NR		Orthophosphate (OPO4)	<5.	0.000
	Total Cations	18.557		Total Anions	18.263

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	983.470	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,321.900	Hardness as CaCO3:	723.530	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	NR	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1250	Akalinity as CaCO3 (mg/L):	547.05	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.651	Field Nitrate (mg/L):	NR
Lab pH:	6.8	Sodium Adsorption Ratio:	1.456	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	0.074	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Report Date: 5/6/2009

Site Name: MONTANA- DAKOTA UTIL. * WELL NO. 357

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1950Q0004 / 895356	Sample Date:	3/8/1950
Location (TRS):	05N 60E 27 CB	Agency/Sampler:	USGS /
Latitude/Longitude:	° ' " N ° ' " W	Field Number:	
Datum:	NAD27	Lab Date:	3/21/1950
Altitude:		Lab/Analyst:	USGS / KPM
County/State:	FALLON / MT	Sample Method/Handling:	PUMPED /
Site Type:	PETWELL	Procedure Type:	DISSOLVED
Geology:	211JDRV		
USGS 7.5' Quad:	WEBSTER NW 7 1/2'		
PWS Id:			
Project:	DEEPAQU		
Sample Water Use:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	134.000	6.687	Bicarbonate (HCO3)	257.000	4.212
Magnesium (Mg)	26.000	2.140	Carbonate (CO3)	NR	0.000
Sodium (Na)	4,266.000	185.571	Chloride (Cl)	6,672.000	188.217
Potassium (K)	NR	0.000	Sulfate (SO4)	99.000	2.062
Iron (Fe)	NR	0.000	Nitrate (as N)	NR	0.000
Manganese (Mn)	NR	0.000	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (OPO4)	NR	0.000
	Total Cations	194.397		Total Anions	194.492

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	441.610	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	NR	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Akalinity as CaCO3 (mg/L):	NR	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	13.998	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	88.336	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	-6.999	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Diss Solids (rpt mg/L) 11,320.000

Notes

Sample Condition:

Field Remarks:

Lab Remarks: JUDITH RIVER FORMATION WATER * SIMILAR TO OTHER WATERS FROM CEDAR CREEK ANTICLINE *

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Attachment P

Clarifications and Responses to Supplemental Information Requests

September 2009 Filing

Response to SIR-1, Section 17.20.1511(7)(b and c)

DEQ Request:

b) Estimates of trench width

Provide the width that the burial depth would be carried laterally to account for lateral stream channel migration.

2/23/09 – DEQ Incomplete. Provide the width that the burial depth would be carried laterally to account for lateral stream channel migration. This information is needed for analyses of impacts.

c) Estimates of scour depth

Keystone Response:

Keystone will comply with applicable requirements for trench width/depth and scour depth. If applicable, ARM 36.15.102 requires that within a 100-year designated floodway certain pipelines "be buried to a depth at least twice the calculated maximum depth of scour for the base flood." (Also see ARM 36.15.101 for applicable definitions.)

The design of the pipeline along the preferred route for channel crossings will be completed prior to construction based on preconstruction surveys and calculations. The standard design will be to install the pipeline 5 feet below the channel depth for a distance of 15 feet beyond the normal high water banks. *Trench width would typically range from 15 to 20 feet at the top of trench and range from 5 to 7 feet at the bottom of the trench depending on trench depth. Soil type and conditions, such as cohesiveness and saturation, and the type of excavation equipment used will also affect trench width and the slope of the sides. Wider trench widths of 30 to 40 feet at the top could be required.* Each channel crossing will be evaluated prior to construction in the manner described below and will take into account the hydrologic and hydraulic parameters associated with general scour and channel migration.

Scour - For scour assessment, various methodologies will be applied and are dependant on the composition of the soil and available information at the crossing. The steps are summarized below:

- Every identified crossing will first be screened based on the delineation of the tributary drainage area. Those drainage basins that are less than 10 square miles in area will be determined not to require further evaluation and the minimum pipe burial requirement of 5 feet will be assumed to be adequate for the crossing design.
  - Basin areas will be determined from the available USGS maps, DEM data and aerials. To determine the 100 year return frequency of inflow to rivers and streams, the available National Flood Frequency regression equations will be applied or new projections will be made using the actual USGS Stream Gage data using the Log-Pearson Type III Distribution or Weibell Formula.
- A second screening will include the evaluation for scour to determine if there is potential to require pipe burial below 5 feet in depth.
  - The mean competent velocity methodology will be used for the evaluation of scour for cohesive and non-cohesive soils. This methodology is described fully in Transportation Association of Canada's Guide to Bridge Hydraulics. In addition, the Critical Shear Stress and Maximum Permissible Velocity will be compared for the evaluation of scour for cohesive and non-cohesive soils. These methodologies are outlined in Ven Te Chow's Open Channel Hydraulics. Institutions

such as the FHWA, USACE, USDA consider the same general method albeit the formula may be different.

- The crossings identified with scour potential will undergo a final evaluation, which may require redesign, to conduct a thorough assessment of the hydrologic and hydraulic condition in order to determine proper pipe depth and length. As discussed below, evaluation may include obtaining detailed cross sections by survey, photos, grab samples, and and/or shallow boreholes to determine subsurface geology.

Stream Meander - The evaluation of stream meander migration will be assessed as follows:

- The initial screening criteria will be a visual inspection of historic and present day aerial photos to determine if significant changes in channel alignment have occurred.
- If changes are observed that potentially may exceed 15 feet in a 50 year pipe service period, additional investigations will be conducted using the circle analysis to determine the appropriate design length required for the crossings.
  - For lateral migration assessment, the methodology as described in the National Cooperative Highway Research Program (NCHRP) Report 533: Handbook for Predicting Stream Meander Migration (Transportation Research Board of the National Academies) will be applied to project the degree of lateral migration. This method involves comparisons of historic and present-day aerial photographs. The stream positions from both the historic and present-day photos are overlain in ArcGIS to estimate the rates of change in the stream position. Circles are used to represent the stream curvature.
- Each crossing will be designed based on the findings of the hydrologic and hydraulic assessments to be performed prior to construction.

Evaluation - The evaluation of scour and stream meander will require collection and analysis of a significant amount of data. Examples of this information are identified below:

- Collection and processing data for the actual engineering evaluation may require a significant amount of time not accounted for in the detailed analysis. Each of the following steps will also require acquisition of appropriate permits and access, as well as mobilization of field crews and equipment.
  - Grab samples may be acquired at major crossings (those that have the potential for significant scour in excess of 5 feet).
  - Boreholes may be acquired near crossings.
  - Cross section survey data for major crossings: 40 – 50 ft upstream of crossing, at the crossing, and downstream of the crossing may also be required.
- An average of 8 hours is spent analyzing each crossing based on the complexity of the crossing and required analysis to finalize the depth and length of the pipe for each crossing.

Because of the site-specific nature of the work, it will not commence until precise crossing locations are determined. It is not considered feasible to conduct these investigations, contact landowners, and impact landowners that are not part of the preferred route nor part of the EIS notification and scoping process crossings on alternative routes.

Contents

Clarification for Section 3.4(7)(a)

DEQ Request:

(7) Social characteristics

(a) current land uses to economic & social activities in the areas

No discussion of social opinions, trends, etc.

Keystone Response:

The social structure of the impacted communities is shaped in part by the rural and remote nature of the project area. Many of the residents are socially isolated and typically have interaction within their own community. From this interaction, the result is generally a common set of values towards land and the community.

Residents often have a lifestyle that is tied to the land via ranching and/or farming, and therefore have a strong conservation ethic based around sustainability. Outside of agriculture, economic opportunities are limited as there are not many large population centers in the project area. The largest cities in the project area are Glendive and Glasgow which provide service and government employment opportunities, as well as options for significant shopping purchases. Nashua, Circle, and Baker also provide limited services and shopping opportunities.

Clarification for Section 3.4(9)(d)

DEQ Request:

(8) Landscape aesthetics

(d) overlay of land areas categorized for visual compatibility.

Keystone Response:

The following tables provide scenic quality ratings by route. The map shows these quality ratings spatially.

In the following tables, scenic quality is rated numerically for each of the 7 factors in the columns of the tables prepared for each of the alternatives. The potential range for most of the factors is either 0 to 5 or 1 to 5 (5 being the highest), but, for cultural modifications, which include any man-caused changes to the natural landscape, the range is -4 to +2 (2 being the highest; 0 indicates modifications add little or no visual variety to the area, and introduce no discordant elements). The higher the total score, the higher the scenic quality for an area. A total score of 11 or less = Class C (relatively low public value), 12 to 18 = Class B (moderate public value), 19 or greater = Class A (high public value).

Table 1 Section 3.4(9)(d) Scenic Quality Rating – Alternative A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 24.5	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
24.5 – 25.6	3	3	3	3	3	3	0	18	B	Frenchman Creek
25.6 – 32.4	1	1	0	3	2	1	0	8	C	-
32.4 – 33.3	3	1	2	3	0	2	0	11	C	Rock Creek
33.3 – 39.0	1	1	0	1	2	1	0	6	C	-
39.0 – 41.0	2	1	2	1	0	2	0	8	C	Willow Creek/Chisholm Creek valleys
41.0 – 46.5	1	1	0	1	2	1	0	6	C	-
46.5 – 47.7	3	1	0	1	0	1	0	6	C	Incised drainages
47.7 – 57.4	1	1	0	1	0	1	0	4	C	-
57.4 – 58.7	2	1	1	1	0	2	0	7	C	Porcupine Creek
58.7 – 80.0	1	1	1	3	0	1	0	7	C	Small creeks and coulees
80.0 – 93.7	3	2	2	2	0	1	0	10	C	Low rolling hills and Cottonwood Creek crossings

Table 1 Section 3.4(9)(d) Scenic Quality Rating – Alternative A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
93.7 – 111.4	1	1	0	3	0	1	0	6	C	-
111.4 – 125.1	1	1	0	3	2	1	0	8	C	-
125.1 – 126.4	1	2	1	1	0	1	0	6	C	-
126.4 – 144.0	1	1	0	3	0	1	0	6	C	-
144.0 – 148.4	2	2	2	2	3	2	0	13	B	Big Muddy Creek bottom land
148.4 – 154.5	2	2	1	2	3	1	0	11	C	Low rolling hills
154.5 – 161.5	1	2	0	2	0	1	0	6	C	-
161.5 – 168.1	1	1	0	1	0	1	0	4	C	-
168.1 – 171.0	1	2	0	2	0	1	0	6	C	-
171.0 – 174.5	1	1	0	1	0	1	0	4	C	-
174.5 – 176.1	1	2	1	2	0	1	0	7	C	-
176.1 – 180.7	1	1	0	1	0	1	0	4	C	-

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 24.5	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
24.5 – 25.6	3	3	3	3	3	3	0	18	B	Frenchman Creek
25.6 – 32.4	1	1	0	3	2	1	0	8	C	-
32.4 – 33.3	3	1	2	3	0	2	0	11	C	Rock Creek
33.3 – 39.0	1	1	0	1	2	1	0	6	C	-
39.0 – 41.0	2	1	2	1	0	2	0	8	C	Willow Creek/ Chisholm Creek valleys
41.0 – 46.5	1	1	0	1	2	1	0	6	C	-
46.5 – 47.7	3	1	0	1	0	1	0	6	C	Incised drainages
47.7 – 54.1	1	1	0	1	0	1	0	4	C	-
54.1 – 57.2	2	1	2	1	0	2	0	8	C	West Fork Porcupine Creek valley
57.2 – 61.1	1	1	0	3	0	1	0	6	C	-
61.1 – 65.0	2	2	2	2	0	2	0	10	C	Middle Fork Porcupine Creek and tributaries
65.0 – 69.8	1	1	0	2	0	1	0	5	C	-
69.8 – 71.7	1	3	2	2	0	2	0	10	C	Snow Coulee

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
71.7 – 73.1	1	1	0	1	0	1	0	4	C	-
73.1 – 74.6	1	3	2	2	0	2	0	10	C	East Fork Snow Coulee
74.6 – 83.6	1	1	0	1	0	1	0	4	C	-
83.6 – 85.6	1	2	2	2	0	2	0	9	C	Hell Creek valley
85.6 – 91.6	2	1	0	1	1	1	0	6	C	-
91.6 – 95.8	2	1	1	1	2	1	0	8	C	Hell Creek and Shipstead Coulee valley bottoms
95.8 – 98.2	3	2	3	2	2	2	0	14	B	West Fork Poplar River valley
98.2 – 99.0	1	1	0	1	1	1	0	5	C	-
99.0 – 100.4	2	2	1	2	0	1	0	8	C	Police Creek
100.4 – 106.1	1	1	0	3	0	1	0	6	C	-
106.1 – 109.2	2	1	0	1	1	1	0	6	C	-
109.2 – 111.6	2	2	3	2	0	2	0	11	C	Poplar River
111.6 – 113.2	1	1	0	2	0	1	0	5	C	-
113.2 – 114.8	1	2	2	2	0	2	0	9	C	Line Coulee
114.8 – 119.6	1	1	0	1	0	1	0	4	C	-
119.6 – 120.5	1	2	2	2	0	2	0	9	C	Smoke Creek
120.5 – 130.2	1	1	0	1	0	1	0	4	C	-
130.2 – 135.7	1	2	1	2	0	2	0	8	C	Wolf Creek valley
135.7 – 154.1	1	1	0	1	0	1	0	4	C	-

Table 2 Section 3.4(9)(d) Scenic Quality Rating – Alternative A1A

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
154.1 – 156.3	2	1	1	1	0	2	0	7	C	Big Muddy Creek valley
156.3 – 165.5	1	1	0	1	0	1	0	4	C	-
165.5 – 173.1	1	1	1	1	2	1	0	7	C	Medicine Lake/Big Muddy Creek area
173.1 – 205.1	1	1	0	1	0	1	0	4	C	-

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
0.0 – 11.5	1	1	0	3	0	1	0	6	C	-
11.5 – 25.2	2	1	0	1	2	1	0	7	C	Through and adjacent to incised drainages
25.2 – 26.2	3	3	3	3	3	3	0	18	B	Frenchman Creek
26.2 – 38.9	1	1	0	3	2	1	0	8	C	-
38.9 – 39.6	2	2	2	2	0	3	0	11	C	Rock Creek
39.6 – 40.1	1	1	0	1	0	1	0	4	C	-
40.1 – 41.0	1	3	2	2	0	3	0	11	C	Willow Creek/Chisholm Creek valleys
41.0 – 55.0	1	1	0	1	0	1	0	4	C	-
55.0 – 55.8	1	3	2	3	0	3	0	12	B	Buggy Creek
55.8 – 66.8	1	1	0	1	0	1	0	4	C	-
66.8 – 67.2	1	3	2	3	0	3	0	12	B	Cherry Creek
67.2 – 71.1	1	1	0	1	0	1	0	4	C	-
71.1 – 82.2	1	1	0	3	0	1	0	6	C	-
82.2 – 83.7	2	3	3	3	0	4	0	15	B	Milk River
83.7 – 88.4	1	1	0	2	3	1	0	8	C	-
88.4 – 89.9	3	3	4	3	1	5	0	19	A	Missouri River
89.9 – 100.9	1	1	0	1	0	1	0	4	C	-
100.9 – 116.8	3	1	0	3	0	2	0	9	C	Badlands
100.9 – 116.8	1	1	0	2	1	1	0	6	C	-
122.0 – 123.4	1	2	2	1	0	2	0	8	C	Fig. Eight and

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

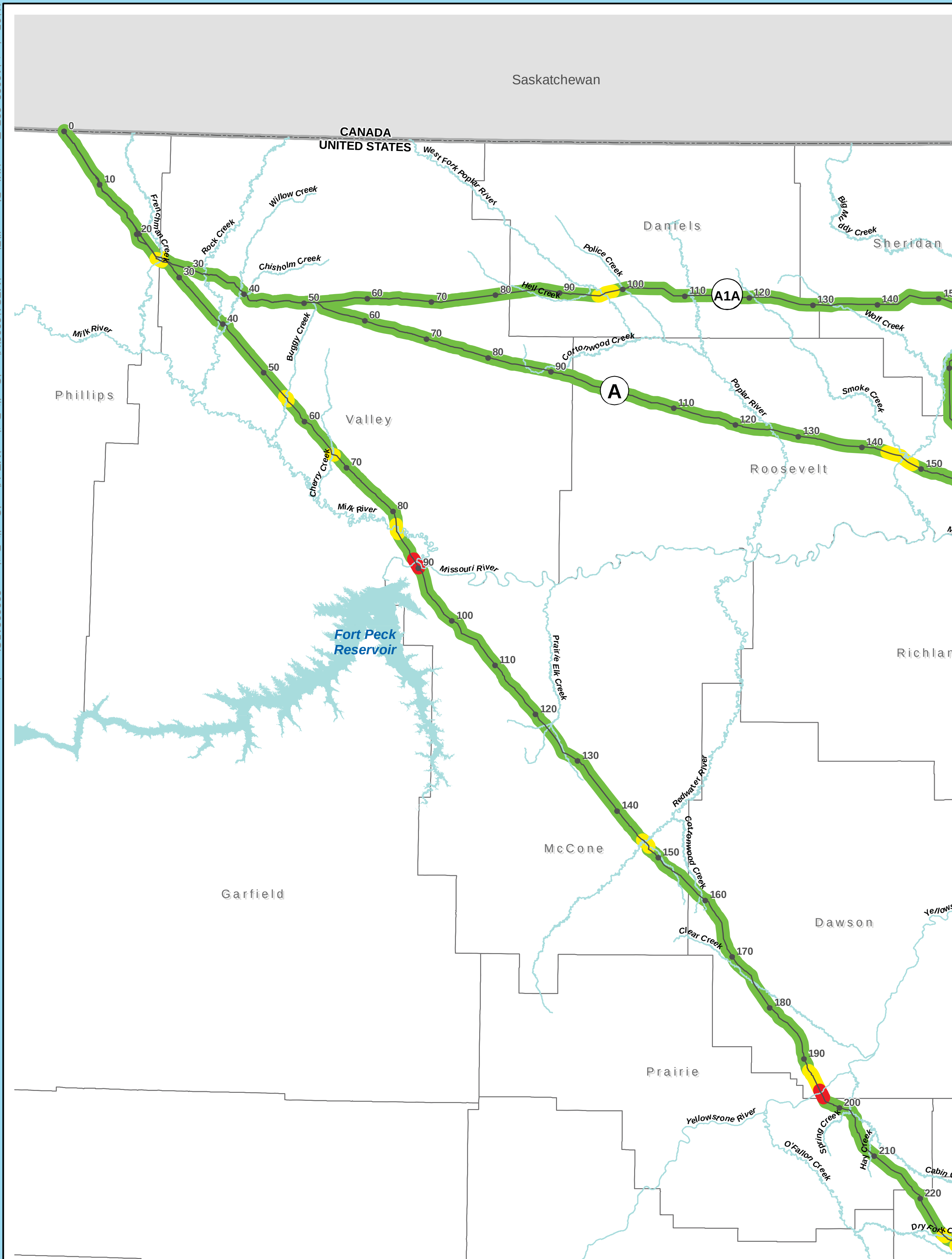
Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
										Mid. Fk. Prairie Elk Creeks influence
123.4 – 125.4	1	1	0	2	1	1	0	6	C	-
125.4 – 129.0	1	2	1	1	2	2	0	9	C	Parallel and crossing E. Fork Prairie Elk Creek
129.0 – 131.4	1	1	0	1	0	1	0	4	C	-
131.4 – 144.8	1	1	0	3	0	1	0	6	C	-
144.8 – 146.0	1	1	0	1	0	1	0	4	C	-
146.0 – 147.5	1	3	3	2	0	3	0	12	B	Redwater River and Buffalo Springs Creek
147.5 – 158.8	1	1	0	2	0	1	0	5	C	-
158.8 – 161.0	1	3	2	2	0	3	0	11	C	Berry Creek complex
161.0 – 163.0	1	1	0	2	0	1	0	5	C	-
163.0 – 163.1	1	3	2	2	0	2	0	10	C	Hay Creek
163.1 – 166.0	1	1	0	2	0	1	0	5	C	-
166.0 – 166.3	1	2	2	2	0	2	0	9	C	Upper Sevenmile Creek
166.3 – 174.8	1	1	0	2	0	1	0	5	C	-
174.8 – 175.6	1	3	2	2	0	3	0	11	C	Clear Creek and bottom land
175.6 – 192.0	1	1	0	2	0	1	0	5	C	-
192.0 – 195.5	2	2	0	3	3	2	0	12	B	Valley bottom – Yellowstone River

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
195.5 – 196.8	3	4	4	4	3	4	0	22	A	Yellowstone River
196.8 – 199.5	1	2	0	2	0	1	0	6	C	-
199.5 – 201.3	1	1	0	1	0	1	0	4	C	-
201.3 – 202.3	1	3	2	2	0	3	0	11	C	Cabin Creek and Spring Creek
202.3 – 204.1	1	2	0	2	0	1	0	6	C	-
204.1 – 209.0	1	1	1	1	0	1	0	5	C	-
209.0 – 215.0	3	1	0	1	0	2	0	7	C	Hummocky terrain
215.0 – 217.1	1	1	1	1	0	1	0	5	C	-
217.1 – 217.4	1	2	1	2	0	2	0	8	C	Creek
217.4 – 221.7	1	1	0	1	1	1	0	5	C	-
221.7 – 222.0	1	2	1	2	0	2	0	8	C	Creek
222.0 – 226.5	1	1	0	1	0	1	0	4	C	-
226.5 – 226.9	1	3	2	3	0	3	0	12	B	Dry Fork Creek
226.9 – 229.2	1	1	0	2	0	1	0	5	C	-
229.2 – 230.8	2	3	0	2	3	3	0	13	B	Pine hills parallel to Pennel Creek
230.8 – 234.2	1	1	0	2	2	1	0	7	C	ROW parallels Pennel Creek
234.2 – 234.5	1	2	2	2	2	3	0	12	B	Pennel Creek crossing
234.5 – 243.9	1	1	0	2	0	1	0	5	C	-
243.9 – 244.1	1	2	1	2	0	2	0	8	C	Sandstone Creek
244.1 – 253.2	1	1	0	2	0	1	0	5	C	-

Table 3 Section 3.4(9)(d) Scenic Quality Rating – Alternative B

Milepost	Landform	Vegetation	Water	Color	Adjacent Scenery Influence	Scarcity	Cultural Mods.	Total Score	Scenic Quality Rating	Notes
253.2 – 256.0	2	1	0	3	0	2	0	8	C	Badlands
256.0 – 257.1	1	1	0	1	0	1	0	4	C	-
257.1 – 258.9	1	2	1	2	0	2	0	8	C	Hidden Water Creek influence
258.9 – 274.9	1	1	0	1	0	1	0	4	C	-
274.9 – 279.1	1	1	1	1	0	1	0	5	C	North and South Forks Coal Bank Creek influence
279.1 – 280.8	1	1	0	1	0	1	0	4	C	-
280.8 – 282.3	1	2	2	2	0	2	0	9	C	Boxelder Creek influence


Saskatchewan
CANADA
UNITED STATES
West Fork Poplar River
Willow Creek
Frenchman Creek
Rock Creek
Chisholm Creek
Milk River
Buggy Creek
Police Creek
Hell Creek
Cottonwood Creek
Big Muddy Creek
Wolf Creek
Smoke Creek
Poplar River
Cherry Creek
Missouri River
Fort Peck Reservoir
Prairie Elk Creek
Redwater River
Cottonwood Creek
Clear Creek
Yellowstone River
O'Fallon Creek
Spring Creek
Hay Creek
Cabin C
Dry Fork C
Daniels
Sheridan
Phillips
Valley
Roosevelt
Richlan
McCone
Garfield
Dawson
Prairie
A1A
A
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170
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190
200
210
220

Clarification for Section 3.7(10)(b)

DEQ Request:

(9) Visual resources and viewer information

(b) visual contrast overlay

Keystone Response:

In combination with photos from 3.7(10)(g), Attachment P, page P-32 to P-64, the following tables provide the visual contrast information by Key Observation Point (KOP) for all three routes.

The contrast ratings were conducted to address the short-term time frame of 5 years. That is, to determine if the proposed pipeline would achieve the requisite VRM class objectives within 5 years of construction. It is assumed that there would be substantially greater visual contrast introduced during construction, but that this would be acceptable as long as progress is made and the objectives are met within 5 years of construction.

Alternative A
Visual Contrast Rating

KOP: MT 24 **Direction:** WNW **M.P.:** 60

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline through the same fields is not visible.

Meets VRM Class Objectives? Y

KOP: MT 24 **Direction:** ESE **M.P.:** 60

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline through the same fields is not visible.

Meets VRM Class Objectives? Y

KOP: MT 13 **Direction:** W **M.P.:** 110.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline not discernible from ground level perspective.

Meets VRM Class Objectives? Y

Alternative A
Visual Contrast Rating

KOP: MT 13 **Direction:** E **M.P.:** 110.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline not discernible from ground level perspective.

Meets VRM Class Objectives? Y

KOP: MT 16 **Direction:** WNW **M.P.:** 156.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline not discernible from ground level perspective.

Meets VRM Class Objectives? Y

KOP: MT 16 **Direction:** ESE **M.P.:** 156.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Existing pipeline not discernible from ground level perspective.

Meets VRM Class Objectives? Y

Alternative A
Visual Contrast Rating

KOP: U.S. 2 **Direction:** NNW **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline visible, but doesn't attract attention. Low scenic quality and mottled, irregular vegetation will provide moderate to high visual absorption.

KOP: U.S. 2 **Direction:** N **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline visible, but doesn't attract attention. Low scenic quality and mottled, irregular vegetation will provide moderate to high visual absorption.

KOP: U.S. 2 **Direction:** S **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective. Grass ground cover much healthier than on N side of U.S. 2; will revegetate more readily.

Alternative A
Visual Contrast Rating

KOP: U.S. 2 **Direction:** **M.P.:** 172.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Existing pipeline not discernible from ground level perspective. Grass ground cover and ag crops much healthier than on N side of U.S. 2; will revegetate more readily.

Alternative A1A
Visual Contrast Rating

KOP: MT 24 **Direction:** W **M.P.:** 60.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with strong existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 24 **Direction:** E **M.P.:** 60.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 13 **Direction:** W` **M.P.:** 109.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Pipeline would parallel existing ag field boundary and two-track.

Alternative A1A
Visual Contrast Rating

KOP: MT 13 **Direction:** E **M.P.:** 109.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III **Notes:** Grassland, very good revegetation potential.

Meets VRM Class Objectives? Y

KOP: MT 16 **Direction:** W **M.P.:** 156.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III **Notes:** Grassland, very good revegetation potential.

Meets VRM Class Objectives? Y

KOP: MT 16 **Direction:** E **M.P.:** 156.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III **Notes:** Crosses existing linear features; rising terrain; good revegetation potential.

Meets VRM Class Objectives? Y

Alternative A1A
Visual Contrast Rating

KOP: MT 16 **Direction:** ENE **M.P.:** 163.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class:

Meets VRM Class Objectives?

Notes: Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** WSW **M.P.:** 163.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: Medicine Lake NWR, Diversion Ditch #1 **Direction:** N **M.P.:** 168.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Ditch would be directionally drilled. Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

Alternative A1A
Visual Contrast Rating

KOP: Medicine Lake NWR, Diversion Ditch #1 **Direction:** S **M.P.:** 168.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Ditch would be directionally drilled. Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 16 **Direction:** NW **M.P.:** 179.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Hay/Grassland, very good revegetation potential.

KOP: MT 16 **Direction:** SE **M.P.:** 179.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X		X						X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Cultivated land with existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons, except for shelterbelt.
.

Alternative B
Visual Contrast Rating

KOP: MT 24 **Direction:** NW **M.P.:** 69.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; visual contrast at 5 years likely to be minimal.

KOP: MT 24 **Direction:** SE **M.P.:** 69.7

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X		X						X
	Color				X		X						X
	Texture				X			X					X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; visual contrast at 5 years likely to be minimal.

KOP: U.S. 2 - BNSF/AMTRAK Crossing **Direction:** N **M.P.:** 82.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Rating assumes a directional drill from atop the ridge approx. 1,000' N of U.S. 2 to approx. 500' S of the Milk River. Pipeline would not be visible from U.S. 2 or RR.

Alternative B
Visual Contrast Rating

KOP: U.S. 2 - BNSF/AMTRAK Crossing **Direction:** S **M.P.:** 82.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Rating assumes directional drilling from top of the ridge approx. 1,000' N of U.S. 2 to approx. 500' S of the Milk River. Pipeline would not be visible from U.S. 2 or RR.

KOP: MT 117 - Ball Rd. - Whatley Rd. **Direction:** NNW **M.P.:** 83.75

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land with some existing form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

KOP: MT 117 - Ball Rd. - Whatley Rd. **Direction:** SSE **M.P.:** 83.75

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land with minor form and line vegetation features; pipeline disturbance would not be visible within two growing seasons.

Alternative B
Visual Contrast Rating

KOP: Missouri River Crossing **Direction:** SSE **M.P.:** 88.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form			X			X						X
	Line		X				X						X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Views from the river to the NE face of the Milk Hills would be largely screened by existing deciduous groves during river use months, reducing the visual effects.

.

KOP: MT 24 parallel to pipeline at M.P. 99.3 **Direction:** NE **M.P.:** 99.3

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Pipeline would not be visible from this part of MT 24 because of terrain.

KOP: NE of Weldon Rd. (CR 252) **Direction:** NE **M.P.:** 127.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Terrain barriers and distance mitigate any potential for adverse visual contrast; pipeline would not attract attention.

Alternative B
Visual Contrast Rating

KOP: Weldon Rd. (CR 252) parallel to pipeline at M.P. 130 **Direction:** NE **M.P.:** 130.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Distance and superior viewing perspective in panoramic landscape mitigate any potential for adverse visual contrast; pipeline would not attract attention.

KOP: MT 13 **Direction:** NW **M.P.:** 145.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; potentially slow revegetation and rising slope in immediate foreground may continue weak contrast from the pipeline, but it would not dominate the view.

KOP: MT 13 **Direction:** SSE **M.P.:** 145.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; Redwater River and deciduous groves at ~3,000' would be more dominant visual features than any residual pipeline effects.

Alternative B
Visual Contrast Rating

KOP: MT 200 **Direction:** NW **M.P.:** 146.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing structures, linear and landform features would be more visually dominant than the pipeline.

KOP: MT 200 **Direction:** SE **M.P.:** 146.9

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing linear features and deciduous groves would be more visually dominant than the pipeline.

KOP: MT 200S **Direction:** N **M.P.:** 147.8

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential. Use existing openings in trees to degree possible to minimize visual effects.

Alternative B
Visual Contrast Rating

KOP: MT 200S **Direction:** SW - SE **M.P.:** 147.8

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland & cultivated ag land with very good revegetation potential.

KOP: MT 200 parallel to pipeline at M.P. 155.6 **Direction:** NW **M.P.:** 155.6

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland with very good revegetation potential; existing linear features (old road alignment) and mottled surface vegetation increases visual absorption potential.

KOP: I-94 **Direction:** NNW **M.P.:** 193.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland; moderate to low revegetation potential may leave weak contrast at 5 years, but topgraphy limits visibility to brief views at interstate speeds.

Alternative B
Visual Contrast Rating

KOP: I-94 **Direction:** SSE **M.P.:** 193.1

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland; moderate to low revegetation potential may leave weak contrast at 5 years. Sufficient visual features to attract more viewer attention than the pipeline.

KOP: Old Highway U.S. 10 **Direction:** NNW **M.P.:** 194.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Grassland with some structural and linear features sufficient to overshadow possible weak contrast remaining at 5 years. Low traffic roadway.

KOP: Old Highway U.S. 10 **Direction:** SSE **M.P.:** 194.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Cultivated ag land with multiple visual features in the landscape; pipeline disturbance would not be visible within one to two growing seasons.

Alternative B
Visual Contrast Rating

KOP: Bad Road (CR 241) **Direction:** NNW **M.P.:** 195.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X		X						X
	Color				X		X						X
	Texture				X			X					X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Hay/grassland with multiple visual features sufficient to overshadow possible weak contrast remaining at 5 years. Very low traffic roadway.

KOP: Bad Road (CR 241) **Direction:** SSE **M.P.:** 195.2

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Hay/grassland with multiple visual features sufficient to overshadow possible weak contrast remaining at 5 years. Very low traffic roadway.

KOP: Yellowstone River/BNSF RR Crossing **Direction:** NNW **M.P.:** 196.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II

Meets VRM Class Objectives? Y

Notes: Rating assumes a directional drill from between tree groves and river approx. 1,000' N of river to ridge top approx. 750' S of the RR.
.

Alternative B
Visual Contrast Rating

KOP: Yellowstone River/BNSF RR Crossing **Direction:** SSE **M.P.:** 196.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X					X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Rating assumes a directional drill from between tree groves and river approx. 1,000' N of river to ridge top approx. 750' S of the RR.
.

KOP: U.S. 12 **Direction:** N **M.P.:** 244.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons.

KOP: U.S. 12 **Direction:** S **M.P.:** 244.5

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: II
Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons.

Alternative B
Visual Contrast Rating

KOP: MT 7 **Direction:** WNW **M.P.:** 248.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland/sage brush; potentially slow revegetation may extend weak visual contrast from the pipeline. Low viewing angle would reduce visibility.

KOP: MT 7 **Direction:** ESE **M.P.:** 248.4

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X			X					X
	Color				X			X					X
	Texture				X				X				X

VRM Class: III

Meets VRM Class Objectives? Y

Notes: Grassland; potentially slow revegetation may extend visual contrast from the pipeline. Existing variation in landform and structural visual features would be more dominant.

KOP: Webster Road (CR 247) **Direction:** NNW **M.P.:** 269.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Cultivated ag land; pipeline disturbance would not be visible within two growing seasons. Very low traffic volumes.

Alternative B
Visual Contrast Rating

KOP: Webster Road (CR 247) **Direction:** SSE **M.P.:** 269.0

		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X				X
	Line				X				X				X
	Color				X				X				X
	Texture				X				X				X

VRM Class: IV

Meets VRM Class Objectives? Y

Notes: Grassland; low viewing angle would minimize visibility. Very low traffic volumes.

Clarification for Section 3.8(1)(c)(i)(A)&(B)

DEQ Comment:

3.8(1)(c)(i)

Information and mapping based upon 1 or 2 dominant species and 1 or 2 understory species needs to be provided for the impact zones below.

(A) areas within 0.5 mile radius of pump or compressor stations
(B) crossing of streams with fishery value class of I or II or waterways with annual discharge of 1,000 cfs or more.

Keystone Response:

(A) Information and mapping of vegetation within a 0.5 mile buffer of the 12 potential pump station locations along the three proposed routes (A, A1A, and B) were developed following a three-step process.

1) Preliminary boundary delineation using aerial imagery,

2) Helicopter surveys for all three routes followed by ground verification efforts on selected PS sites, and

3) Final mapping.

The first step, preliminary desktop aerial interpretation, occurred during initial land use analysis and identified five plant community types (very low cover grasslands, low/moderate cover grassland, mixed riparian, wetlands and agricultural lands-dry crop) using digital aerial imagery (2006 NAIP 1-meter color imagery and 2005 DOQQ 1-meter color imagery).

Helicopter surveys were conducted in April 2009 for pump stations on all three route alternatives to assign vegetation/land use type. Furthermore, helicopter surveys were also conducted along the major river crossings (Milk River, Missouri River and Yellowstone River). In May 2009, field confirmation of selected sites was performed in order to field check types and develop species lists. Ground verification efforts identified the dominant plants within the upper and lower canopies of the vegetation profile within each plant community. Final mapping followed these efforts.

Very Low Cover and Low/Moderate Cover Grasslands

Within the very low cover and low/moderate cover grasslands graminoids were typically the dominant plants comprising the greatest canopy cover within the potential pump station locations. The dominant species in the very low cover grasslands type include blue grama (*Bouteloua gracilis*), Prairie June grass (*Koeleria macrantha),* western wheatgrass (*Pascopyrum smithii*), and threadleaf sedge *(Carex filifolia*). Associated species include clubmoss (*Saleginella densa*) and Hood's phlox (*Phlox hoodii*). The dominant species encountered within the low/moderate grasslands include western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), green needlegrass (*Nassella viridula*), and Idaho fescue (*Festuca idahoensis*). Other commonly dominant species encountered include Prairie June grass (*Koeleria macrantha),* Sandberg's bluegrass (*Poa secunda*), needle and thread grass (*Hesperostipa comate*), and threadleaf sedge (*Carex filifolia*). Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* and *Artemisia cana* were also encountered.

Wetlands

The vegetation of the wetland community is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex nebrascensis*. Other graminoid species present are *Carex praegracilis, Calamagrostis stricta, Deschampsia caespitosa, Eleocharis palustris, Glyceria striata, Juncus balticus,* and *Schoenoplectus pungens*. This type is shown as emergent wetlands (PEM) or forested wetlands (PFO).

Mixed Riparian

Within the mixed riparian plant community the plains cottonwood (*Populus deltoides*) was the dominant overstory with the shrub species silver sage (*Artemisia cana*) and *Symphoricarpos* spp. occupying the understory. The herbaceous plant community includes the species bluejoint reedgrass (*Calamagrostis Canadensis*), Baltic rush (*Juncus balticus*), and sedges (*Carex spp.*).

Agricultural Lands–Dry Crop

Agricultural lands–dry crop plant community had crested wheatgrass (*Agropyron cristatum)* as the dominant plant species with smooth brome (*Bromus inermis*) also occurring. The agricultural lands-dry crop classification also includes dry-land wheat (*Triticum aestivum*) and other crops. These two types are broken into two classes in the tables below.

Agricultural Lands–Irrigated

Agricultural lands-irrigated is typically planted wheat.

Water

Waterbodies are one of three types: ephemeral (EPH), intermittent (INT), and perennial (PER). These are not shown in the vegetation tables below, but are displayed on the maps.

Developed Lands

Developed lands includes commercial (DCOM), residential (DRES), industrial (DIND) as well as right-of-way (DROW) designations. These are not shown in the vegetation tables below, but are displayed on the maps.

Table 1 Pump Station Vegetation Communities along Route A

Vegetation Cover Type	**Pump Station 9**	**Pump Station 10**	**Pump Station 11**	**Pump Station 12**
Very Low Cover Grassland		x		
Low/Moderate Cover Grassland				
Agricultural Land-Dry Crop (Hay)	x	x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)			x	x
Mixed Riparian				
Wetland	x			

Table 2 Pump Station Vegetation Communities along Route A1A

Vegetation Cover Type	Pump Station 9	Pump Station 10	Pump Station 11	Pump Station 12	Pump Station 13
Very Low Cover Grassland		x	x		
Low/Moderate Cover Grassland				x	
Agricultural Land-Dry Crop (Hay)	x	x	x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)					
Mixed Riparian					x
Wetland	x				

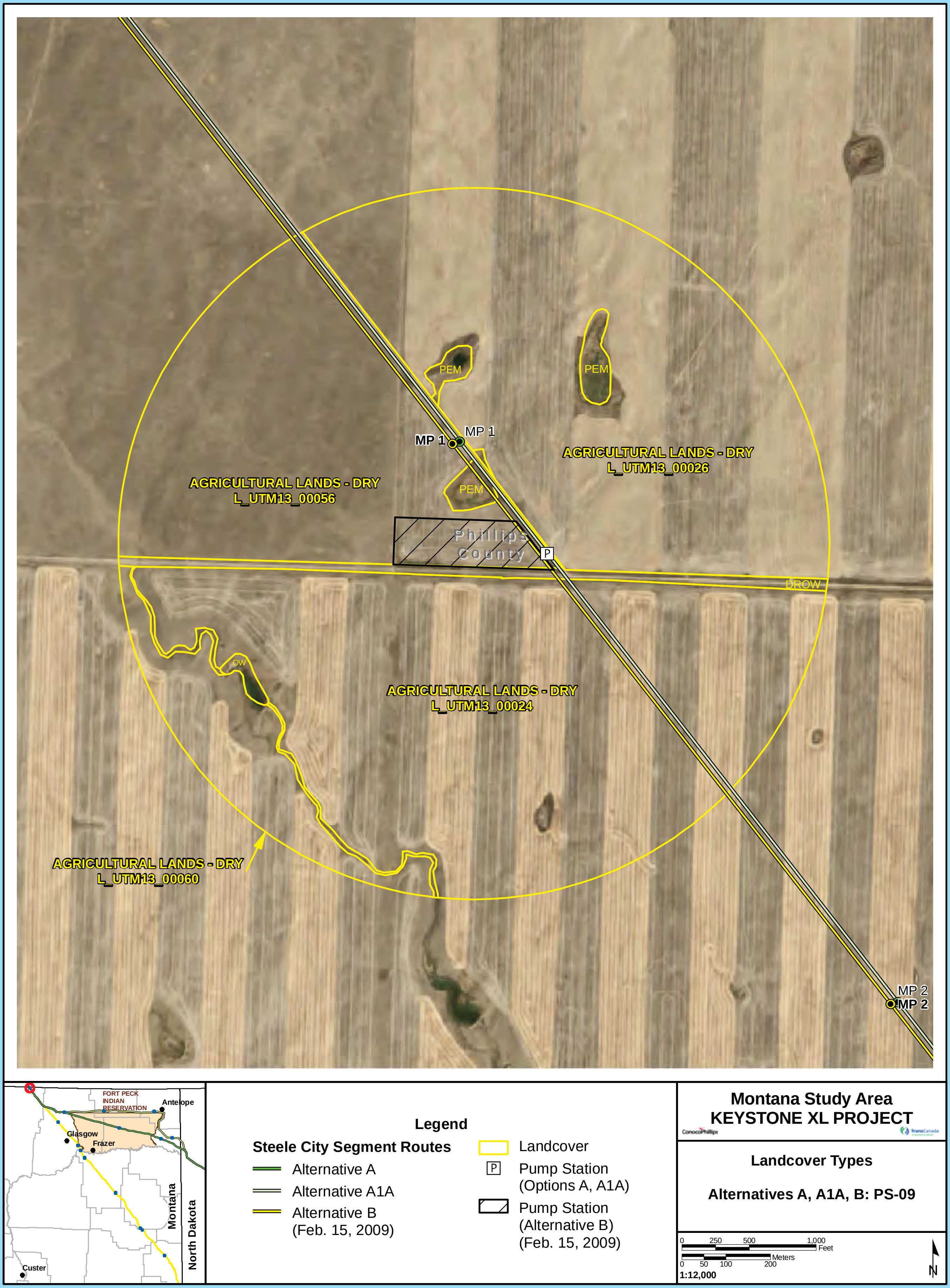
Table 3 Pump Station Vegetation Communities along Route B

Vegetation Cover Type	Pump Station 9	Pump Station 10	Pump Station 11	Pump Station 12	Pump Station 13	Pump Station 14
Very Low Cover Grassland		x				
Low/Moderate Cover Grassland			x	x	x	x
Agricultural Land-Dry Crop (Hay)	x			x	x	x
Agricultural Land-Dry Crop (Wheat and other crops)					x	
Agricultural Land-Irrigated					x	
Mixed Riparian				x		
Wetland	x					

(B) Only Route B crosses Class 1 or 2 or 1,000 cfs streams. The vegetation/land use data for these crossings were collected in 2008 during on the ground field surveys of the project survey corridor. These data are provided in Table 4 and the following maps.

Table 4 Vegetation Communities along Class 1 or 2 or 1,000 cfs Streams

Vegetation Cover Type	Milk River	Missouri River	Yellowstone River
Low/Moderate Cover Grassland			
Agricultural Land-Dry Crop (Hay)			
Agricultural Land-Dry Crop (Wheat and other crops)		x	
Agricultural Land-Irrigated	x		
Mixed Riparian	x	x	x
Wetland	x	x	



Legend

Steele City Segment Routes

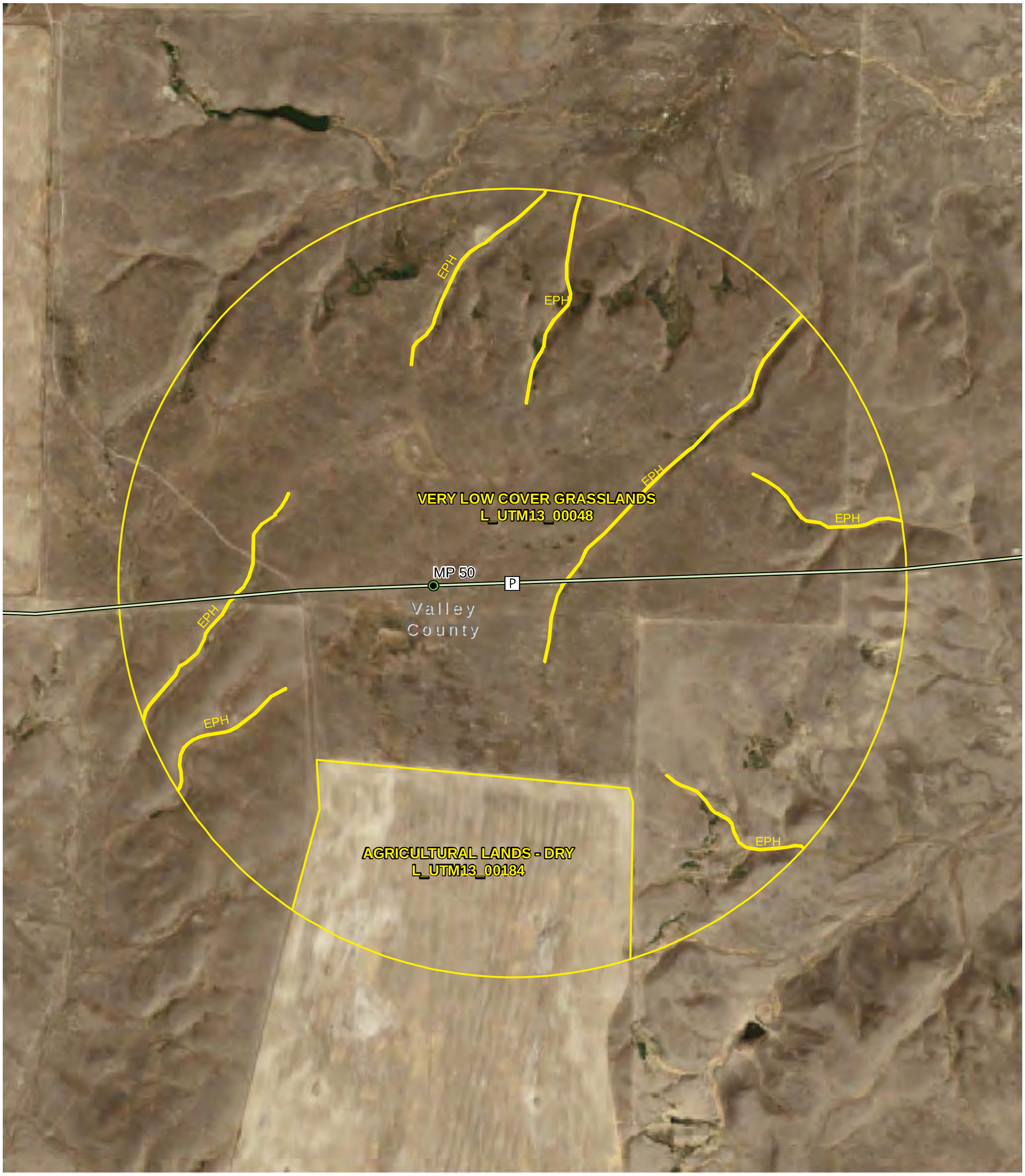
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

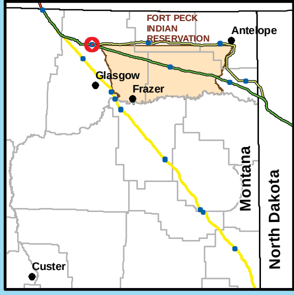
Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternatives A, A1A, B: PS-09

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

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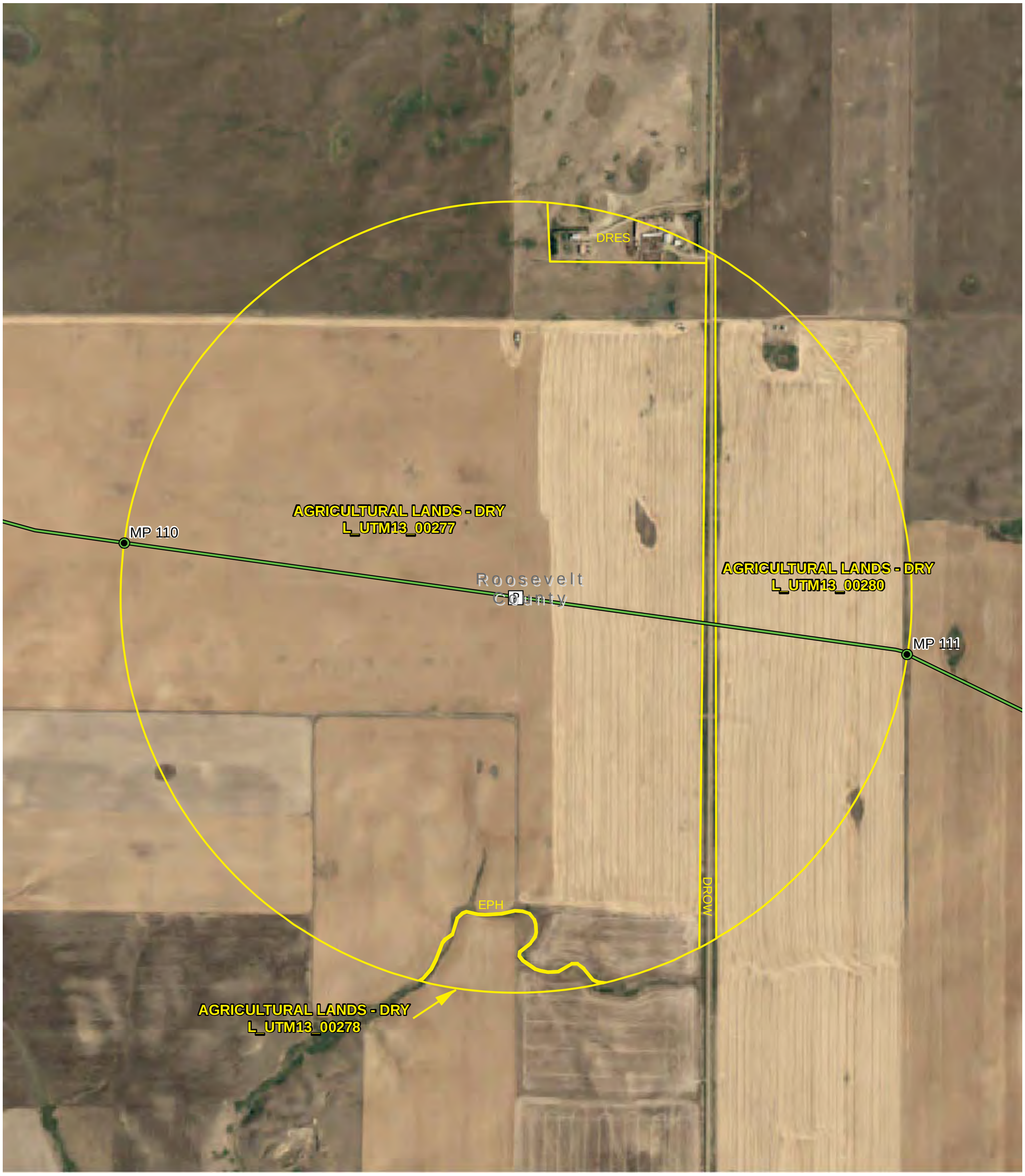
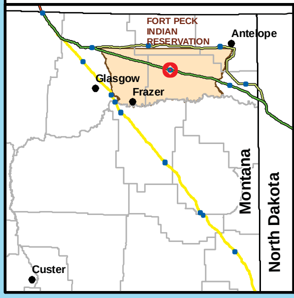
Landcover Types

Alternatives A, A1A: PS-10

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative A: PS-11

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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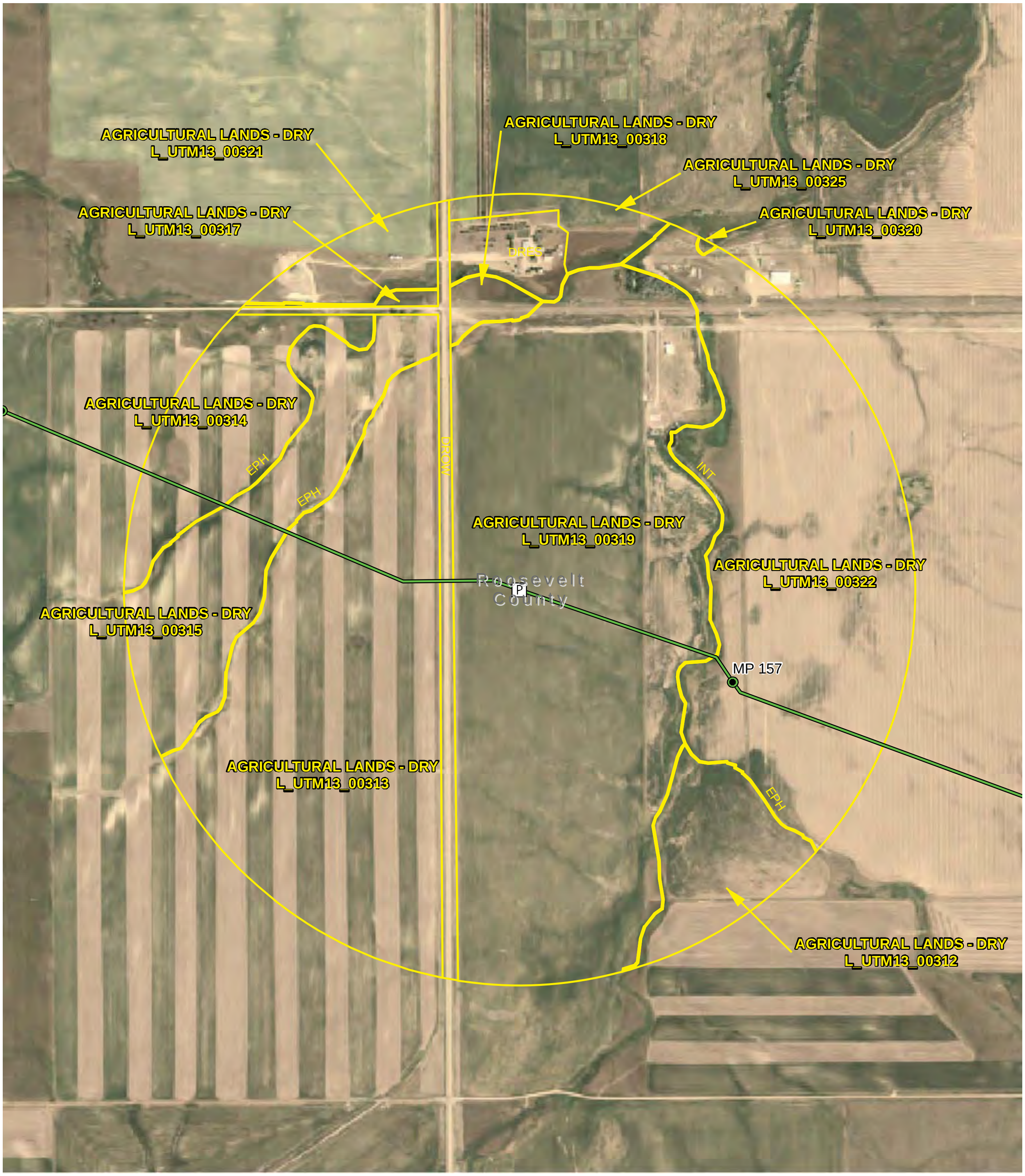

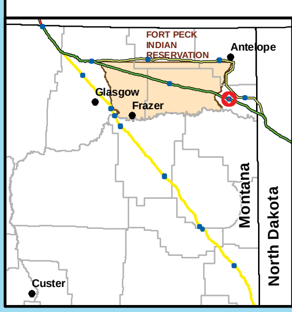

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative A: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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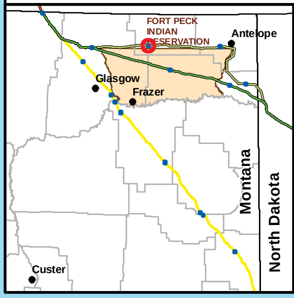


Legend

Steele City Segment Routes

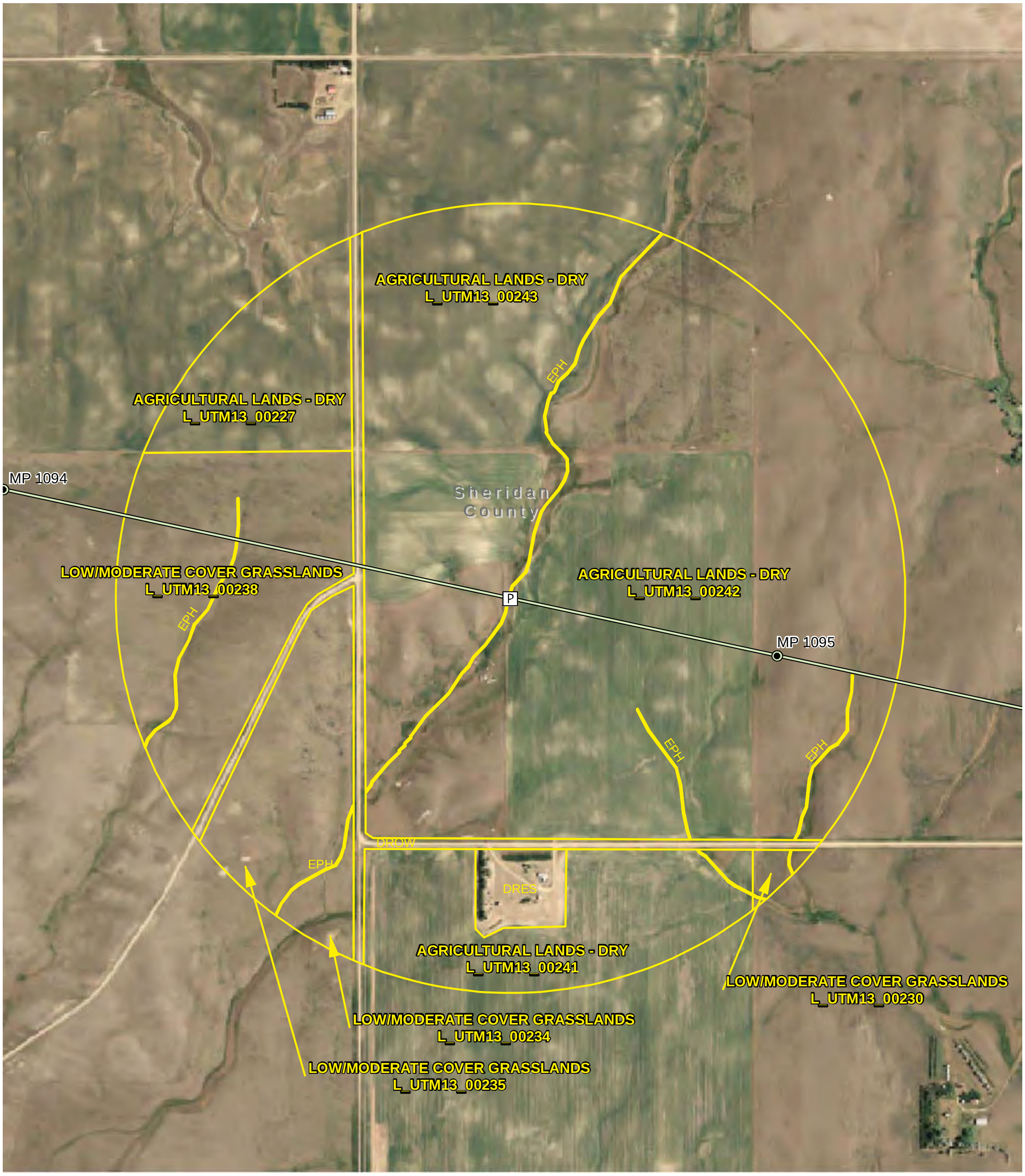
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

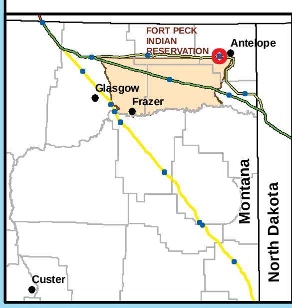
Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative A1A: PS-11

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative A1A: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

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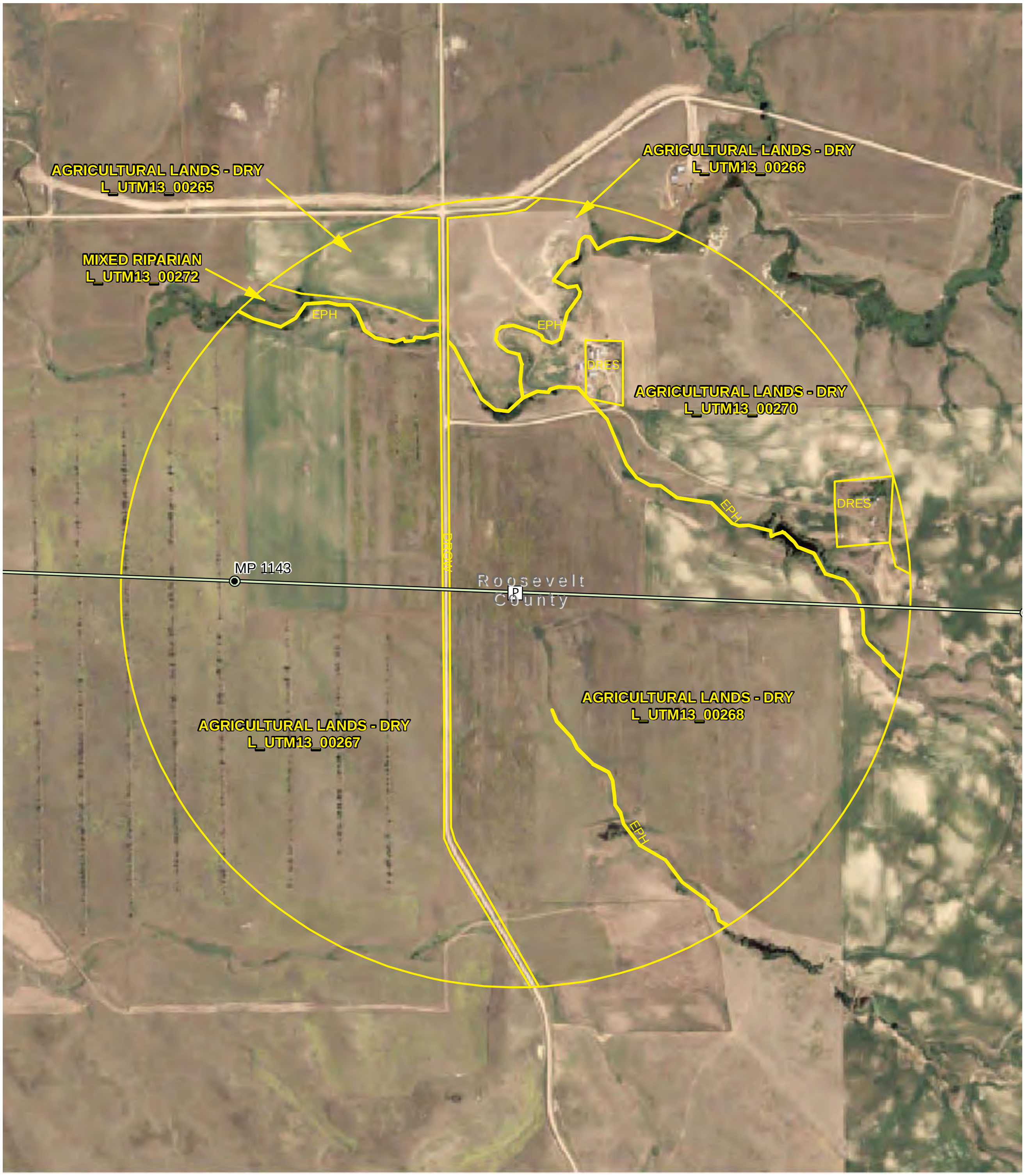

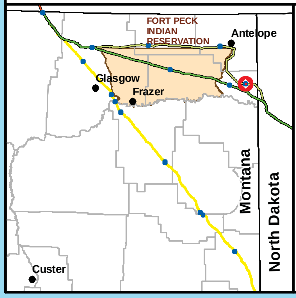

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative A1A: PS-13

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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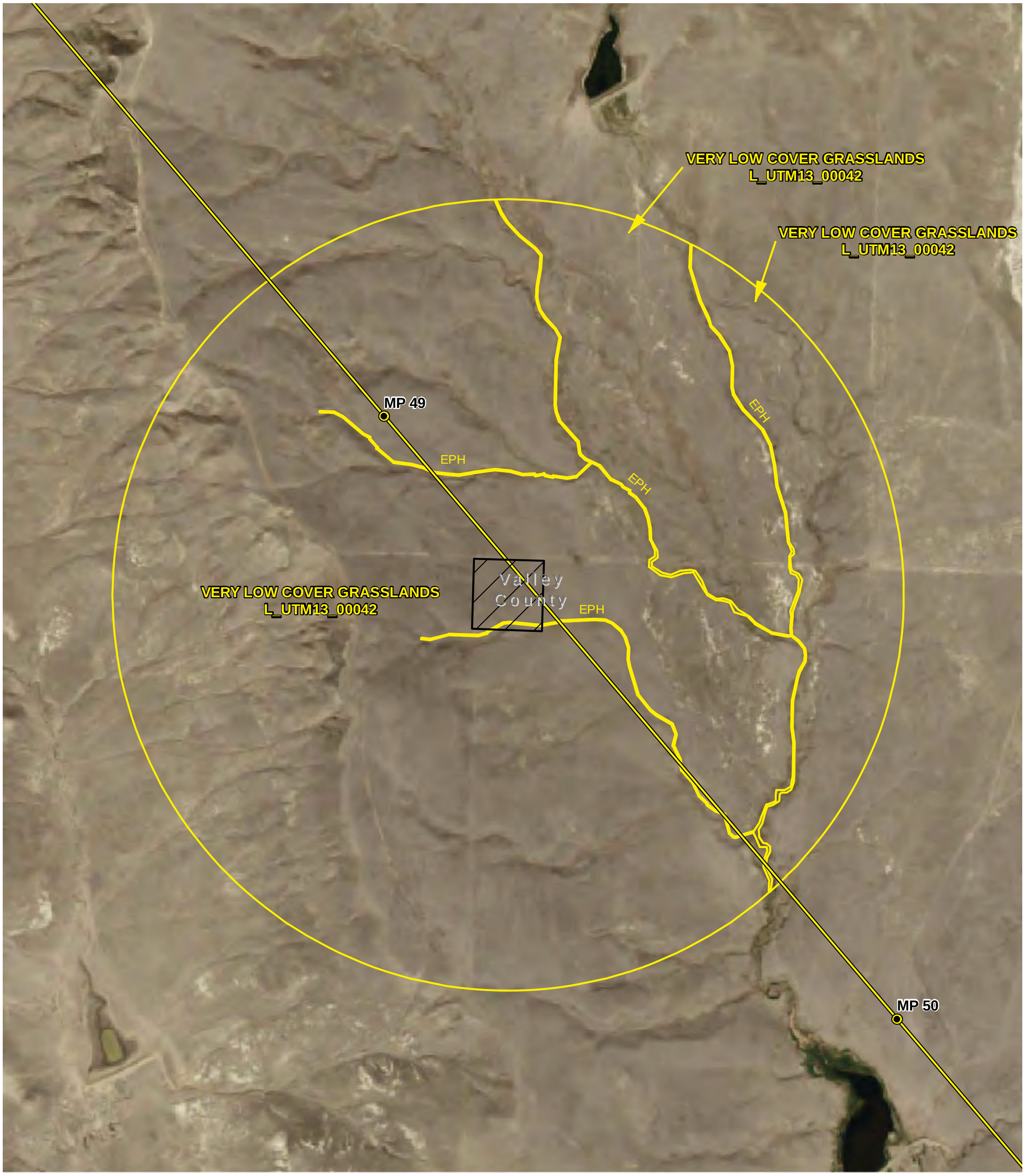

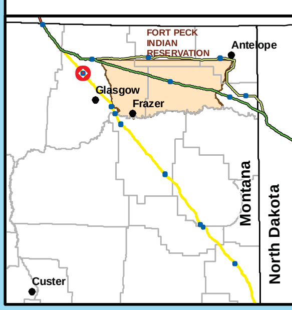

Legend

Steele City Segment Routes
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative B: PS-10

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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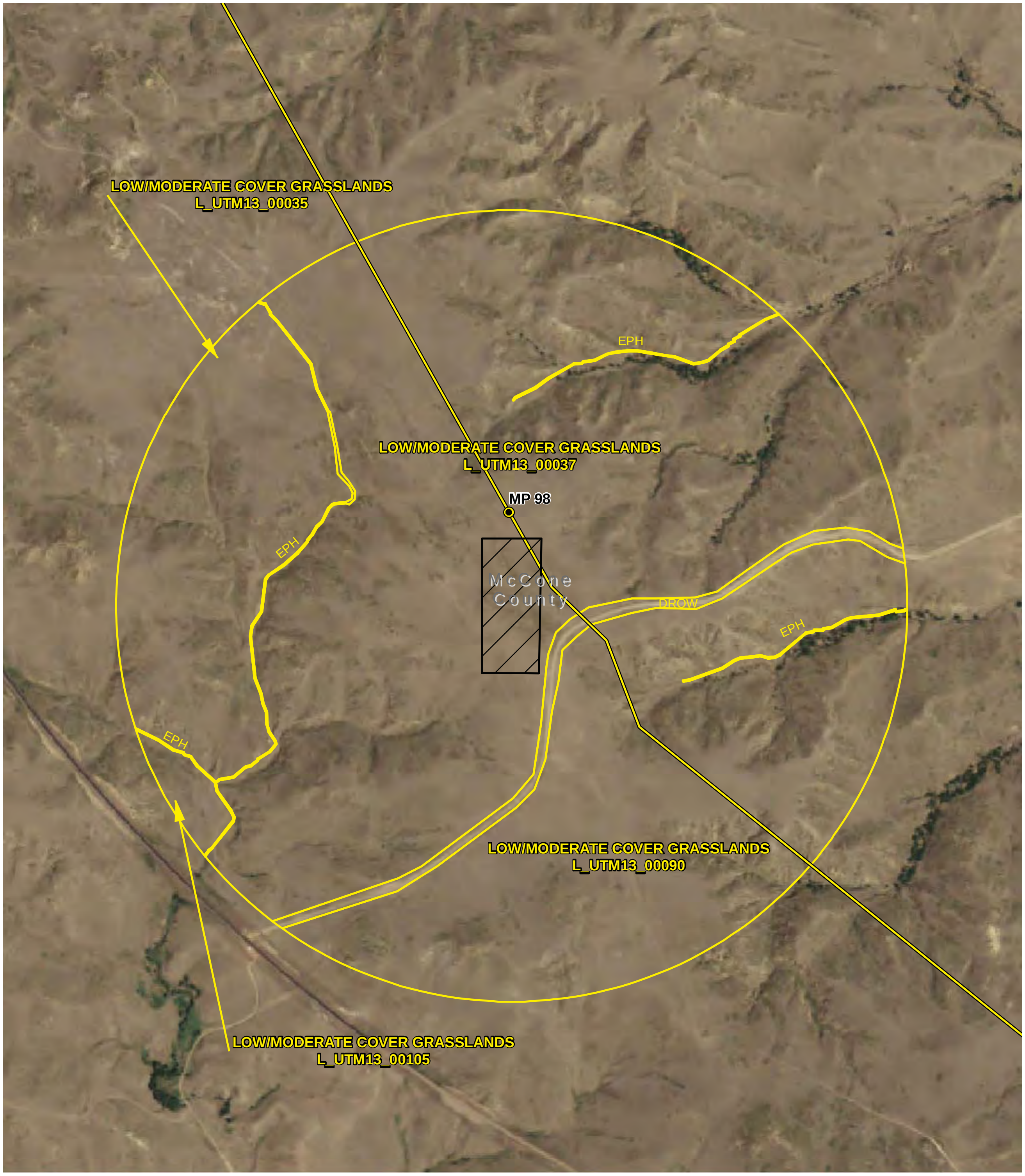

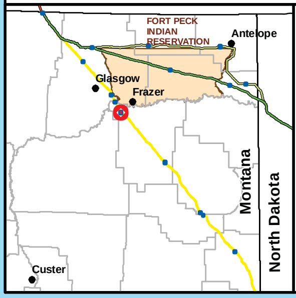

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative B: PS-11

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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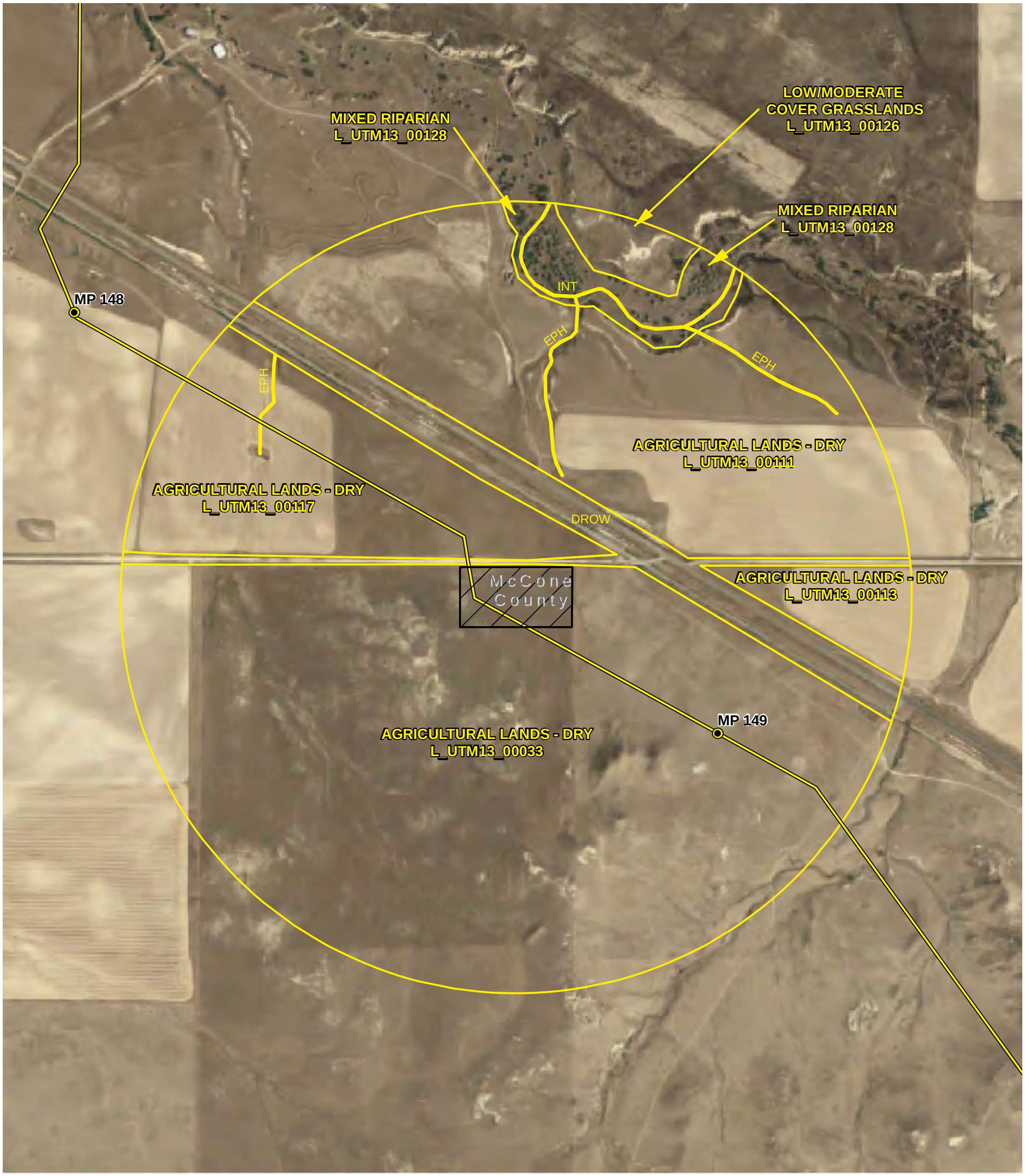
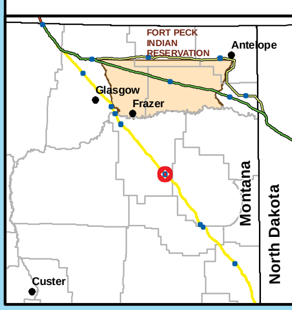




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

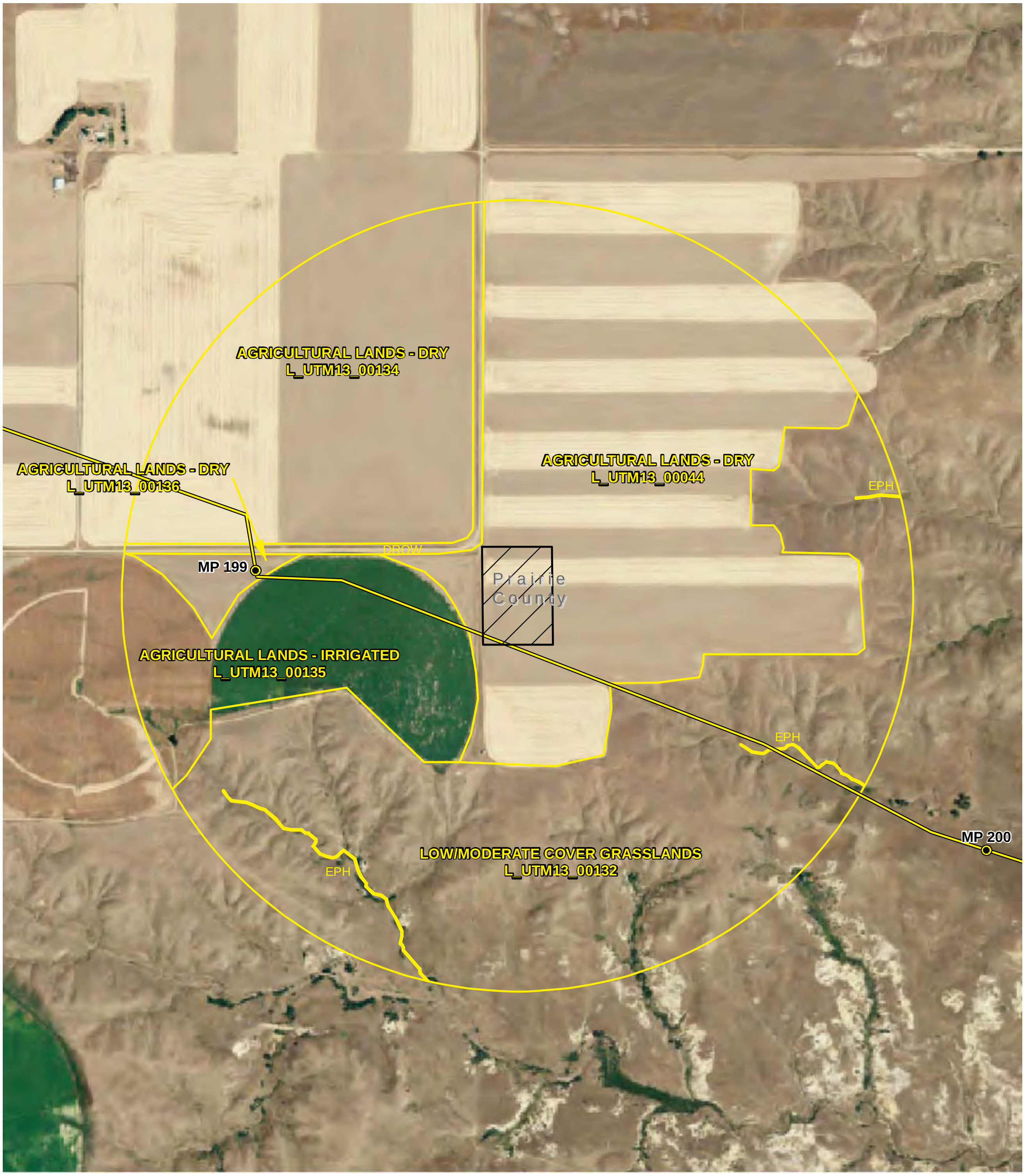
ConocoPhillips TransCanada

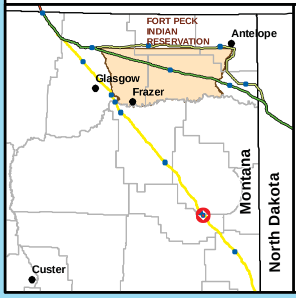
Landcover Types

Alternative B: PS-12

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N





Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Alternative B: PS-13

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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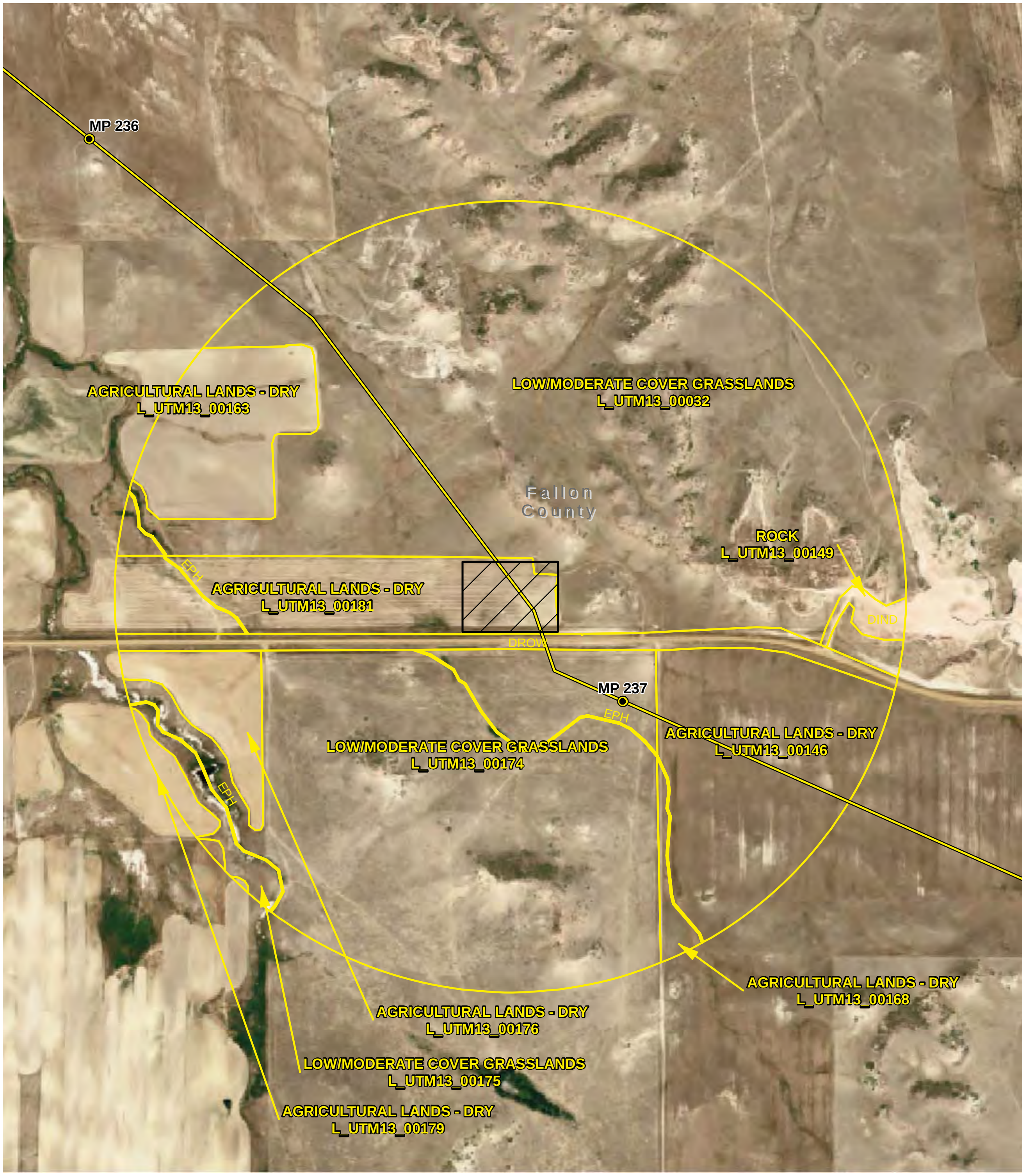
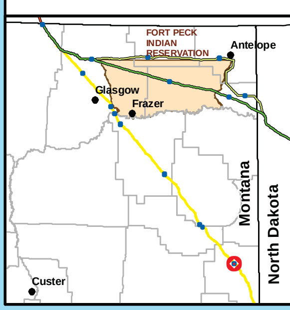




Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- P Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

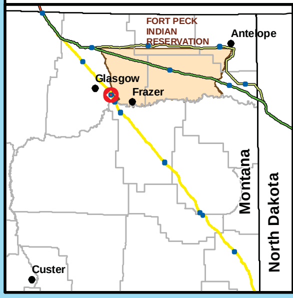
Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Alternative B: PS-14

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N



Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Milk River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000
N

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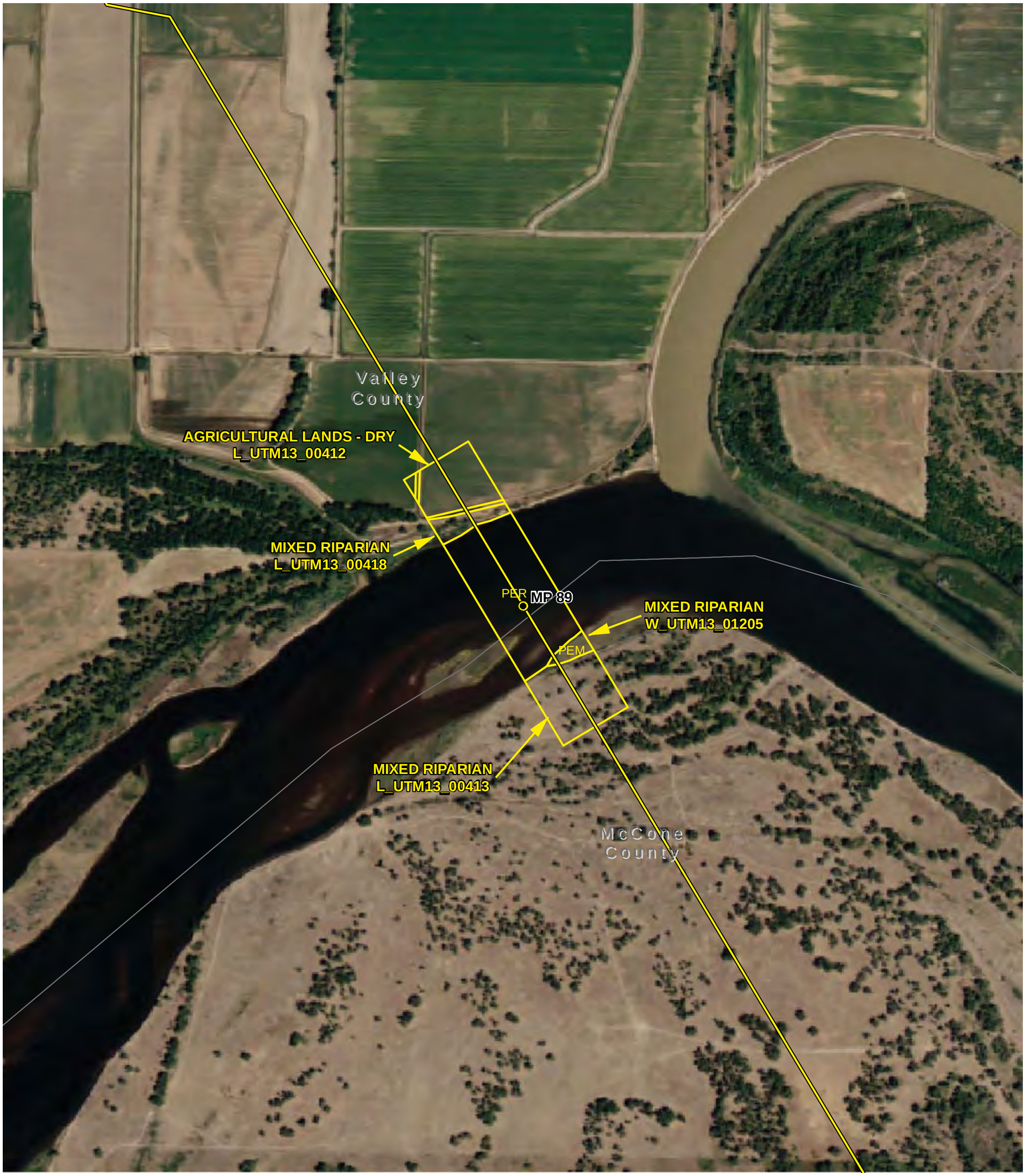

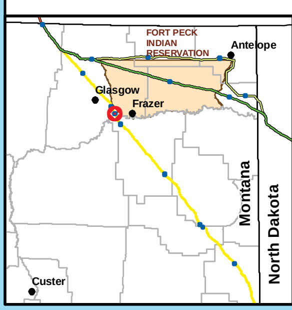

Legend

Steele City Segment Routes

- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)
- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

Landcover Types

Missouri River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

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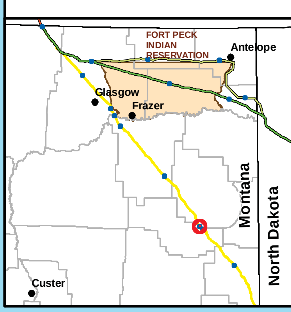


Legend

Steele City Segment Routes
- Alternative A
- Alternative A1A
- Alternative B (Feb. 15, 2009)

- Landcover
- Pump Station (Options A, A1A)
- Pump Station (Alternative B) (Feb. 15, 2009)

Montana Study Area
KEYSTONE XL PROJECT

ConocoPhillips TransCanada

Landcover Types

Yellowstone River Crossing

0 250 500 1,000 Feet
0 50 100 200 Meters
1:12,000

N

Clarification for Section 3.8(1)(c)(iii)(C)

DEQ Request:

> 3.8(1)(c)(iii)(C) for liquid pipelines, any additional waters where aquatic habitats could be adversely affected by a liquid spill or leak;

Keystone Response:

Attachment D, Section 3 estimates incident frequency conservatively as 1 release in any 1-mile segment every 7,500 years along the Project in Montana. A hypothetical release would have a 50 percent probability of being 3 barrels or less; 35 percent probability of being between 3 and 100 barrels; 10 percent probability of being between 100 and 1,000 barrels; 5 percent probability of being between 1,000 and 10,000 barrels; and a 0.5 percent probability of being more than 10,000 barrels. Please note that an amendment to **Attachment D**, Section 4 is also included in this submittal.

The method used to respond to Section 3.8(1)(c)(iii)(C) accounts for 100 percent of the alternative routes, and categorizes all portions of the pipeline that cross or are located near a National Hydrography Dataset (NHD)-defined waterway within one of the categories indicating where impacts might possibly occur. A 500 foot buffer along the pipeline on either side of waterways crossed was included as part of the crossing. All portions of the pipeline within ¼ mile of waterways were analyzed for surrounding topography. It was assumed that product could only travel over flat ground for 200 yards, or for up to ¼ mile over steep terrain with slopes greater than 5 percent. Buffers of ¼ mile were transposed on the routes, and slopes within the buffer were analyzed. Portions of pipeline in each simulated catchment within 200 yards, excluding areas with slopes greater than 5 percent, were identified as pipeline segments that could impact aquatic habitats (PSAH).

In order for impacts to occur, the following circumstances must all surround a release and happen at the same time and place: 1) be within a segment that could contribute to a stream; 2) be of a sufficient size to travel overland and reach the waterway; 3) have water flow in the waterway for transport; 4) have presence of aquatic habitat at or downstream from the introduction; and 5) have contaminant in a concentration (release size) great enough to impact the aquatic habitat. It is highly unlikely that all these circumstances would occur at the same time causing an impact to aquatic habitat. **Mapbook 8** depicts the reaches of stream that might, although highly unlikely, have aquatic habitat impacted by a release. All these factors are shown in **Table 1,** which lists the length of each route's PSAH as an indication of the aquatic habitats that could be adversely impacted by a hypothetical release. All route alternatives have 1 percent or less contributing by direct flow to a perennial waterway. The postulated occurrence interval for theoretical impacts occurring in each category of PSAH along each alternative route is also noted by incident magnitude. **Table 2** contains examples of calculations used to arrive at the occurrence intervals.

Table 1 Categorization by Contribution Method of Pipeline Segments that Could Impact Aquatic Habitats

Contribution Method	Miles of Route	Percent of Route	Potential Exposure of Aquatic Habitat - Occurrence Interval by Incident Size [1] (years)			
			Very Small	Small	Moderate	Large
Route A						
Does not contribute to waterway	64.2	36%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	65.8	36%	45,707	32,648	38,089	30,471
Direct flow to Intermittent waterway	48.6	27%	3,094	4,420	15,471	30,942
Overland flow to Perennial waterway	1.3	1%	231,348	165,248	192,790	154,232
Direct flow to Perennial waterway	0.8	<1%	18,797	26,853	93,985	187,970
Total	180.7	100%	-	-	-	-
Route A1A						
Does not contribute to waterway	96.3	47%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	64.7	31%	46,484	33,203	38,737	30,989
Direct flow to Intermittent waterway	42.4	21%	3,547	5,067	17,733	35,466
Overland flow to Perennial waterway	0.7	<1%	429,646	306,890	358,038	286,430
Direct flow to Perennial waterway	1.4	1%	10,741	15,344	53,706	107,411
Total	205.5	100%	-	-	-	-

Table 1 Categorization by Contribution Method of Pipeline Segments that Could Impact Aquatic Habitats

Contribution Method	Miles of Route	Percent of Route	Potential Exposure of Aquatic Habitat - Occurrence Interval by Incident Size [1] (years)			
			Very Small	Small	Moderate	Large
Route B						
Does not contribute to waterway	79.5	28%	No Exposure	No Exposure	No Exposure	No Exposure
Overland flow to Intermittent waterway	130.8	46%	22,993	16,424	19,161	15,329
Direct flow to Intermittent waterway	69.0	24%	2,179	3,113	10,897	21,794
Overland flow to Perennial waterway	1.4	<1%	214,823	153,445	179,019	143,215
Direct flow to Perennial waterway	2.0	1%	7,519	10,741	37,594	75,188
Total	282.7	100%	-	-	-	-

[1] Incident size: Very small=3 barrels; Small=50 barrels; Moderate=1,000 barrels; Large=10,000 barrels.

Occurrence interval calculations account for probability of each spill size (Att. D, Section 3.2), probability of flow in the waterway (Perennials flow 100%, Intermittent flow 50% of time), probability of resources being present (100% Perennial, 20% Intermittent have resources), and probability of spill size traveling overland to waterway (Very small = 5%, Small = 10%, Moderate = 30%, Large = 75%).

Table 2 Examples of Calculations of the Occurrence Intervals by Incident Size

Very Small Size - Overland flow to Intermittent waterway	One incident divided by the following denominator: Total miles (for Route A, 65.8 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (very small, 0.5) * spill size's assumed probability of reaching the waterway via overland flow (very small, 0.05) * assumed probability of flow in the waterway (intermittent, 0.5) * assumed presence of a resource downstream in the waterway (intermittent, 0.2). 1 incident / (65.8 miles * 0.000133 incidents/mile/year * 0.5 * 0.05 * 0.5 * 0.2) = 45,707 years

Table 2 Examples of Calculations of the Occurrence Intervals by Incident Size

Small Size **Direct flow to Intermittent waterway**	One incident divided by the following denominator: Total miles (for Route A, 48.6 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (small, 0.35) * assumed probability of flow in the waterway (intermittent, 0.5) * assumed presence of a resource downstream in the waterway (intermittent, 0.2). 1 incident / (48.6 * 0. 000133 incidents/mile/year * 0.35 * 0.5 * 0.2) = 4,420 years
Moderate Size Overland flow to Perennial waterway	One incident divided by the following denominator: Total miles (for Route A, 1.3 miles) * probability of a spill (0. 000133 incidents/mile*year) * spill size's probability of occurring (moderate, 0.1) * spill size's assumed probability of reaching the waterway via overland flow (moderate, 0.3) * assumed probability of flow in the waterway (perennial, 1.0) * assumed presence of a resource downstream in the waterway (perennial, 1.0). 1 incident / (1.3 miles * 0. 000133 incidents/mile/year * 0.1 * 0.5 * 1.0 * 1.0) = 192,790 years
Large Size – **Direct flow to Perennial waterway**	One incident divided by the following denominator: Total miles (for Route A, 0.8 miles) * probability of a spill (0.000133 incidents/mile*year) * spill size's probability of occurring (large, 0.05) * assumed probability of flow in the waterway (perennial, 1.0) * assumed presence of a resource downstream in the waterway (perennial, 1.0). 1 incident / (0.8 miles * 0. 000133 incidents/mile/year * 0.05 * 1.0 * 1.0) = 187,970 years

Attachment D, Section 4.2.2.4 discusses the potential impacts to aquatic habitats. **Tables 4-4** through **4-11** of **Attachment D** contain details of potential impacts according to stream size and hypothetical release size. Please refer back to **Tables 1** and **2** in **Attachment P** pages P-71 to P-81 for descriptions of aquatic habitat, special use sites, and fish distribution in perennial streams near the Keystone XL Project Alternatives.

Montana's Comprehensive Fish and Wildlife Conservation Strategy (MCFWCS) emphasized two aquatic focus areas within the project area, the Lower Missouri River and the Lower Yellowstone River. Portions of Routes A and A1A are in the Lower Missouri River area and a portion of Route B is within the Lower Yellowstone River area. These prairie stream drainages include large perennial warmwater rivers, breaks and coulees, pothole lakes, and intermittent streams (MCFWCS 2005). There are a total of 55 aquatic (2 crayfish, 3 mussel, and 50 fish) species that are found within the Lower Missouri River Focus area and 65 aquatic (1 crayfish, 3 mussel, and 60 fish) species within the Lower Yellowstone River Focus Area (MCFWCS 2005). After meetings between Keystone representatives and Montana Fish, Wildlife, and Parks (MFWP) in 2008 and 2009, the northern redbelly dace x finescale dace and pearl dace were the only species of concern that have the potential to occur within intermittent streams with suitable habitat crossed by the Project.

Conclusion

This conservative analysis of the proposed Project alternatives coupled with the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis for Montana (Attachment D) demonstrates that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently risk of a release that would impact aquatic habitats is extremely low. Compliance with regulations, application of Keystone's IMPs and Emergency Response Plan (ERP), as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline.

Clarification for Section 3.8(1)(c)(iv)

DEQ Request:

> 3.8(1)(c)(iv) for a liquid pipelines facility, a detailed assessment of the consequences of a spill or leak downstream of each crossing of a perennial waterway, including a description of the principal resources that would be affected, the magnitude of the impact to fishery resources and habitat, and a description of proposed spill detection, containment, and cleanup techniques;

Keystone Response:

Table 1 below indicates perennial waterway crossings for each route and the associated resources that could be impacted by a hypothetical release at each crossing along with shading that indicates the magnitude of impacts that might be expected from a hypothetical release. Resources were identified through multiple sources. Fisheries that are downstream of potential hypothetical releases at perennial waterway crossings are the same as those listed in **Attachment P**, pages P-71 to P-81. Public water supply system intakes were identified through data from MDEQ (MDEQ 2009). USGS 24K topographic maps were also utilized in the analysis of resources.

Table 2 below lists streamflow statistics for perennial streams crossed by the alternative routes where gaging station records were available. These perennial streams can be classified according to their average annual flow by the stream categories within Table 4-1 in the Project Pipeline Risk Assessment and Environmental Consequences Analysis for Montana (**Attachment D**).

Attachment D, Section 4.2.2.4 provides information regarding the magnitude of possible impacts to aquatic ecosystems. The magnitude of effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of crude oil spilled, the species assemblage present, climate, and the spill response tactics employed. If a hypothetical release were to occur along a PSAH to the streams and rivers referenced in **Table 2**, the magnitude of the impacts can be estimated to those specific streams by referencing the average annual flow at the gage (after considering any necessary adjustment for tributaries and/or distance from gage to crossing) to **Attachment D**, Section 4.2.2.4.

Hypothetical release frequency and size is discussed in Chapter 1, Section 1.5.5 of the MFSA application on page 1-34. Hypothetical release detection is described in Chapter 1, Section 1.5.6 on pages 1-34 and 1-35.

Containment and cleanup will be addressed in the Spill Prevention, Control and Countermeasure (SPCC) Plan for construction and in the Emergency Response Plan (ERP) for operations. A draft SPCC Plan was provided in the April 7, 2009 (green) supplemental filing. An outline of the ERP can be found in **Attachment B**. The Keystone XL ERP, which is based on the previously PHMSA- approved Keystone ERP, is under development and will be filed with PHMSA for review prior to operations.

Conclusion

This conservative analysis of the proposed Project alternatives coupled with the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis for Montana (**Attachment D**) demonstrates that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently, risk of a release that would impact principal resources or fishery resources and habitats is minimal. Compliance with regulations, application of Keystone's Integrity Management Program and ERP, as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline.

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval [2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Route A									
Frenchman Creek	Low	25.0	0.20	Frenchman Reservoir	1.9	73,714	105,305	368,568	737,137
Poplar River	Lower Moderate	125.5	0.21	--	--	71,950	102,786	359,751	719,502
Big Muddy Creek	Low	146.9	0.20	--	--	76,722	109,603	383,612	767,224
Shotgun Creek	Low	168.0	0.19	Reservoir (unknown name, on-channel downstream from Bainville)	9.5	79,5644	113,663	397,820	795,640
Route A1A									
Frenchman Creek	Low	25.0	0.20	Frenchman Reservoir	1.9	73,714	105,305	368,568	737,137
West Fork Poplar River	Low	96.8	0.42	--	--	35,804	51,148	179,019	358,038
Poplar River	Low	110.7	0.24	--	--	63,719	91,027	318,593	637,186

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval[2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Big Muddy Creek	Low	155.7	0.20	--	--	75,566	107,951	377,829	755,658
Lake Creek	Low	172.3	0.20	--	--	75,947	108,496	379,737	759,474
East Shotgun Creek	Low	194.3	0.19	--	--	79,564	113,663	397,820	795,640
Route B									
Frenchman Creek	Low	25.9	0.19	Frenchman Reservoir	0.6	77,127	110,181	385,633	771,265
Rock Creek	Low	39.2	0.18	--	--	83,542	119,346	417,711	835,422
Milk River	Lower Moderate	82.7	0.20	Town of Nashua PWS ID # MT0000297 (alluvial wells)	3.0	73,490	104,986	367,450	734,900
Missouri River	High	88.9	0.25	Important aquatic ecosystem	0.0	60,907	87,010	304,537	609,073
Yellowstone River	Upper Moderate	195.9	0.21	Important aquatic ecosystem	0.0	73,022	104,317	365,109	730,218

Table 1 Perennial Waterway Crossings and Associated Resources that may be Affected by a Hypothetical Release

Stream or River Name	Stream Flow Category[1]	Approx. MP	PSAH Distance (miles)	Resource Affected by Hypothetical Release	Distance Down-stream (miles)	Occurrence Interval[2] (years)			
						Very Small (3 bbls)	Small (50 bbls)	Moderate (1,000 bbls)	Large (10,000 bbls)
Cabin Creek	Low	201.3	0.19	--	--	73,134	104,477	365,670	731,340
Cabin Creek	Low	201.9	0.13	--	--	79,433	113,476	397,164	794,329
Sandstone Creek	Low	244.1	0.18	--	--	119,540	170,772	597,702	1,195,405
Little Beaver Creek	Low	262.2	0.18	--	--	82,441	117,773	412,206	824,411
Boxelder Creek	Low	281.2	0.14	--	--	81,982	117,117	409,909	819,818

[1] Based on average annual stream flow after considering any necessary adjustment for tributaries and/or distance from gage to crossing where appropriate, or on stream width when no gage data was available.

[2] Incident size: Very small=3 barrels; Small=50 barrels; Moderate=1,000 barrels; Large=10,000 barrels.

Shading indicates concentrations that could potentially cause acute toxicity to aquatic species according to Attachment D, Table 4-7. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold), lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold), and unshaded areas represent low probability of acute toxicity (< toxicity threshold).

Occurrence interval based on the conservative overall predicted incident frequency of 0. 000133 incidents/mile*year, projected frequencies of each spill volume (Attachment D, Section 3.2), and calculated with miles of CPS per crossing prior to rounding.

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	Approx. MP	USGS Gaging Station Site Number and Name	Gage Direction and Distance from Crossing (miles)	Period of Record	Average Annual Flow (cfs)	Lowest Average Monthly Flow (cfs) [Month]	Highest Average Monthly Flow (cfs) [Month]
Route A							
Frenchman Creek	25.0	Ungaged	-	-	-	- -	- -
Poplar River	125.5	06181000 Poplar River near Poplar MT	downstream 27	1908-2008	115	0.013 [JAN]	4918 [APR]
Big Muddy Creek	146.9	06185110 Big Muddy Creek nr mouth nr Culbertson MT	downstream 21	1982-1992	22	0 [MLT]	778.6 [APR]
Shotgun Creek	168.0	Ungaged	-	-	-	- -	- -
Route A1A							
Frenchman Creek	25.0	Ungaged	-	-	-	- -	- -
West Fork Poplar River	96.9	06180000 West Fork Poplar River near Richland MT	upstream 27	1935-1949 [1]	19 [2]	0 [FEB]	460 [MAR]
Poplar River	110.9	06181000 Poplar River near Poplar MT	downstream 70 [3]	1908-2008	115	0.013 [JAN]	4918 [APR]
		06179000 East Fork Poplar River near Scobey MT	upstream 29	1935-1981 [4]	21 [2]	0 [FEB]	297 [MAR]

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	Approx. MP	USGS Gaging Station Site Number and Name	Gage Direction and Distance from Crossing (miles)	Period of Record	Average Annual Flow (cfs)	Lowest Average Monthly Flow (cfs) [Month]	Highest Average Monthly Flow (cfs) [Month]
Big Muddy Creek	155.8	06183450 Big Muddy Creek near Antelope MT	upstream 12	1979-2008	29	0 [MLT]	850.7 [MAR]
Lake Creek	172.4	Ungaged (below NWR)	-	-	-	- -	- -
East Shotgun Creek	194.4	Ungaged	-	-	-	- -	- -
Route B							
Frenchman Creek	25.9	Ungaged	-	-	-	- -	- -
Rock Creek	39.2	06171000 Rock Creek near Hinsdale MT	downstream 20	1906-1920 [1]	195 [2]	0 [MLT]	1905 [APR]
Milk River	82.7	06174500 Milk River at Nashua MT	downstream 2.2	1940-2008	619	3.42 [AUG]	20930 [APR]
Missouri River	88.9	06132000 Missouri River below Fort Peck Dam MT	upstream 1.9 [3]	1934-2008	9284	832.3 [JUN]	35030 [JUL]
Yellowstone River	195.9	06329500 Yellowstone River near Sidney MT	downstream 90 [3]	1911-2008	12370	1602 [AUG]	77280 [JUN]
Cabin Creek	201.3	Ungaged	-	-	-	- -	- -
Cabin Creek	201.9	Ungaged	-	-	-	- -	- -

Table 2 Streamflow Statistics for Perennial Streams Crossed by Project Alternate Routes in Montana

Stream or River Name	**Approx. MP**	**USGS Gaging Station Site Number and Name**	**Gage Direction and Distance from Crossing (miles)**	**Period of Record**	**Average Annual Flow (cfs)**	**Lowest Average Monthly Flow (cfs) [Month]**	**Highest Average Monthly Flow (cfs) [Month]**
Sandstone Creek	244.1	Ungaged	-	-	-	- -	- -
Little Beaver Creek	262.2	Ungaged	-	-	-	- -	- -
Boxelder Creek	281.2	06334630 Box Elder Creek at Webster MT	downstream 2.2	1961-1973	91	0.665 [JUL]	1049 [MAY]

[1] No data for years 1908-1911.

[2] Incomplete data have been used for statistical calculation.

[3] River at Project crossing may be one order of magnitude different than gage indicates due to large tributaries and/or large distance between gage and crossing.

[4] No data for years 1941-1970.

Source: USGS. 2009. National Water Information System: Web Interface. Accessed on May 5, 2009 at http://waterdata.usgs.gov/nwis.

Clarification for Section 3.8(1)(c)(v)

DEQ Request:

> 3.8(1)(c)(v) for any wetlands or other waterfowl habitat downstream from a river crossing that could be adversely affected by a liquid spill or leak, information on seasonal abundance and species composition of waterfowl populations.

Keystone Response:

Wetlands that have the possibility of being affected by a hypothetical release were identified through GIS analysis of the National Land Cover Dataset (NLCD) 2001. Any areas attributed in the NLCD as wetland land cover was considered; "Emergent Herbaceous Wetlands" and "Woody Wetlands" were both present in the area. Any wetlands over 1 acre surface area and intersecting with the hypothetical release paths, along with additional wetlands identified along possibly affected reaches of the Yellowstone and Missouri rivers were categorized and presented to the MFWP in May 2009 for information on waterfowl species composition and seasonal abundance. Based on the response from MFWP, these data are not available and to provide these data, surveys would need to be conducted during three seasons. MFWP advised that specific data on such waterfowl species and seasonal abundance is not available. General information that is available is provided in the discussion below. Based on this discussion, this item should be deemed complete.

Wetland Habitat Downstream of Pipeline Waterway Crossings Along Possible Release Paths

County	Number of wetlands <10 acres	Number of wetlands >10 acres	Mean Size (acres)
Route A			
Phillips	30	6	13
Valley	274	53	9
Roosevelt [1]	279	91	31
Route A Total	583	150	20
Route A1A			
Phillips	30	6	13
Valley	170	57	18
Daniels	93	43	18
Sheridan	98	11	9
Roosevelt	76	13	89
Route A1A Total	467	130	27
Route B			
Phillips	27	6	14

Wetland Habitat Downstream of Pipeline Waterway Crossings Along Possible Release Paths

County	**Number of wetlands <10 acres**	**Number of wetlands >10 acres**	**Mean Size (acres)**
Valley	341	107	23
McCone	208	38	12
Dawson	324	60	8
Prairie	25	1	3
Fallon [2]	280	30	5
Route B Total	1205	242	12

[1] Includes wetlands south of Missouri River actually located in Richland County.

[2] Includes wetlands in Custer County, downstream of Fallon County.

Source: USGS. 2001. National Land Cover Database (NLCD) 2001

The Project is located within the Central Flyway for migrating bird species. Medicine Lake National Wildlife Refuge (NWR), located along and adjacent to routes A and A1A, provides representative information for the seasonal abundance and composition of waterfowl within the Project area. Medicine Lake NWR has long been recognized for it's importance to breeding and migrating waterfowl and was the primary reason for the purchase of the refuge in 1935 (USFWS 2009). Most common nesting ducks are mallard, gadwall, northern pintail, northern shoveler, blue-winged teal, and lesser scaup, with a total of 14 species breeding locally (USFWS 2009). More than 300 pairs of Plains Canada geese breed in the refuge complex (USFWS 2009). Spring and fall migrations bring thousands of waterfowl to the refuge, mostly ducks, Canada and white-fronted geese, and tundra swans, with a smaller number of snow geese (USFWS 2009).

References

Montana Department of Environmental Quality (MDEQ). 2009. Source Water Protection Program - Query System. Website accessed on July 7, 2008 and May 6, 2009: http://nris.state.mt.us/wis/swap/swapquery.asp.

Montana Fish Wildlife and Parks (MFWP). 2005. Montana's Comprehensive Fish and Wildlife Conservation Strategy. Montana Fish, Wildlife, & Parks, 1420 East Sixth Avenue, Helena, MT 59620.

US Environmental Protection Agency (USEPA). 1999. DRAFT Standards for National Hydrography Dataset - High Resolution. Website accessed on June 15, 2009: http://nhd.usgs.gov/techref.html

US Fish and Wildlife Service (USFWS). 2009. Medicine Lake National Wildlife Refuge Complex. Website accessed on June 30, 2009: http://www.fws.gov/medicinelake/Wildlife.htm#Birds.

Clarification for Section 17.20.815(6)

DEQ Request:

Design capacity and operational characteristics.

Describe design capacity and operational characteristics for associated facilities.

Keystone Response:

The proposed service to Project pump stations are 115 kilovolt (kV) transmission lines, with a proposed transmission structure matching the TP-115; a single pole, horizontal post insulator design.

Three factors are considered in designing a power line. The first is the voltage characteristic during load flow, or voltage drop. This is a combination of the load current and the resistance of the conductor. Though the final conductor size has not been determined for Project power lines, the conductor will have a minimum ampacity of 560 amps. Using that, the maximum load at 115 kilovolts would be 110 megawatts. For all locations, source voltage is the determining factor in the circuits to be used, not load flow. For example, initial load flow calculations indicate the 115 kV circuit will be needed to maintain the voltage regulation (spread between no-load and loaded circuit voltage) to select Project pump stations. Using this voltage will be more economical rather than adding transformation costs.

The second factor is the power limit of the line. Bulletin 62-5 "Electrical Characteristics of AC Transmission Line Designs" (USDA 1976) outlines a parameter called Surge Impedance Loading, or SIL. The published SIL value for the TP-115 structure proposed for the Project is 36 megawatts (MW), which is the optimum load for a line of this design with a distance equal to 300 miles. A line shorter than 300 miles can be loaded more heavily than 36 MW, and a longer line should be loaded less than that. The longest proposed power line within Montana is approximately 50 miles in length. The published SIL would indicate that a 115 kV line would be able to very capably serve the 25 MW Project loads.

Theoretically, the stability (or power) limit for a transmission line is calculated using the following equation:

Power Max = (0.75 * Voltage (in kilovolts)^2) / line length (in miles)

For a 115 kV circuit, 50 miles in length, that maximum power would be:

- P max = (.75 * 115^2) / 50
- P max = 9920 / 50
- P max = 198 megawatts.

Based on the above formulas, the optimum load for the proposed 115 kV lines lies between 36 and 200 MW, depending upon the conductor size chosen. The distances for each of the proposed transmission lines are known factors. Therefore, the conductor size will vary. Based on current estimates, the minimum conductor size will be at least 397 aluminum conductor steel reinforced (ACSR) or larger.

The third factor considered is limitation of motor starting, or flicker, seen by other users of the circuits interconnecting to the power lines for Project pump stations. The current is lower for the 115 kV line, in comparison to a lower voltage circuit. This assists in mitigation of any flicker or disturbance to the line with motor starting. Thus, the 115 kV rating is desirable for these loads, especially if other customers are fed from the same circuit.

References:

US Department of Agriculture (USDA), Rural Electrification Administration (REA). 1976. Electrical characteristics of REA alternating current transmission line designs. REA Bulletin No 62-5. July 1976.

Clarification to 75.20.1511(9)

(9) Construction camps

DEQ Comment:

Update requested. Keystone has recently indicated that worked camps are being planned in the areas of Nashua and Baker, Montana. To address this rule, please provide a description of the camps planned for the construction crew, and how they will be operated.

Keystone Response:

Based on an in-depth housing analysis and on updated discussions with construction contractors, Keystone plans to use temporary construction camps. These temporary camps will supplement local housing in remote areas of Montana for the duration of construction in the area. Currently, Keystone is considering two camps in Montana, generally situated at the spread breaks between Spreads 1 and 2 and between Spreads 3 and 4.

Each camp will be designed to house approximately 600 people. Camps will consist of prefabricated, modular, dormitory-style units that include heat and air conditioning systems. Camps typically will include sleeping areas with shared and private baths, craft rooms, recreation facilities, telecommunication/media rooms, kitchen/dining facilities, laundry facilities, security/infirmary unit, offices, and wastewater treatment facilities.

Construction camp sites will be approximately 80 acres each in size, of which 30 acres will be used as a contractor yard and 50 acres will be used as the actual camp site. Within the acreage designated for the camp site, space will also be set aside for RVs. The water, electricity, and wastewater for RVs will be tied into one camp system. Camps will be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations. **Table 1** summarizes the regulations and permits required for construction camps based upon preliminary designs of the camps. Final design will be accomplished after bidding and hiring contractors to build and maintain the camps. Keystone will be responsible for obtaining all permits. Due to the timing of engaging a contractor to build and operate the camps, Keystone will acquire permits based upon a preliminary design for each camp.

Where feasible, potable water will be provided by drilling a well. If an adequate water supply cannot be obtained from the well, water will be provided by municipal sources or trucked to each camp. A wastewater treatment facility will be included in each camp to treat wastewater to meet regulatory standards prior to discharge.

In areas where construction camps are used, camps will include a health, safety and environment program, fire and HAZMAT protection programs (NFPA Level 101), and a vector program. Therefore, strains on the public services in areas where camps are employed would be minimal.

Table 1 Construction Camp Permits and Regulations

Agency/State	**Permit/Discussion**
Montana	
Montana DEQ	Public water and sewer (PWS) laws, Title 75, chapter 6, part 1, MCA. Rules at Administrative Rules of Montana (ARM) 17.38 101, and Department Circulars incorporated by reference. Require plan and spec review before construction of a public water or sewer system. Circulars contain design requirements. Requires water quality monitoring of water supply. Sanitation in subdivisions laws, Title 76, Chapter 4, MCA. Rules at ARM Title 17, Chapter 36. If applicable, requirements would be the same as the PWS laws and Circulars for water supply and wastewater. Would require additional review of stormwater systems and solid waste management. (Likely not applicable unless created "permanent" multiple spaces for mobile homes or RVs. 76-4-102(16), MCA.) Water Quality Act Discharge Permits, Title 75, Chapter 5, MCA. Rules at ARM Title 17, Chapter 30. Groundwater discharge permit would be required if a wastewater drain field had a design capacity over 5,000 gpd. ARM 17.30.1022. Air permit for diesel fired generators.
Department of Public Health and Human Services (DPHHS)	Work Camp licensing laws, Title 50, Chapter 52, MCA. Rules at ARM Title 37, Chapter 111, Subchapter 6. Regulations regarding water, sewer, solid waste, and food service. Incorporates DEQ PWS requirements but has additional water and sewer provisions. Administered by DPHHS, Public Health and Safety Division, Communicable Disease Control and Prevention Bureau, Food and Consumer Safety Section.
Counties	Permit required for wastewater systems, Regulations adopted under Section 50-2-116(1)(k), MCA. Adopting state minimum standards promulgated by Board of Environmental Review at ARM Title 17, chapter 36, Subchapter 9. Generally follow state laws for subdivisions, PWS, DEQ-4. Work camp permit required in some counties.

The Project is in the process of identifying existing electric power infrastructure to supply power to each of the construction camps. However, if existing infrastructure is not available, diesel-fired internal combustion engines may be used to supply primary power to one or more of the construction camps. Additionally, even if power line infrastructure to each of the construction camps is available, the Project may install diesel-fired internal combustion engines as emergency back-up generators, to supply power to the camps if electrical power from the local utility is interrupted. To determine preliminary emissions estimates from the diesel-fired generator engines, a worst-case scenario of four, 400-kilowatt generator engines was assumed for installation per camp. This worst-case scenario would occur if electrical power to one of the construction camps was unavailable. Each of the diesel-fired engines would be "Tier 3" certified engines and are assumed to operate 8,760 hours per year. Preliminary estimates of emissions associated with four primary power generators are included in **Table 2** and preliminary estimates of emissions from one backup generator are included in **Table 3**.

Table 2 Four Power Generators

Compound	Emission Factor	Units	Hourly (lbs/hr)	Annual (tons/year)
NO_x + NMHC	3.0	g/bhp-hr	14.11	61.80
CO	2.6	g/bhp-hr	12.35	54.07
PM	0.15	g/bhp-hr	0.71	3.09
SO_x	0.054	lb/MMBtu	0.98	4.31
Pb	9.0	lb/10^{12} BTU	16e-04	7.2e-04

Table 3 One Back-up Generator

Compound	Emission Factor	Units	Hourly (lbs/hr)	Annual (tons/year)
NO_x + NMHC	3.0	g/bhp-hr	3.53	15.45
CO	2.6	g/bhp-hr	3.09	13.52
PM	0.15	g/bhp-hr	0.18	0.77
SO_x	0.054	lb/MMBtu	0.25	1.08
Pb	9.0	lb/10^{12} BTU	4.1E-05	1.8E-04

The Project also will be subject to air quality regulatory programs in Montana if generator engines are needed to supply power at one or more of the construction camps.

New Source Performance Standard regulations establish a standard of performance for new, modified, or reconstructed sources, which fall into any specified source category, regardless of geographic location or the existing ambient air quality. The standards define emission limitations for a particular source group. The NSPS potentially applicable to the Project, which may apply to the construction camp generator engines, include Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, as discussed below.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

In 2006, USEPA promulgated this rule that applies to stationary diesel-fired internal combustion (IC) engines and that sets standards for oxides of nitrogen (NO_X), CO, PM, and non-methane hydrocarbon (NMHC), along with limiting SO_2 emissions through use of lower sulfur fuel. This regulation may apply to the generator engines at the construction camps, depending upon the manufacture dates of the engines. The primary burden of the proposed regulation falls on IC engine manufacturers, rather than on owners/operators, since engine manufacturers must certify their engines to the emission standards.

The ARM, Title 17, lays the framework for the state air quality laws and regulations in Montana. The ARM establishes the legal authority of the MDEQ to enforce the regulations set forth by the Clean Air Act of Montana, Title 75. Chapter 8 of Title 17 of the ARM identifies the air quality regulations that would apply to the generators at the construction camps, if the generators are installed. Specifically, Subchapter 7 includes provisions for the construction and operating permit requirements of air contaminant sources. These regulations would apply if the construction camp generators are installed at construction camps in Montana.

The diesel-fired generator engines that may be located at one or more of the construction camps in Montana if line power is not acquired will have criteria pollutant emission levels below 100 tpy. Therefore, the construction camps would not be subject to Title V operating permit requirements. However, if the generator engines are located at the construction camps long enough for them to be considered stationary sources, they would be subject to state minor source air permitting requirements. The diesel-fired engines may be subject to Subpart IIII of the NSPS, if the engines are manufactured after the regulatory applicability date as specified in the regulation for that engine power rating. The construction camps will comply with Montana air quality permitting requirements if it is determined that installation of the generator engines at one or more locations is required.

Wastewater will be treated with a system established on the site to handle the anticipated volume of wastewater discharge from the camp and to meet the effluent standards required in each county where the camps are located. The details of the wastewater treatment facilities will be provided once a contractor has been selected.

The camp will require approximately 45,000 gallons of water per day. If water wells cannot be installed or can not provide this volume of water, Keystone will look to nearby municipal systems and purchase the water required.

Clarification for Section 17.20.1512(7)(a-g)

DEQ Request:

7) Detailed Spill Contingency Plan

a. Immediate Notification Procedures

b. Type and Location of Emergency Response Personnel and Equipment

c. Any Mutual Aid Agreements to supply Personnel and Equipment and Respond in the Event of a Spill

d. Response Procedures

e. Equipment Testing Procedures

f. Frequency of Field Training Exercises

g. Plan Update Procedures

Keystone Response:

7) **Detailed Spill Contingency Plan**

As an interstate liquids pipeline, Keystone is required by federal regulation to develop a detailed Emergency Response Plan (ERP or Plan) prior to commencing pipeline operations. The Plan must be filed for review with the US Department of Transportation (US DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA). Keystone developed an ERP for the initial Keystone Pipeline project. That ERP was approved by PHMSA in January 2009. Keystone is now in the process of preparing an ERP specifically for the Keystone XL Pipeline. The Keystone XL ERP will utilize the work done on the Keystone ERP to the extent applicable. The Keystone XL ERP also will be customized to include numerous location- and project-specific elements. The Keystone XL ERP will be filed with PHMSA prior to commencing operations. The ERP cannot be filed until such time as final pipeline design is completed and route approvals received so that site specific information can be developed for incorporation into the Plan. Keystone will liaise with state and local officials to ensure coordination with local and state offices of disaster services as the Plan is further developed.

The Keystone XL Project ERP will have five broad components: the Plan itself; resources (equipment, personnel, and contractors); training; continuous improvement; and public awareness. Each component is integral to the build up and success of the program and needs to proceed collectively once implemented.

The overall strategy behind the ERP is to manage risks and be able to address the potential consequences in the event of a release. The ERP needs to satisfy regulatory requirements and be user friendly and practical for operations. The ERP must be understood and implemented by field operations which will be achieved through training programs.

Emergency management will be built into pipeline operations through a series of training exercises that direct operations to test and maintain the ERP on an on-going basis.

The Plan is being developed using proprietary software called "ePlan". This will mean that the entire Plan will be electronic and revised on a continual basis making the Plan current all the time. Administratively, the Plan will be part of the corporate Emergency Management System.

The Plan will include Response Zones, notifications, public official listings, contractors, technical response procedures, forms, and other elements.

a. Immediate Notification Procedures

Keystone is required by law to notify immediately the National Response Center (NRC) if an event: (1) violates water quality standards; (2) creates a sheen on water; or (3) causes a sludge or emulsion to be deposited beneath the surface of the water on upon adjoining shorelines (40 CFR Part 112). In addition to the NRC notification, Keystone will make timely notifications to other agencies, including the appropriate local emergency planning committee, sheriffs department, US Environmental Protection Agency (USEPA), and affected landowners.

b. Type and Location of Emergency Response Personnel and Equipment

The specific locations of Keystone's emergency responders and equipment will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP. Keystone will base Company emergency responders consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195. Keystone's response time to transfer additional resources to a potential leak site will follow an escalating tier system, with Keystone's initial emergency responders capable of reaching all locations within Montana within 6 hours in the event of a spill. Typically, emergency responders will be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings,
- Populated and urbanized areas, and
- Unusually sensitive areas, including drinking water locations, ecological, historical, and archaeological resources.

Consistent with industry practice and in compliance with applicable regulations, the types and amount of emergency response equipment based on worst case discharge volumes that will be pre-positioned for access by Keystone will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP, but prior to commencing line fill.

Emergency response equipment will be strategically situated along the pipeline route. Types of emergency response equipment are detailed below. Keystone will engage a national response contractor who will have access to and be able to provide large quantities of equipment to meet Oil Spill Response Organization (OSRO) requirements. Keystone also will have a number of local contractors available to provide emergency response assistance as required. Finally, Keystone will have a contract Spill Management Team available to respond and assist with incident management in the event of a significant release.

The overall strategy is to purchase and situate enough equipment for a Tier 1 response in each Response Zone. A Tier 1 response means a company leak that can be contained, controlled, and cleaned up using primarily Company personnel within a defined period of time from when a release is discovered, which, according to US Department of Transportation (US DOT) regulations, is 6 to 12 hours, depending on the location. It is important to note that the tiered level of response pertains to time requirements and is completely independent of spill threshold volumes. Although volumes are important for determining the correct amount of equipment needed for the tiered response times, they are not intended to define a spill threshold amount. It is well understood by the US DOT/PHMSA that once a Tier 1 requirement is satisfied, Keystone will cascade equipment to Tiers 2 and 3 until enough equipment is available to respond to the Worst Case Discharge amount.

The equipment will be stored strategically along the pipeline typically in the center of the Response Zone and accessible by Keystone and contract staff.

Consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195, the types of emergency response equipment that will be pre-positioned for access by Keystone are highlighted below:

- Pick-up trucks, one-ton trucks and vans;
- Vacuum trucks;
- Work and safety boats;
- Containment boom;
- Skimmers;
- Pumps, hoses, fittings and valves;
- Generators and extension cords;
- Air compressors;
- Floodlights;
- Communications equipment including cell phones, two way radios and satellite phones;
- Containment tanks and rubber bladders;
- Expendable supplies including absorbent booms and pads;
- Assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws;
- Ropes, chains, screw anchors, clevis and other boom connection devices;
- Personnel Protective Equipment (PPE) including rubber gloves, chest and hip waders and H_2S, O_2, LEL and benzene detection equipment; and
- Wind socks, signage, air horns, flashlights, megaphones and fluorescent safety vests.

Additional equipment including helicopters, fixed wing aircraft, all-terrain vehicles (ATV's), snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders may also be accessed depending upon site-specific circumstances. Other types, numbers and locations of equipment will be determined upon conclusion of the pipeline detailed design and the completion of Keystone's ERP.

c. Any Mutual Aid Agreements to Supply Personnel and Equipment and Respond in the Event of a Spill

Keystone will investigate opportunities to form and participate in mutual aid agreements once the pipeline begins operations.

d. Response Procedures

SCADA System

Keystone will be operated from an Operations Control Center (OCC), which will be manned on a 24 (hrs/day) x 7(days/week) basis. Keystone will utilize a Supervisory Control and Data Acquisition (SCADA) system to remotely monitor and control the pipeline system. Keystone's SCADA system will include:

- Redundant fully functional backup OCC available for service at all times;
- Automatic features installed as integral components within the SCADA system to ensure operation within prescribed pressure limits; and
- Additional automatic features installed at the local pump station level also will be utilized to provide pipeline pressure protection in the event communications with the SCADA host are interrupted.

Leak Detection Systems

Keystone will have a number of complimentary leak detection methods and systems available within the OCC. These methods and systems are overlapping in nature and progress in leak detection thresholds.

- The first leak detection method is remote monitoring performed by the OCC Operator. Remote monitoring consists primarily of pressure and flow data received from pump stations and valve sites fed back to the OCC to detect leaks down to approximately 25 percent – 30 percent of pipeline flow rate.
- Next are software based volume balance systems that monitor injection and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of pipeline flow rate.
- Next are Computational Pipeline Monitoring or model based leak detection systems that break the pipeline system into smaller segments and monitor each of these segments on a mass balance basis. These systems compensate for line pack and are typically capable of detecting leaks down to a level approximately 1.5 percent to 2 percent of pipeline flow rate.
- Finally, we will use direct observation methodologies, which include aerial patrols, ground patrols and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

Emergency Response

In the event Keystone suspects a leak or a leak is reported to the OCC, Keystone would respond with an emergency pipeline shutdown. This would involve stopping all operating pumping units at all pump stations. Depending on the flow rate at the time of the incident this would mean stopping two to three pumping units at each of Keystone's 39 pumping stations in the US and Canada. This line shutdown is estimated to take approximately 9 minutes. Once all the operating pumping units have been shut down, the OCC Operator would close the sectionalizing or isolation valves in the vicinity of the leak to limit any further draindown at the leak site. Closure of these isolation valves would take an additional 3 minutes. Therefore, from when the leak was reported or alarm received, it would take approximately 12 minutes to shut down and isolate the pipeline. For purposes of estimating worst case spill volumes, however, Keystone has assumed an additional 10 minute period, which is the maximum period an operator is allotted to verify the condition and begin to shut down the affected segment of pipe.

The on-call response designate will be required to respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel may elect to dispatch other resources as soon as practical. It is recommended that each truck contain the basic oil spill response equipment such as absorbent boom, rakes, shovels, safety equipment, road barricades etc. The exact first responder equipment strategy is in the developmental stage.

It is anticipated that once the call is received, on-call personnel should respond and arrive on-site within 4 hours. Keystone is required by 49 CFR Part 194 to calculate Worst Case Discharge and address response and mitigative measures within each Response Zone.

Keystone will use environmental information collected during the application process and incorporate response and mitigative measures in the ERP. In addition, an aerial reconnaissance of the route will be completed to verify this information and develop site-specific Tactical Plans for those areas requiring additional details pertaining to an emergency event.

One of the most critical aspects of an emergency is communication and site management. While Keystone will send first responders and verifiers to the site, a mobile command post is recommended to act as a communication link between the site and the Emergency Operations Center. It is envisioned that this will be handled by an outside contractor that can arrive on-site within 12 hours. We have included a very small office inside the 34 foot trailers which would include basic communication equipment including satellite phones.

Keystone will maintain personnel on-call on a 24(hrs/day) x 7(days/week) basis. These first responders will consist of both employees and contract personnel and will be based at various locations along the length of the pipeline.

The number of emergency responders comprising specific response teams will be determined upon completion of Keystone's ERP. Emergency responders will meet or exceed the requirements of 49 CFR Part 194.115.

Typically, emergency response teams would be comprised of Hazardous Waste Operations and Emergency Response (HAZWOPER) trained personnel as follows:

Tier 1: 8 HAZWOPER trained personnel (includes Emergency Site Manager and Command Post Safety Officer).

Tier 2: 12 HAZWOPER trained personnel.

Tier 3: 24 HAZWOPER trained personnel.

Responders will be dispatched from multiple locations and will have access to alternative means of transportation if weather or other conditions limit access. Alternative means of transportation will include fixed wing aircraft, helicopter, boats and other watercraft, all terrain vehicles, and snowmobiles.

Following execution of the emergency pipeline shutdown, the OCC operator will perform internal notifications as described in the ERP and dispatch first responders to the location identified. Key individuals would then be notified and Keystone's ERP activated as follows:

First Responder

- Notification of potential spill and dispatch received from OCC;
- Spill verified;
- Notification of Emergency Services, if required; and
- Verify with OCC:
  - Pipeline shutdown and status;
  - Pipeline segment isolation; and
- Regional EOC Manager and Qualified Individual (QI) notified.

Regional EOC Manager (QI)

- Notification received from OCC;
- Notification of spill details received from First Responder;
- Oil spill response plan activated;
- Emergency Site Manager (QI) notified;
- Regional EOC activated
- Mobilize response resources requested by Emergency Site Manager (QI);
- Corporate EOC Manager contacted; and
- Agency contacts including the National Response Center and other state and local agencies contacted.

Incident Commander

- Notification received from Regional EOC Manager (QI);
- On-site First Responder contacted to obtain briefing on spill;
- On-site Command Post activated;
- Regional EOC advised of resource requirements; and
- First Responder relieved.

Response efforts are first directed to preventing or limiting any further contamination of the waterway, once any concerns with respect to health and safety of the responders have been addressed. This is typically accomplished primarily with containment booms and berms. The Incident Commander assumes responsibility for selecting the appropriate locations for construction of berms and deployment of booms as well as communicating any additional resource requirements to the EOC Manager.

Efforts are initially directed toward containing any spilled product on land prior to it reaching the waterway. With the approval of authorities having jurisdiction, activities such as digging ditches and building berms would be undertaken on the down slope of the spill site, to prevent any overland flow of spilled product from entering the waterway. In some cases it may be possible to use a combination of ditches and berms to divert the overland flow of spilled product to a collection point.

To contain the spilled product once it has reached the waterway, efforts are typically directed toward the deployment of containment boom as close as practical and safe downstream of the spill location. With the approval of the authorities having jurisdiction, the Incident Commander assumes responsibility and a tactical plan is developed for selecting a suitable location for the deployment of containment booms, based upon the waterway site-specific conditions, including flow velocity and avoidance of rapids and falls to ensure the effectiveness of the containment booms.

Product is typically recovered from the surface of water and transferred to containment facilities by a combination of mechanical skimming, vacuum recovery, and sorbent materials. Typical methods for the recovery and transfer to containment facilities for product spilled on land include vacuum recovery and sorbent materials.

The cleaning of shorelines and other affected natural or manmade structures is typically performed by traditional methods including wiping, hot water and low or high pressure wash down and the use of surfactants and emulsifiers or other agents. Water and other liquids used for wash down purposes for onshore applications are typically contained and collected using a combination of ditches and berms as described above. All site-specific cleaning methods and materials to be utilized are subject to the approval of the authorities having jurisdiction.

Product laden soils are typically either removed or treated with bioremediation in the event such intrusive cleanup techniques are not appropriate. These and other methods of cleanup including natural recovery, burning, dispersants, and other chemical usage can be considered in accordance with and at the discretion of the authorities having

Consistent with industry practice and in accordance with regulations including 49 CFR Part 194.115, Keystone's response time to transfer such additional resources to a potential leak site will follow an escalating or tier system. Dependant upon the nature of site specific conditions and resource requirements, Keystone will meet or exceed the following requirements, along the entire length of the pipeline system:

49 CFR Part 194	Tier 1 Resources	Tier 2 Resources	Tier 3 Resources
High volume area[1]	6 hours	30 hours	54 hours
All other areas	12 hours	36 hours	60 hours

[1] High volume area means an area with an oil pipeline having a nominal outside diameter of 20 inches or more, crosses a major river or other navigable waters, which, because of the velocity of the river flow and vessel traffic on the river, would require a more rapid response in the case of a worst-case discharge or the substantial threat of such a discharge.

Tier 1, 2, and 3 resources will typically include equipment as described above, along with additional HAZWOPER trained response personnel, as required to effectively respond to site specific conditions and as directed by the Incident Commander.

The primary task of the Tier 1 response team is to minimize the spread of product on the ground surface or water in order to protect the public and unusually sensitive areas, including ecological, historical, and archaeological resources and drinking water locations. The Incident Commander will make an assessment of the site-specific conditions, such as:

- The nature of the spilled product;
- Source of the spill;
- Direction(s) of spill migration;
- Known or apparent impact of subsurface geophysical feature that may be affected;
- Overhead and buried utility lines, pipelines, etc.;
- Nearby population, property or environmental feature that may be affected; and
- Concentration of wildlife and breeding areas.

The Incident Commander will request additional resources in terms of personnel, equipment and materials, from the Tier 2 and, if necessary, the Tier 3 response teams. Once containment activities have been successfully concluded efforts are directed toward the recovery and transfer of free product. Site cleanup and restoration activities follow, all of which are conducted in accordance with the authorities having jurisdiction.

Keystone will utilize both employees and contractors as emergency responders within its initial response efforts in the event of a pipeline spill. In the case of contractors and other spill response organizations, Keystone will have agreements in place identifying and ensuring the availability of the specified personnel, consistent with industry practice and in compliance with the applicable regulations, including 49 CFR Parts 194 and 195.

e. **Equipment Testing Procedures**

Emergency response equipment will be maintained and tested in accordance with manufacturers recommendations. Problems and deficiencies will be immediately corrected.

f. Frequency of Field Training Exercises

Emergency Response Program training will include a combination of regulatory compliance and technical training. To achieve regulatory compliance, Keystone will ensure its employees have all mandatory training, including becoming Qualified Individuals and HAZWOPER compliant. Other regulatory requirements will be included in a regular training schedule for operations personnel.

From a technical training perspective, field technicians and managers will be participating in water-based spill response scenarios on an annual basis. Other training elements will be documented in the ERP and be implemented according to the prescribed regulatory agenda. Emergency response agencies and public officials will be invited to observe the field exercises. Staff also will be trained on Incident Command System levels 100/200 and some key staff also will be trained in ICS 300. The Incident Command System is a prescriptive system of responding and managing incidents. Technical staff will be completing ICS 100/200, while management will be completing ICS 300. Training includes class room lectures, table top exercises, on-call drills, field deployment on both land and water, and mutual aid participation.

It is recommended that each region complete at least five exercises per response zone annually. These include a water based drill, table top exercises, dry land deployments, attendance at mutual aid events, etc.

The positions and training requirement for on-site personnel have been identified as follows:

Position	**Specialized Training to Meet Oil Spill Response Duties**
First Responders	Hazardous Waste Operations and Emergency Response (HAZWOPER) training to Hazmat Technician Level 3 with annual refresher, as required Keystone Emergency Management System (EMS) training National Fire Protection Association (NFPA) training
Emergency Site Manager – Qualified Individual	HAZWOPER training to Hazmat Level 4 Specialist with annual refresher, as required ICS Communication training Keystone EMS training NFPA training
Command Post Media	Keystone EMS training Keystone Media Relations training
Command Post Safety	Keystone EMS training Advanced safety related training
Command Post Documentation	Keystone EMS training
Command Post Site Security	Keystone EMS training
Command Post Resource Mobilization	Keystone EMS training
Command Post Technical	Keystone EMS training
Command Post Staging Leader	Keystone EMS training
Regional EOC Resource Mobilization	Keystone EMS training

Position	Specialized Training to Meet Oil Spill Response Duties
Regional EOC Community Evacuation Leader	Keystone EMS training
Regional EOC Administration Support	Keystone EMS training

g. Plan Update Procedures

The Plan is being developed using proprietary software called ePlan. This will mean that the entire Plan will be electronic and revised on a continual basis making the Plan current all the time. Administratively, the Plan will be part of the corporate IMS System.

Response to SIR-1.42

DEQ Request:

(xii) noise, radio, and television interference and electric effects

SIR-1.42: How many residences are located within 500 feet of the associated power lines? Would noise, radio, and television interference, and electrical effects be an issue?

Keystone Response:

See revised Attachment O for the number of residences within 500 feet of the alternative power line routes.

Power Provider Practices – Routing and siting information related to electromagnetic and inductive mitigation on the 115 kV power lines and radio communication serving the Keystone XL Pipeline is provided below.

Electromagnetic induction does occur from power lines. The potential radio and television interference, as well as, noise interference, is mitigated by keeping the power line located away from residences (500 feet minimum, if possible). The routing of the power line is done to keep parallel metallic plant (pipelines, metallic cable, fences) at a minimum. On fences, when paralleling the power line, the metallic wire is grounded (driven ground electrode) at least four times per mile. When crossing fences, the metallic wire is grounded using a 5 foot (minimum) ground electrode. Whenever possible a 100 foot right-of-way for the 115 kV power line will be obtained to minimize any future installation of facilities that could be affected by induction.

There are three potential influences on a communication (metallic) plant in the vicinity of a power line. These are inductive influence, coupling, and susceptiveness. The power providers will work closely with sister utilities to determine the route of existing cable plant. Routing takes into account other utilities and keeps separation between the two different types of plant. Montana state law requires that the project engineer obtain as-built information from other utilities. This allows the design engineer the ability to mitigate inductive influences, to the best of their ability. Avoiding paralleling facilities for long distances (over ten miles) is one method of reducing the susceptiveness to communication plant. Shielded telephone cables reduce coupling with nearby power lines. This helps to reduce coupling caused by close spacings.

Harmonic and waveform distortion may occur due to rectifier action of solid-state motor speed controllers. Harmonic mitigation measures are required on all large loads. Experience with the Express Pipeline indicates that when the harmonic filters tripped off line, noise built to levels that effectively shut down the telephone communications. Close cooperation between the consumers (large motor loads) and the power providers will mitigate such harmonic potential. Harmonic filters will be required, based upon measured system harmonic influence levels.

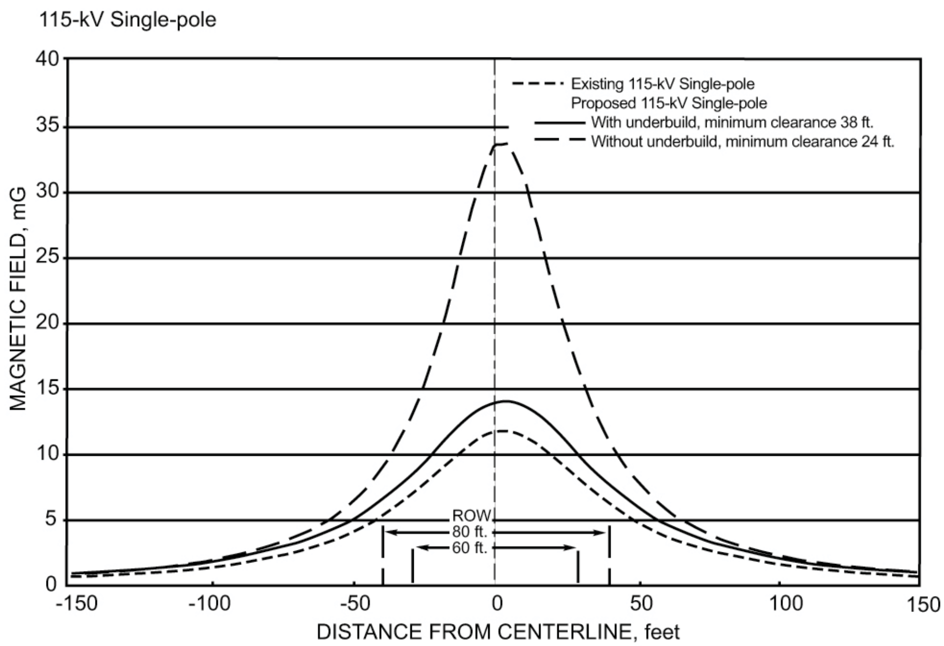
No impacts are expected from the radio communication systems at the Project facilities with regards to electrical and magnetic fields. The only electromagnetic field emitted from the radio antenna is the normal radio frequency signal as licensed by the FCC.

The C-filter on communication systems eliminates the 60 Hz induced noise, but not the harmonics on a telephone system. The system is terminated in delta – wye configurations. This keeps the phase currents relatively balanced. Mitigation efforts on the distribution circuits will include phase balancing.

Power line Radio Frequency Interference (RFI) is usually caused by sparking (arcs). Typically this is caused by loose hardware.

Power lines associated with the Project will have with similar specifications as those analyzed for the Bonneville Power Administration EIS for the construction of a 115 kV circuit from Libby to Troy, Montana (BPA

2008). The cooperative's proposed electric service facilities for the Keystone XL pipeline will be nearly identical to the BPA single-pole construction. For their transmission line, BPA calculated typical magnetic and electric field strengths. Because no national standards for EMF are in place, industry practice is to limit EMF exposure at or below those in a typical house. As shown in the following figure, at 40 feet from the power centerline, the electric and magnetic field levels calculated for that 115 kV transmission line are equal to or less than this level; therefore, based on power lines with similar specifications, EMF levels will be at or below acceptable values at 40 feet from the transmission centerline. If required by DEQ, the cooperatives can commit to calculate the EMF fields using the BPA Corona and Field Effects Program (USDOE).



2008. Bonneville Power Administration (BPA). 2008. Rebuild of the Libby (FEC) to Troy Section of Bonneville Power Administration's Libby to Bonners Ferry 115-kilovolt Transmission Line Project; Final Environmental Impact Statement. DOE/EIS - 0379. May 2008.

As stated in the Clarification for Section 3.6(7)(c), every effort is made to maintain a minimum clearance of 500 feet to the extent practical, but never less than 100 feet at these locations. Maintaining a minimum of 100 feet from residences will ensure there will be no EMF effects noticed by residents within their homes.

The power provider design uses spring washers to keep hardware tight. Conductor supports use trunion clamps and AGS factory preformed clamps to keep the conductor and support clamps with a firm contact between the two entities at all times, to mitigate arcing sources. At the 115 kV level, corona is usually not a major issue. Corona in itself is not a major source of RFI. Defective lightning arrestors also contribute to RFI. The power providers use a static conductor at the top of the pole to mitigate lightning caused flashovers. Lightning arrestors are limited to the stations where major equipment is located.

These are some of the measures that are incorporated in the line design to minimize the inductive and noise causing potential to communication and other affected facilities.

The radio communication systems at the Project Facilities will operate on specific frequencies licensed by the FCC. This minimizes the risk of any interference with radio, television or any other communication system in the area as well as providing for a process if any interference should occur.

References:

Bonneville Power Administration (BPA). 2008. Rebuild of the Libby (FEC) to Troy Section of Bonneville Power Administration's Libby to Bonners Ferry 115-kilovolt Transmission Line Project; Final Environmental Impact Statement. DOE/EIS - 0379. May 2008.

Response to SIR-1.43

DEQ Request:

> SIR-1.43: Text on page 4-181, section 4.5.1.6 says one of the avoidance areas was state land. For what reason did you avoid state land?

Keystone Response:

The reference to avoiding state land was inadvertently included in the paragraph in question. A significant amount of state lands are crossed by the proposed routes. Consistent with MCA 75-20-301(1)(h), the use of public lands for the location of the facility was evaluated by Keystone, and public lands were selected where their use was as economically practicable as the use of private lands. Routing was developed through processes identified in Section 4.0. Public lands were crossed by route alternatives; however, consistent with the "economically practicable" provision, preferentially crossing public lands for the sole purpose of maximizing presence on these lands was considered to be less crucial than producing the most constructible and direct route. Crossing public lands in some areas offered more potential for environmental effects or constructability issues, or resulted in a longer route. Therefore, in these cases, opportunities to avoid private lands by 'stitching' across public lands were not preferable.

While Keystone believes it has appropriately considered public lands in route development, at DOS and MDEQ's request, Keystone has generated additional alternatives using a GIS model and associated data layers as outlined in DOS DR #1. These alternatives along with the previous alternatives were reevaluated utilizing the same level of data on each route alternative so an equal comparison was made to each alternative and the preferred route selected. This information was provided to MDEQ August 17, 2009.

Clarification for Section 3.8(1)(i)

DEQ Request:

(i) Overlay to map and electronic equivalent required by section 3.6(2) indicating discharge points.

Specified discharge points for hydrostatic discharges were not listed nor were landowners, water supply wells, and the information describing existing ground water quality and uses within 1 miles of the discharge.

Keystone Response:

Table 1: Potential Sites for Discharge of Hydrostatic Test Water in Montana, provides a listing of probable areas for dewatering. These locations are based on best available information at this time. Final dewatering locations will be determined once the hydrostatic test contractor is selected and presents a hydrostatic test plan to Keystone. **Table 2:** Wells, Ground Water Quality and Water Uses within One Mile of Potential Hydrostatic Test Dewatering Locations, provides water supply wells within one mile of sites. It also provides information on ground water quality and groundwater uses where available. Keystone submits that data provided herewith should be adequate to justify a completeness determination with respect to this item.

Following **Table 2** are two sets of ground water quality reports. The ground water quality well identification numbers listed in **Table 2** were entered into web databases and the reports downloaded where available. Where groundwater quality reports are available, these wells are in bold and italics in **Table 2**. USGS ground water quality reports are first and the Montana Groundwater Information Center (GWIC) water quality reports follow. Where specific ground water quality data is not available, it has been more generally discussed in Chapter 4, Section 4.3.5 of the KXL MFSA application.

Background:

In order to create **Table 2**, the following data sets were downloaded:

Point of Diversion (POD) wells and Water Rights - Place of Use (POU) data was available from the Montana Department of Natural Resources and Conservation: Water Resources Division. Data were downloaded from: ftp://nris.mt.gov/dnrc/

Well information was downloaded from a number of sources:

National Water Information System (NWIS) wells were downloaded from a web database with latitude/longitude and converted into a shapefile: http://waterdata.usgs.gov/nwis/gw#top_of_page

GWIC well data was downloaded from: http://nris.mt.gov/nsdi/nris/shape/gwicwells.zip

Other wells were downloaded for a web database by downloading by county, combining tables and converting into a shapefile. This site has well data from several agencies: http://nris.mt.gov/Apps/WQProject/watermain.asp

USGS Groundwater quality reports were downloaded from:http://waterdata.usgs.gov/mt/nwis/annual?referred_module=gw&search_criteria=search_site_no&search_criteria=site_tp_cd&submitted_form=introduction

GWIC ground water quality reports were downloaded from: http://mbmggwic.mtech.edu/sqlserver/v11/help/go/signin.asp

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Route A		
Boxelder Creek	BUZZARDS GLORY FARMS INC	T31NR48ES30
	FORT PECK INDIAN RESERVATION	T31NR47ES25
Middle Fork Porcupine Creek	USA IN TRUST	T33NR41ES31
	USA IN TRUST	T33NR40ES25
Poplar River	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
	FORT PECK ASSINIBOINE & SIOUX	T30NR51ES18
Big Muddy Creek	BIG MUDDY GRAZING ASSOCIATION	T29NR54ES3
	DAMM GEORGE & ALMA MAE	T29NR54ES3
	UNITED STATES OF AMERICA IN TR	T29NR54ES4
Shotgun Creek	LARSEN FARMS	T27NR58ES1
	STATE OF MONTANA	T28NR58ES36
	STATE OF MONTANA	T28NR58ES36
	STATE OF MONTANA	T28NR58ES36
	ROMO BROTHERS	T28NR58ES35
	HARRELSON MARION	T28NR58ES26
	GRANLEY DAVE A	T28NR58ES22
	ROMO BROTHERS A	T28NR58ES22
Little Muddy Creek	NELSON DENNIS D	T27NR59ES6
	NELSON DENNIS D	T27NR59ES6
Frenchman Creek	BERGTOLL DARREL & RHONDA	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	CARROLL STERLING C	T33NR37ES6
	CARROLL STERLING	T34NR37ES31
Route A1A		
West Fork Poplar River	WILCOXON BAR 14 RANCH	T34NR46ES33
	WILCOXON BAR 14 RANCH	T34NR46ES33
Lake Creek	NORBO FARMS A PARTNERSHIP	T31NR55ES11
	FRENCH FARMS INC	T31NR55ES2
East Shotgun Creek	HUSTAD BETTY LOU	T29NR57ES24
	BARR LOWELL L & JANICE M	T29NR57ES23

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Frenchman Creek	BERGTOLL LEO & ALDON	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	CARROLL STERLING	T33NR37ES6
	CARROLL STERLING	T34NR37ES31
Middle Fork Porcupine Creek	STATE OF MONTANA	T33NR40ES1
	STATE OF MONTANA	T33NR40ES1
Poplar River	Tribal Land	T34NR48ES35
	DRURY ALTON G REV TRUST	T34NR48ES35
	DRURY ALTON G REV TRUST	T34NR48ES34
Big Muddy Creek	EIDSNESS BETTY J	T33NR56ES6
	BREKKE IVAR S & ELAINE	T33NR55ES1
Route B		
Frenchman Creek	BERGTOLL DARREL & RHONDA	T34NR35ES18
	BERGTOLL DARREL & RHONDA	T34NR35ES7
	BERGTOLL LEO & ALDON	T34NR34ES12
Willow Creek	BERGTOLL DARREL & RHONDA	T32NR37ES6
	BERGTOLL DARREL & RHONDA	T33NR36ES35
Milk River	VALLEY COUNTY	T27NR41ES2
	NICOL GEORGE R JR & JESSIE M	T27NR41ES2
Missouri River	HARMASH ROBERT V & LANETTE G	T27NR42ES33
	USDI BUREAU OF LAND MANAGEMENT	T27NR42ES32
Redwater River	MASSAR RANCH INC	T19NR48ES1
	MASSAR RANCH INC	T19NR48ES1
	JAMES WESLEY P & KAREN T	T19NR48ES2
	JAMES WESLEY P & KAREN T	T19NR48ES2
Yellowstone River	OLLERMAN ALLEN D	T13NR53ES14
Cabin Creek	ULRICH DONALD & JUDITH	T12NR54ES1
	ALLEN LILY M	T13NR54ES34
	HAIDLE FREDA R	T13NR54ES33
Sandstone Creek	ESTES AUDELLE SCHNEIDER	T7NR59ES9
Little Beaver Creek	U HANGING SEVEN RANCH INC	T5NR60ES35
	U HANGING SEVEN RANCH INC	T5NR60ES26

Table 1 Section 3.8 (1)(i) Potential Sites for Discharge of Hydrostatic Test Water in Montana

	Probable Areas for Dewatering	
Water Sources along Pipelines	**Landowner**	**Township, Range, Section**
Boxelder Creek	KNIPFER VIRGINIA L	T2NR62ES32
	KNIPFER VIRGINIA L	T2NR62ES30

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Route A							
Boxelder Creek							
Water Wells (within 1 mile)	43016	Stai Mrs. Albert	48.40770000	-105.53630000	Roosevelt	T31NR48ES30	-
	42997	Ft. Peck Tribes	48.41103300	-105.54997100	Roosevelt	T31NR47ES25	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***482428105321101***	31N48E30CBCD01	48.4078	-105.536	Roosevelt	Houg Farms Inc	-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Poplar River							
Water Wells (within 1 mile)	42242	Price Laurence	48.36945200	-105.15677800	Roosevelt	T30NR50ES12	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Big Muddy Creek							
Water Wells (within 1 mile)	41328	Hekkel Duane	48.27894300	-104.67381400	Roosevelt	T29NR54ES10	-
	41327	Hekkel David	48.28305100	-104.67312700	Roosevelt	T29NR54ES10	-
	132730	Unknown	8731.000000	7855.000000	Roosevelt	T29NR54ES10	-
	83946	Unknown	8822.000000	7745.000000	Roosevelt	T29NR54ES10	-
	196415	Unknown	9652.000000	8478.000000	Roosevelt	T29NR54ES11	-
	185660	Smith Wade	48.28694200	-104.66441700	Roosevelt	T29NR54ES11	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	132730	Unknown	-	-	Roosevelt	29N54E10	Stock
	83946	Unknown	-	-	Roosevelt	29N54E10	Stock
	132730	Unknown	-	-	Roosevelt	29N54E10	Stock
Shotgun Creek							
Water Wells (within 1 mile)	39471	Larson Farms	48.11849600	-104.16992200	Roosevelt	T27NR58ES1	-
	704251	Clark Lundquist	48.12250000	-104.17250000	Roosevelt	T27NR58ES1	-
	704254	Clark Lindquist	48.12610000	-104.18300000	Roosevelt	T27NR58ES2	-
	704255	Clark Lindquist	48.12610000	-104.18300000	Roosevelt	T27NR58ES2	-
	704660	Paul Panasuk	48.13380000	-104.19330000	Roosevelt	T28NR58ES35	-
	190335	MSCA*RO-62-07	48.13158400	-104.13710000	Roosevelt	T28NR59ES32	-
	40342	Nelson Dean	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	137014	Nelson Dean (Test Hole B)	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	40316	Granley Albert	48.14489100	-104.21192800	Roosevelt	T28NR58ES27	-
	3484	Simard John * 2.1 Mi E Bainville	48.14440000	-104.19720000	Roosevelt	T28NR58ES26	-
	704645	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
	704646	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
	704647	John Simard	48.14470000	-104.19330000	Roosevelt	T28NR58ES26	-
	3483	Landtech Water Disposal Service	48.14630000	-104.19690000	Roosevelt	T28NR58ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	225693	MDOT* Bainville - East & West (2145M)* 4-71-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225705	MDOT*Bainville - East & West (2145M)* 4-72-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225719	MDOT* Bainville - East & West (2145M)* 4-70-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	225738	MDOT* Bainville - East & West (2145M)* 4-69-04	48.14762400	-104.21869800	Roosevelt	T28NR58ES27	-
	40312	City of Bainville #1	48.15035700	-104.21463600	Roosevelt	T28NR58ES27	-
	40313	City of Bainville #2	48.15035700	-104.21463600	Roosevelt	T28NR58ES27	-
	704644	Andrew Simonson	48.14830000	-104.16630000	Roosevelt	T28NR58ES25	-
	40314	Granley Albert	48.15110000	-104.20910000	Roosevelt	T28NR58ES27	-
	190328	MSCA*RO-69-07	48.15172300	-104.20854200	Roosevelt	T28NR58ES27	-
	40310	Romo Ranch	48.15122300	-104.19431500	Roosevelt	T28NR58ES26	-
	190327	MSCA*RO-69-05	48.15263400	-104.20448000	Roosevelt	T28NR58ES27	-
	190326	MSCA*RO-69-06	48.15445600	-104.20583400	Roosevelt	T28NR58ES27	-
	40307	Granley Albert 01	48.15801700	-104.21525000	Roosevelt	T28NR58ES22	-
	40308	Granley Albert 02	48.15801700	-104.21525000	Roosevelt	T28NR58ES22	-
	704639	Mrs C Evans	48.15910000	-104.23610000	Roosevelt	T28NR58ES21	-
	704640	Albert Granley	48.15910000	-104.21470000	Roosevelt	T28NR58ES22	-
	704641	Albert Granley	48.15910000	-104.20940000	Roosevelt	T28NR58ES22	-
	196659	Harrelson Charles	48.15983800	-104.21933700	Roosevelt	T28NR58ES22	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	3482	Bainville City Well #3* 1 Mi NE Bainville	48.16520000	-104.21440000	Roosevelt	T28NR58ES22	-
	40305	City of Bainville 01	48.16575900	-104.21593200	Roosevelt	T28NR58ES22	-
	40306	City of Bainville 02	48.16575900	-104.21593200	Roosevelt	T28NR58ES22	-
	195774	Granley Dave*Test Hole #1	48.16803600	-104.22737500	Roosevelt	T28NR58ES21	-
	40304	Granley Albert R.	48.16803600	-104.22478700	Roosevelt	T28NR58ES22	-
	195772	Granley Dave	48.16894700	-104.23011100	Roosevelt	T28NR58ES21	-
	215456	Berwick Keith	48.17182000	-104.24768500	Roosevelt	T28NR58ES20	-
	3481	Harmon Dave * Irrigation Well * Bainville	48.17130000	-104.23610000	Roosevelt	T28NR58ES21	-
	199339	Romo Brothers	48.17023500	-104.19566200	Roosevelt	T28NR58ES23	-
	200759	Romo Brothers LLP	48.17023500	-104.19566200	Roosevelt	T28NR58ES23	-
	40309	Crusch Everett	48.17069100	-104.19771900	Roosevelt	T28NR58ES23	-
	211987	Hanson Chris *Test Hole 1	48.17580000	-104.28410000	Roosevelt	T28NR58ES18	-
	704590	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704591	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704592	S H Mitchell	48.17750000	-104.29270000	Roosevelt	T28NR57ES13	-
	704635	Unknown	48.17690000	-104.27380000	Roosevelt	T28NR58ES18	-
	704633	S Runningen Est	48.17690000	-104.25770000	Roosevelt	T28NR58ES17	-
	704634	S Runningen Est	48.17690000	-104.25770000	Roosevelt	T28NR58ES17	-
	704632	O Granley	48.17690000	-104.21470000	Roosevelt	T28NR58ES15	-
	211974	Hanson Chris *Test Hole 2	48.17940000	-104.26390000	Roosevelt	T28NR58ES17	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	182273	MSCA -Dick Hansen *RO-47	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	195334	Petroleum Nance	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	195336	Petroleum Nance	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	198466	Nance Petroleum	48.19163200	-104.26802200	Roosevelt	T28NR58ES8	-
	480721104102101	Unknown	48.122521	-104.172996	Roosevelt	T27NR58ES1	-
	480734104105901	Unknown	48.126132	-104.183552	Roosevelt	T27NR58ES2	-
	480734104105902	Unknown	48.126132	-104.183552	Roosevelt	T27NR58ES2	-
	480802104113601	Unknown	48.133910	-104.193830	Roosevelt	T28NR58ES35	-
	480841104113602	Unknown	48.144743	-104.193830	Roosevelt	T28NR58ES26	-
	480841104113603	Unknown	48.144743	-104.193830	Roosevelt	T28NR58ES26	-
	480854104095901	Unknown	48.148355	-104.166884	Roosevelt	T28NR58ES25	-
	480904104123301	Unknown	48.151132	-104.209664	Roosevelt	T28NR58ES27	-
	480933104125301	Unknown	48.159188	-104.215220	Roosevelt	T28NR58ES22	-
	480933104123401	Unknown	48.159188	-104.209942	Roosevelt	T28NR58ES22	-
	481039104173401	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481039104173402	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481039104173403	Unknown	48.177521	-104.293279	Roosevelt	T28NR57ES13	-
	481037104162601	Unknown	48.176966	-104.274389	Roosevelt	T28NR58ES18	-
	481037104152801	Unknown	48.176966	-104.258277	Roosevelt	T28NR58ES17	-
	481037104152802	Unknown	48.176966	-104.258277	Roosevelt	T28NR58ES17	-
	481037104125301	Unknown	48.176966	-104.215220	Roosevelt	T28NR58ES15	-
	482428105321101	Unknown	48.407800	-105.536941	Roosevelt	T31NR48ES30	-
	128510	Unknown	3363.000000	6370.000000	Roosevelt	T27NR58ES1	-
	108659	Unknown	6434.000000	4151.000000	Roosevelt	T28NR58ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	36915	Unknown	6807.000000	3105.000000	Roosevelt	T28NR58ES27	-
	324611	Unknown	6855.000000	4310.000000	Roosevelt	T28NR58ES26	-
	348063	Unknown	8318.000000	2198.000000	Roosevelt	T28NR58ES22	-
	55631	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	111834	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	55633	Unknown	8358.000000	2598.000000	Roosevelt	T28NR58ES22	-
	337492	Unknown	8724.000000	1554.000000	Roosevelt	T28NR58ES21	-
	348486	Unknown	8832.000000	124.000000	Roosevelt	T28NR58ES20	-
	141094	Unknown	190.000000	6474.000000	Roosevelt	T28NR57ES13	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***3481***	Harmon Dave * Irrigation Well * Bainville	48.1713	-104.236	Roosevelt	Harmon David W	-
	40305	City of Bainville 01	48.166	-104.215	Roosevelt	Granley Lloyd & Dave	-
	3482	Bainville City Well #3* 1 Mi NE Bainville	48.1652	-104.214	Roosevelt	Harrelson Marion	-
	3483	Landtech Water Disposal Service *	48.1463	-104.196	Roosevelt	Romo Brothers	-
	480840104115001	28N58E26CDCD01	48.1443	-104.197	Roosevelt	Romo Brothers	-
Existing Groundwater Uses (within 1 mile)	128510	Unknown	-	-	Roosevelt	27N58E1	Stock
	55633	Unknown	-	-	Roosevelt	28N58E27	Municipal
	55631	Unknown	-	-	Roosevelt	28N58E27	Municipal
	306153	Unknown	-	-	Roosevelt	28N58E27	Municipal
	218117	Unknown	-	-	Roosevelt	28N58E27	Municipal
	108659	Unknown	-	-	Roosevelt	28N58E26	Commercial

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	36915	Unknown	-	-	Roosevelt	28N58E27	Stock
	324611	Unknown	-	-	Roosevelt	28N58E26	Stock
	348063	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	108344	Unknown	-	-	Roosevelt	28N58E21	Irrigation
	337492	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E20	Irrigation
	337492	Unknown	-	-	Roosevelt	28N58E22	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E20	Irrigation
	108344	Unknown	-	-	Roosevelt	28N58E21	Irrigation
	348486	Unknown	-	-	Roosevelt	28N58E17	Irrigation
	141094	Unknown	-	-	Roosevelt	28N57E13	Stock
Little Muddy Creek							
Water Wells (within 1 mile)	39471	Larson Farms	48.11849600	-104.16992200	Roosevelt	T27NR58ES1	-
	704251	Clark Lundquist	48.12250000	-104.17250000	Roosevelt	T27NR58ES1	-
	704292	Oscar Nelson	48.12270000	-104.12360000	Roosevelt	T27NR59ES5	-
	190335	MSCA*RO-62-07	48.13158400	-104.13710000	Roosevelt	T28NR59ES32	-
	40342	Nelson Dean	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	137014	Nelson Dean (Test Hole B)	48.13251100	-104.15427500	Roosevelt	T28NR59ES31	-
	190337	MSCA*RO-62-02	48.13158400	-104.13305600	Roosevelt	T28NR59ES32	-
	480721104102101	Unknown	48.122521	-104.172996	Roosevelt	T27NR58ES1	-
	480722104072501	Unknown	48.122799	-104.124105	Roosevelt	T27NR59ES5	-
	128510	Unknown	3363.000000	6370.000000	Roosevelt	T27NR58ES1	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Uses (within 1 mile)	128510	Unknown	-	-	Roosevelt	27N58E1	Stock
Middle Fork Porcupine Creek							
Water Wells (within 1 mile)	96655	Unknown	4329.000000	7951.000000	Valley	T33NR41ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	44989	Fuhrman Harry & Earl	48.56900800	-106.41705100	Valley	T33NR40ES36	-
Existing Groundwater Uses (within 1 mile)	83946	Unknown	-	-	Roosevelt	29N54E10	Stock
Willow Creek							
Water Wells (within 1 mile)	44966	Hinsdale Livestock	48.64198200	-106.93671100	Valley	T33NR37ES6	-
	44965	Echart Gene	48.65197800	-106.93806400	Valley	T33NR37ES6	-
	45596	Hinsdale Livestock	48.66096200	-106.93536000	Valley	T34NR37ES31	-
	45594	Hinsdale Livestock#2	48.66459700	-106.92993700	Valley	T34NR37ES31	-
	45595	Hinsdale Livestock	48.66823200	-106.93536000	Valley	T34NR37ES31	-
	45593	Hinsdale Livestock#1	48.66823200	-106.92993700	Valley	T34NR37ES31	-
	210044	Hinsdale Livestock	48.66910000	-106.92780000	Valley	T34NR37ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Route A1A							
Middle Fork Porcupine Creek							
Water Wells (within 1 mile)	44974	Fauth Gilbert	48.63235400	-106.44059600	Valley	T33NR40ES11	-
	44993	Fuhrman Lillie #1	48.63321500	-106.41285200	Valley	T33NR41ES7	-
	44994	Fuhrman Lillie #2	48.63321500	-106.41285200	Valley	T33NR41ES7	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	248906	Unknown	1546.000000	7461.000000	Valley	T33NR41ES7	-
	60189	Unknown	1584.000000	5179.000000	Valley	T33NR40ES11	-
	85512	Unknown	1584.000000	5179.000000	Valley	T33NR40ES11	-
	105292	Unknown	3912.000000	5407.000000	Valley	T34NR40ES35	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Uses (within 1 mile)	248906	Unknown	-	-	Valley	33N41E7	Stock
	85512	Unknown	-	-	Valley	33N40E11	Stock
	60189	Unknown	-	-	Valley	33N40E11	Stock
	105292	Unknown	-	-	Valley	34N40E35	Commercial
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Big Muddy Creek							
Water Wells (within 1 mile)	3846	Brekke Bayard & Antelope MT	48.62940000	-104.43380000	Sheridan	T33NR56ES7	-
	45245	Brekke Erling A.	48.63459700	-104.42150600	Sheridan	T33NR56ES8	-
	45244	Sundsted Erick	48.64361400	-104.44881800	Sheridan	T33NR56ES6	-
	175334	Murray Farms	48.64453100	-104.45277000	Sheridan	T33NR55ES1	-
	483746104260201	Unknown	48.629471	-104.434396	Sheridan	T33NR56ES7	-
	108404	Unknown	9361.000000	3954.000000	Sheridan	T33NR56ES8	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	193130	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
	310829	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
	248693	Unknown	207.000000	1304.000000	Sheridan	T33NR55ES1	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	483746104260201	33N56E07ACDA01	48.6293	-104.433	Sheridan	Eidsness Betty J	-
	3846	Brekke Bayard & Antelope MT	48.6294	-104.433	Sheridan	Eidsness Betty J	-
Existing Groundwater Uses (within 1 mile)	108404	Unknown	-	-	Sheridan	33N56E8	Stock
	310829	Unknown	-	-	Sheridan	33N55E1	Multiple Domestic
	248693	Unknown	-	-	Sheridan	33N55E1	Stock
	193130	Unknown	-	-	Sheridan	33N55E1	Stock
Middle Fork Poplar River							
Water Wells (within 1 mile)	No specific data available from sources searched.[A]						-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Lake Creek							
Water Wells (within 1 mile)	No specific data available from sources searched.[A]						-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
East Shotgun Creek							
Water Wells (within 1 mile)	14028	Unknown	7357.000000	8221.000000	Roosevelt	T29NR57ES23	-
	14030	Unknown	7357.000000	8221.000000	Roosevelt	T29NR57ES23	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	14028	Unknown	-	-	Roosevelt	29N57E23	Domestic
	14030	Unknown	-	-	Roosevelt	29N57E23	Domestic
West Fork Poplar River							
Water Wells (within 1 mile)	146234	Wilcoxon James	48.65803800	-105.72557300	Daniels	T34NR46ES32	-
	45744	Wilcoxon Ross	48.65938900	-105.72216200	Daniels	T34NR46ES32	-
	121130	Wilcoxon James	48.66000000	-105.71910000	Daniels	T34NR46ES32	-
	45745	Wilcoxon Ross 01	48.66029000	-105.72079800	Daniels	T34NR46ES32	-
	162625	Unknown	6545.000000	7901.000000	Daniels	T34NR46ES32	-
	254651	Unknown	6775.000000	8287.000000	Daniels	T34NR46ES32	-
	162627	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	162623	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	311740	Unknown	6790.000000	8488.000000	Daniels	T34NR46ES32	-
	254653	Unknown	6976.000000	8273.000000	Daniels	T34NR46ES32	-
	45746	Wilcoxon Ross 02	48.66029000	-105.72079800	Daniels	T34NR46ES32	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	162625	Unknown	-	-	Daniels	34N46E32	Stock
	254651	Unknown	-	-	Daniels	34N46E32	Stock
	162623	Unknown	-	-	Daniels	34N46E32	Stock
	162627	Unknown	-	-	Daniels	34N46E32	Domestic
	311740	Unknown	-	-	Daniels	34N46E32	Stock
	254653	Unknown	-	-	Daniels	34N46E32	Domestic
Poplar River							

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	45786	Hellickson Luella 02	48.65073200	-105.41454200	Daniels	T34NR48ES34	-
	45787	Hellickson Luella 01	48.65073200	-105.41454200	Daniels	T34NR48ES34	-
	45788	Hellickson Luella	48.65073200	-105.41180300	Daniels	T34NR48ES34	-
	45785	Manternach Clare	48.65164100	-105.43097900	Daniels	T34NR48ES34	-
	206405	Drury Lane	48.65207700	-105.39051700	Valley	T34NR48ES35	-
	45792	Drury Kent & Jesse	48.65253100	-105.38843900	Daniels	T34NR48ES35	-
	45784	Morrison James	48.65436700	-105.42276100	Daniels	T34NR48ES34	-
	703476	Larson G	48.65440000	-105.42250000	Daniels	T34NR48ES34	-
	703479	Drury K	48.65360000	-105.38750000	Daniels	T34NR48ES35	-
	45791	Hellickson Luella	48.65434900	-105.40367800	Daniels	T34NR48ES35	-
	146047	Drury Lane	48.65662200	-105.38913100	Daniels	T34NR48ES35	-
	703477	Drury J C	48.65970000	-105.38770000	Daniels	T34NR48ES35	-
	45789	Drury Jesse C. 01	48.65980400	-105.38843900	Daniels	T34NR48ES35	-
	45790	Drury Jesse C. 02	48.65980400	-105.38843900	Daniels	T34NR48ES35	-
	703478	Drury J C	48.66000000	-105.38750000	Daniels	T34NR48ES35	-
	45779	Shaw Alvah	48.66437200	-105.43367600	Daniels	T34NR48ES33	-
	45778	Shaw Alvah	48.66437200	-105.43229900	Daniels	T34NR48ES33	-
	483916105252101	Unknown	48.654468	-105.423048	Daniels	T34NR48ES34	-
	483913105231501	Unknown	48.653635	-105.388047	Daniels	T34NR48ES35	-
	483935105231601	Unknown	48.659746	-105.388325	Daniels	T34NR48ES35	-
	483936105231502	Unknown	48.660024	-105.388047	Daniels	T34NR48ES35	-
	358058	Unknown	7092.000000	9462.000000	Daniels	T34NR48ES33	-
	162604	Unknown	7640.000000	2661.000000	Daniels	T34NR48ES35	-
	187238	Unknown	8041.000000	2630.000000	Daniels	T34NR48ES35	-
Water Wells (within 1 mile)	187235	Unknown	8041.000000	2630.000000	Daniels	T34NR48ES35	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	15597	Unknown	8295.000000	9368.000000	Daniels	T34NR48ES33	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	358058	Unknown	-	-	Daniels	34N48E35	Stock
	162604	Unknown	-	-	Daniels	34N48E35	Domestic
	187235	Unknown	-	-	Daniels	34N48E35	Stock
	187238	Unknown	-	-	Daniels	34N48E35	Domestic
	15597	Unknown	-	-	Daniels	34N48E33	Domestic
Willow Creek							
Water Wells (within 1 mile)	44966	Hinsdale Livestock	48.64198200	-106.93671100	Valley	T33NR37ES6	-
	44965	Echart Gene	48.65197800	-106.93806400	Valley	T33NR37ES6	-
	45596	Hinsdale Livestock	48.66096200	-106.93536000	Valley	T34NR37ES31	-
	45594	Hinsdale Livestock#2	48.66459700	-106.92993700	Valley	T34NR37ES31	-
	45595	Hinsdale Livestock	48.66823200	-106.93536000	Valley	T34NR37ES31	-
	45593	Hinsdale Livestock#1	48.66823200	-106.92993700	Valley	T34NR37ES31	-
	210044	Hinsdale Livestock	48.66910000	-106.92780000	Valley	T34NR37ES31	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Route B							
Frenchman Creek							
Water Wells (within 1 mile)	45584	Mogan Bros. #1	48.70925900	-107.17947600	Valley	T34NR35ES17	-
Existing Groundwater Quality	No specific data available from sources searched.[A]						-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
(within 1 mile) Aquifers, TDS							
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Willow Creek							
Water Wells (within 1 mile)	180125	MDOT * Willow Creek N. of Hinsdale	48.56401600	-106.98216100	Valley	T32NR36ES1	-
	180126	MDOT * Willow Creek N. of Hinsdale	48.56401600	-106.98216100	Valley	T32NR36ES1	-
	44962	Craig Albert Jr #3	48.57180500	-107.00423100	Valley	T33NR36ES34	-
	44963	Craig Albert Jr #4	48.57180500	-107.00423100	Valley	T33NR36ES34	-
	44964	Craig Albert Jr #5	48.57180500	-107.00423100	Valley	T33NR36ES34	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	No specific data available from sources searched.[A]						-
Milk River							
Water Wells (within 1 mile)	82690	Unknown	4263.000000	2439.000000	Valley	Novak Melvin J & Linda A	-
	327077	Unknown	4472.000000	2565.000000	Valley	Novak Melvin J & Linda A	-
	156299	Unknown	5494.000000	2806.000000	Valley	Lauckner William W & Peggy S	-
	182940	Unknown	5494.000000	2806.000000	Valley	Lauckner William W & Peggy S	-
	92154	Unknown	5506.000000	3007.000000	Valley	Lauckner William W & Peggy S	-
	96805	Unknown	5834.000000	1177.000000	Valley	Bellon Farm & Ranch Inc	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	159044	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	332576	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	159041	Unknown	6079.000000	2812.000000	Valley	Ersland Levi & Shirley K	-
	38971	Hill Lewis	48.12446400	-106.37169400	Valley	T27NR41ES1	-
	38979	Bellon John H & L	48.12641000	-106.39072800	Valley	T27NR41ES2	-
	139222	Lauckner Will W	48.12718400	-106.37033100	Valley	T27NR41ES1	-
	167598	Lauckner William W.	48.12718400	-106.37033100	Valley	T27NR41ES1	-
	3295	Turner Kenneth	48.12830000	-106.39800000	Valley	T27NR41ES2	-
	38975	Jarrell Ray	48.13081100	-106.38123400	Valley	T27NR41ES1	-
	38977	Davis Lyle C.	48.13090700	-106.38389400	Valley	Not Available	-
	38978	Davis Glenn & W. #1	48.13135600	-106.38321100	Valley	Not Available	-
	3413	Stebins Mary	48.13190000	-106.39190000	Valley	T28NR41ES35	-
	40059	Ersland Mrs. Levi	48.13350600	-106.36894400	Valley	T28NR41ES36	-
	40060	Ersland Levi&Shirley	48.13350600	-106.36894400	Valley	T28NR41ES36	-
	40056	Davis Glen&Winnie #2	48.13488600	-106.39399100	Valley	Not Available	-
	225364	Riverside Contractors	48.13780000	-106.40750000	Valley	T28NR41ES34	-
	225359	Riverside Contractors	48.14110000	-106.40060000	Valley	T28NR41ES35	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***3295***	Turner Kenneth	48.1283	-106.398	Valley	Turner Steven K	-
	480742106235301	27N41E02BBDD01	48.1283	-106.398	Valley	Turner Steven K	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	480755106233101	28N41E35DCCC01	48.1319	-106.391	Valley	Not Available	-
	3413	Stebins Mary	48.1319	-106.391	Valley	Not Available	-
Existing Groundwater Uses (within 1 mile)	82690	Unknown	-	-	Valley	27N41E12	Stock
	327077	Unknown	-	-	Valley	27N41E1	Domestic
	96805	Unknown	-	-	Valley	27N41E2	Stock
	182940	Unknown	-	-	Valley	27N41E1	Stock
	156299	Unknown	-	-	Valley	27N41E1	Stock
	92154	Unknown	-	-	Valley	27N41E1	Domestic
	159044	Unknown	-	-	Valley	28N41E36	Lawn and Garden
	332576	Unknown	-	-	Valley	28N41E36	Stock
	159041	Unknown	-	-	Valley	28N41E36	Stock
Missouri River							
Water Wells (within 1 mile)	143084	Unknown	7311.000000	7841.000000	McCone	USDI Bureau of Land Management	-
	267205	Unknown	7676.000000	7215.000000	Valley	-	-
	253649	Unknown	7676.000000	7215.000000	Valley	-	-
	143081	Unknown	7688.000000	7415.000000	McCone	Westland Robert	-
	39056	Mattingly Eugene	48.05463900	-106.34660200	Valley	T27NR42ES31	-
	39057	Mattingly Eugene	48.05735000	-106.33725000	Valley	T27NR42ES32	-
	39055	Garwood Ronald & Pat	48.05831300	-106.34393700	Valley	T27NR42ES31	-
	39054	Peters Homer	48.07084500	-106.32238000	Valley	T27NR42ES29	-
	57864	Unknown	9380.000000	6633.000000	Valley	Harmash Robert V & Lanette G	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	143084	Unknown	-	-	McCone	27N42E33	Stock
	253649	Unknown	-	-	Valley	27N42E33	Irrigation
	267205	Unknown	-	-	Valley	27N42E33	Irrigation
	143081	Unknown	-	-	McCone	27N42E33	Wildlife
	57864	Unknown	-	-	Valley	27N42E29	Domestic
Redwater River							
	231933	Unknown	9929.000000	8483.000000	McCone	James Judith A	-
	360233	Unknown	9944.000000	8683.000000	McCone	James Judith A	-
	91887	Unknown	160.000000	8869.000000	McCone	James Judith A	-
	3320	Unknown	331.000000	6738.000000	McCone	Stans Auto Inc	-
	65532	Unknown	364.000000	7543.000000	McCone	Mid Rivers Telephone Co Op Inc	-
	68044	Unknown	471.000000	7636.000000	McCone	James Judith A	-
	231923	Unknown	501.000000	8037.000000	McCone	James Judith A	-
	231922	Unknown	501.000000	8037.000000	McCone	James Judith A	-
	231925	Unknown	516.000000	8237.000000	McCone	James Judith A	-
	115749	Unknown	673.000000	5940.000000	McCone	Brost Deanna M	-
	80988	Unknown	786.000000	7751.000000	McCone	Eissinger Equip Co Inc	-
	96590	Unknown	981.000000	6018.000000	McCone	James Wesley Pearce et al	-
	43800	Unknown	1197.000000	6203.000000	McCone	Circle Veterinary Clinic Inc	-
	123127	Unknown	1227.000000	6604.000000	McCone	James Wesley P & Karen T	-
Water Wells (within 1 mile)	32484	James Mathew	47.42213700	-105.53623400	McCone	T19NR48ES12	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	224837	Wahl Grant	47.42570000	-105.56294800	McCone	T19NR48ES11	-
	32477	Rittal Samuel L.	47.42570000	-105.55760000	McCone	T19NR48ES11	-
	32485	Mid Rivers Telephone	47.42581700	-105.55235800	McCone	T19NR48ES12	-
	32478	Youngquist Kenneth & Norma L	47.42661800	-105.56161100	McCone	T19NR48ES11	-
	2379	James Mat* 1.2 Mi E Circle*	47.42690000	-105.54520000	McCone	T19NR48ES12	-
	32461	Curtis Francis	47.42924500	-105.57371000	McCone	T19NR48ES2	-
	32462	Idland Oddvar	47.42924500	-105.56834300	McCone	T19NR48ES2	-
	2378	James Matthew * 7 Mi NE of Circle*	47.43190000	-105.57130000	McCone	T19NR48ES2	-
	199315	Circle Vet Clinic	47.43291700	-105.56834300	McCone	T19NR48ES2	-
	32458	James Anna	47.43383600	-105.56968500	McCone	T19NR48ES2	-
	32459	Fladland Allen	47.43383600	-105.56968500	McCone	T19NR48ES2	-
	33977	James Anna	47.44651100	-105.55365600	McCone	T20NR48ES36	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	2379	James Mat* 1.2 Mi E Circle*	47.4269	-105.545	McCone	James Wesley Pearce et al	-
	472537105324300	19N48E12BAAB01	47.4269	-105.545	McCone	James Wesley Pearce et al	-
	472555105341700	19N48E02CBDA01	47.4318	-105.571	McCone	James Wesley Pearce et al	-
	2378	James Matthew * 7 Mi NE of Circle*	47.4319	-105.571	McCone	James Wesley Pearce et al	-
Existing Groundwater Uses (within 1 mile)	360233	Unknown	-	-	McCone	19N48E12	Domestic
	91887	Unknown	-	-	McCone	19N48E12	Domestic
	3320	Unknown	-	-	McCone	19N48E11	Domestic

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	65532	Unknown	-	-	McCone	19N48E12	Commercial
	68044	Unknown	-	-	McCone	19N48E12	Commercial
	231923	Unknown	-	-	McCone	19N48E12	Stock
	231922	Unknown	-	-	McCone	19N48E12	Domestic
	231925	Unknown	-	-	McCone	19N48E12	Stock
	115749	Unknown	-	-	McCone	19N48E2	Domestic
	80988	Unknown	-	-	McCone	19N48E1	Domestic
	96590	Unknown	-	-	McCone	19N48E2	Stock
	43800	Unknown	-	-	McCone	19N48E2	Domestic
	123127	Unknown	-	-	McCone	19N48E2	Commercial
	152822	Unknown	-	-	McCone	19N48E2	Municipal
Yellowstone River							
	465232104592401	Unknown	46.875564	-104.990527	Dawson	Armstrong Lyle D	-
	465245104593301	Unknown	46.879175	-104.993028	Dawson	Armstrong Lyle D	-
	465245104592402	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104592404	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104592405	Unknown	46.879176	-104.990527	Dawson	Armstrong Lyle D	-
	465245104585501	Unknown	46.879176	-104.982471	Dawson	Ollerman Allen D	-
	465245104584501	Unknown	46.879176	-104.979694	Dawson	Ollerman Allen D	-
	465251104593304	Unknown	46.880842	-104.993028	Dawson	Armstrong Lyle D	-
	465251104592403	Unknown	46.880842	-104.990527	Dawson	Ollerman Allen D	-
	465251104591401	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
	465251104591402	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
	465251104591403	Unknown	46.880842	-104.987750	Dawson	Ollerman Allen D	-
Water Wells (within 1 mile)	465251104590401	Unknown	46.880842	-104.984972	Dawson	Ollerman Allen D	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	465251104590402	Unknown	46.880842	-104.984972	Dawson	Ollerman Allen D	-
	465251104580701	Unknown	46.880842	-104.969138	Dawson	Ollerman Allen & Joleen	-
	465254104585601	Unknown	46.881676	-104.982749	Dawson	Siegle Inc	-
	465258104592401	Unknown	46.882787	-104.990527	Dawson	Ollerman Allen D	-
	465258104592402	Unknown	46.882787	-104.990527	Dawson	Ollerman Allen D	-
	465258104585503	Unknown	46.882787	-104.982471	Dawson	Siegle Inc	-
	465258104583601	Unknown	46.882787	-104.977193	Dawson	Ollerman Allen D	-
	465304104584501	Unknown	46.884453	-104.979694	Dawson	Siegle Inc	-
	465311104593301	Unknown	46.886398	-104.993028	Dawson	Haas Mark A & Barbara R	-
	465311104591401	Unknown	46.886398	-104.987750	Dawson	Frost Keith E & Doris	-
	465311104584502	Unknown	46.886398	-104.979694	Dawson	Frost Keith E & Doris	-
	465317104592401	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592402	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592403	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592404	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592405	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104592406	Unknown	46.888064	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465317104584501	Unknown	46.888064	-104.979694	Dawson	Siegle Inc	-
	465324104592401	Unknown	46.890009	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465324104592402	Unknown	46.890009	-104.990527	Dawson	Haas Mark A & Barbara R	-
	465324104584501	Unknown	46.890009	-104.979694	Dawson	Siegle Inc	-
	465339104574501	Unknown	46.894176	-104.963026	Dawson	Bouchard Arthur W & Verna M Li	-
	472507105321400	Unknown	47.418620	-105.537775	McCone	James Judith A	-
	472507105321400	Unknown	47.418620	-105.537775	McCone	James Judith A	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	472537105324300	Unknown	47.426953	-105.545831	McCone	James Judith A	-
	472537105324300	Unknown	47.426953	-105.545831	McCone	James Judith A	-
	472537105324100	Unknown	47.426953	-105.545276	McCone	James Wesley Pearce et al	-
	472555105341700	Unknown	47.431953	-105.571943	McCone	James Wesley Pearce et al	-
	472603105341700	Unknown	47.434175	-105.571943	McCone	James Wesley Pearce et al	-
	472700105325800	Unknown	47.450009	-105.549998	McCone	State of Montana	-
	480742106235301	Unknown	48.128353	-106.398645	Valley	Turner Steven K	-
	480753106225501	Unknown	48.131409	-106.382533	Valley	Walberg Ruth M	-
	480755106233101	Unknown	48.131964	-106.392534	Valley	Bellon Farm & Ranch Inc	-
	63	Unknown	266.000000	4075.000000	Dawson	Bloom William Lane	-
	702015	Unknown	46.87550000	-104.99000000	Dawson	T13NR53ES22	-
	702018	Unknown	46.87720000	-104.99000000	Dawson	T13NR53ES22	-
	702028	Unknown	46.87910000	-104.99250000	Dawson	T13NR53ES22	-
	702023	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702024	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702025	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702026	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702027	Unknown	46.87910000	-104.99000000	Dawson	T13NR53ES22	-
	702022	Unknown	46.87910000	-104.98190000	Dawson	T13NR53ES14	-
	702021	Unknown	46.87910000	-104.97910000	Dawson	T13NR53ES14	-
	702039	Unknown	46.88080000	-104.99250000	Dawson	T13NR53ES22	-
	702037	Unknown	46.88080000	-104.99000000	Dawson	T13NR53ES14	-
	702038	Unknown	46.88080000	-104.99000000	Dawson	T13NR53ES14	-
	140761	Field III P2	46.88080000	-104.98720000	Dawson	T13NR53ES14	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	702035	Unknown	46.88080000	-104.98720000	Dawson	T13NR53ES14	-
	702036	Unknown	46.88080000	-104.98720000	Dawson	T13NR53ES14	-
	702033	Unknown	46.88080000	-104.98440000	Dawson	T13NR53ES14	-
	702034	Unknown	46.88080000	-104.98440000	Dawson	T13NR53ES14	-
	702032	Unknown	46.88080000	-104.96860000	Dawson	T13NR53ES12	-
	25457	Rein Carl	46.88160000	-104.98220000	Dawson	T13NR53ES14	-
	702047	Unknown	46.88270000	-104.99000000	Dawson	T13NR53ES14	-
	702048	Unknown	46.88270000	-104.99000000	Dawson	T13NR53ES14	-
	702046	Unknown	46.88270000	-104.98720000	Dawson	T13NR53ES14	-
	702045	Unknown	46.88270000	-104.98440000	Dawson	T13NR53ES14	-
	702043	Unknown	46.88270000	-104.98190000	Dawson	T13NR53ES14	-
	702044	Unknown	46.88270000	-104.98190000	Dawson	T13NR53ES14	-
	702042	Unknown	46.88270000	-104.97660000	Dawson	T13NR53ES14	-
	702054	Unknown	46.88440000	-104.99250000	Dawson	T13NR53ES15	-
	702053	Unknown	46.88440000	-104.98720000	Dawson	T13NR53ES15	-
	702052	Unknown	46.88440000	-104.97910000	Dawson	T13NR53ES14	-
	702059	Unknown	46.88630000	-104.99250000	Dawson	T13NR53ES10	-
	702058	Unknown	46.88630000	-104.98720000	Dawson	T13NR53ES10	-
	702057	Unknown	46.88630000	-104.97910000	Dawson	T13NR53ES10	-
	140760	Field III P1	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702064	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702065	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702066	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702067	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-
	702068	Unknown	46.88800000	-104.99000000	Dawson	T13NR53ES10	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	702063	Unknown	46.88800000	-104.97910000	Dawson	T13NR53ES11	-
	702062	Unknown	46.88800000	-104.96050000	Dawson	T13NR53ES12	-
	702072	Unknown	46.89000000	-104.99000000	Dawson	T13NR53ES10	-
	702073	Unknown	46.89000000	-104.99000000	Dawson	T13NR53ES10	-
	702071	Unknown	46.89000000	-104.97910000	Dawson	T13NR53ES11	-
	702078	Unknown	46.89160000	-104.98190000	Dawson	T13NR53ES10	-
	702077	Unknown	46.89160000	-104.96580000	Dawson	T13NR53ES11	-
	1852	Siegle William *	46.89220000	-104.97630000	Dawson	T13NR53ES11	-
	151965	EERC-UND * G-11	46.89288300	-104.96780400	Dawson	T13NR53ES11	-
	702083	Unknown	46.89360000	-104.98190000	Dawson	T13NR53ES10	-
	702086	Bouchard Donald	46.89410000	-104.96250000	Dawson	T13NR53ES12	-
	8116	Not Available	2669.000000	3124.000000	Dawson	Haas Mark A & Barbara R	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***151965***	EERC-UND * G-11	46.8931	-104.969	Dawson	Siegle Inc	-
Existing Groundwater Uses (within 1 mile)	8116	Unknown	-	-	Dawson	13N53E15	Domestic
Cabin Creek							
Water Wells (within 1 mile)	50945	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	50953	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	294448	Unknown	6412.000000	2914.000000	Prairie	Urlich Donald & Judith	-
	70852	Unknown	6961.000000	2261.000000	Prairie	Urlich Donald & Judith	-
	65087	Unknown	6961.000000	2261.000000	Prairie	Urlich Donald & Judith	-
	71879	Unknown	6995.000000	2661.000000	Prairie	Urlich Donald & Judith	-
	67930	Unknown	6995.000000	2661.000000	Prairie	Urlich Donald & Judith	-
	700064	G Ulrick	46.82860000	-104.88250000	Prairie	T12NR54ES2	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	151481	Ulrich Donald & Kurt	46.82860000	-104.87440000	Prairie	T12NR54ES1	-
	24808	Ulrich Rudolph	46.82860000	-104.87190000	Prairie	T12NR54ES1	-
	24809	Ulrich Donald & Kurt	46.82910000	-104.87410000	Prairie	T12NR54ES1	-
	24810	Ulrich Gottlieb	46.82987600	-104.88270600	Prairie	T12NR54ES2	-
	25506	Ulrich Gottlieb	46.83300000	-104.87580000	Prairie	T13NR54ES34	-
	25494	Farmers Union Oil	46.83905800	-104.86876300	Prairie	T13NR54ES34	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	50945	Unknown	-	-	Prairie	12N54E1	Stock
	294448	Unknown	-	-	Prairie	12N54E1	Stock
	50953	Unknown	-	-	Prairie	12N54E1	Domestic
	65087	Unknown	-	-	Prairie	12N54E1	Domestic
	70852	Unknown	-	-	Prairie	12N54E1	Stock
	67930	Unknown	-	-	Prairie	12N54E1	Stock
	71879	Unknown	-	-	Prairie	12N54E1	Stock
Sandstone Creek							
Water Wells(within 1 mile)	462255104192001	Unknown	46.381950	-104.322720	Fallon	T7NR59ES10	-
	185137	Unknown	7884.000000	5727.000000	Fallon	Croy Alvin L & Becky A	-
	92969	Unknown	7955.000000	6942.000000	Fallon	State of Montana	-
	358750	Unknown	8017.000000	8154.000000	Fallon	Fallon County	-
	319668	Unknown	8944.000000	8203.000000	Fallon	Randash William L & Phyllis	-
	11779	Unknown	9122.000000	7576.000000	Fallon	Estes Audelle Schneider	-
	185214	Unknown	9525.000000	7945.000000	Fallon	Hanley William D & Rita F	-
	80752	Unknown	124.000000	5806.000000	Fallon	Engesser Roberta J	-
	136044	Hitchcock Vern	46.35902400	-104.32077100	Fallon	T7NR59ES15	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	Site Name	Latitude	Longitude	County	Owner or Township, Range, Section	Purpose
	20519	Moline F R	46.36888900	-104.32221300	Fallon	T7NR59ES10	-
	20515	Beckers Leonard	46.37145200	-104.34981300	Fallon	T7NR59ES8	-
	20518	Kellner Jerry	46.37163600	-104.31827900	Fallon	T7NR59ES10	-
	700293	H Wyrack	46.37410000	-104.34660000	Fallon	T7NR59ES8	-
	20517	Beckers Leonard	46.37345400	-104.32605300	Fallon	T7NR59ES9	-
	167838	Handley Bill	46.37712900	-104.32090100	Fallon	T7NR59ES10	-
	223989	Wiseman Terry	46.37712900	-104.31565600	Custer	T7NR59ES10	-
	20513	Engessor Charles	46.38066400	-104.34717200	Fallon	T7NR59ES8	-
	700294	Engesser Charles	46.38190000	-104.32220000	Fallon	T7NR59ES10	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	358750	Unknown	-	-	Fallon	7N59E15	Other Purpose
	185137	Unknown	-	-	Fallon	7N59E17	Lawn and Garden
	92969	Unknown	-	-	Fallon	7N59E16	Stock
	319668	Unknown	-	-	Fallon	7N59E10	Stock
	11779	Unknown	-	-	Fallon	7N59E9	Domestic
	185214	Unknown	-	-	Fallon	7N59E10	Lawn and Garden
	80752	Unknown	-	-	Fallon	7N59E5	Stock
Little Beaver Creek							
Water Wells (within 1 mile)	460900104110501	Unknown	46.150003	-104.185216	Fallon	T5NR60ES34	-
	48927	Unknown	5081.000000	168.000000	Fallon	U Hanging Seven Ranch Inc	-
	700233	Johnson Darrell	46.15000000	-104.18470000	Fallon	T5NR60ES34	-
	221944	Johnson, Cody	46.15080000	-104.19830000	Fallon	T5NR60ES33	-
	221942	Johnson, Cody	46.15070000	-104.19070000	Fallon	T5NR60ES34	-
	17603	Beck Frederick	46.16197900	-104.16140000	Fallon	T5NR60ES26	-

Table 2 Section 3.8 (1) (i) Wells, Ground Water Quality and Water Uses within 1 mile of Potential Hydrostatic Test Up-take and Dewatering Locations for the Keystone XL Pipeline in Montana

	Well ID #	**Site Name**	**Latitude**	**Longitude**	**County**	**Owner or Township, Range, Section**	**Purpose**
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	***895356***	Montana- Dakota Util. * Well No. 357	46.1561	-104.194	Fallon	U Hanging Seven Ranch Inc	-
Existing Groundwater Uses (within 1 mile)	48927	Unknown	-	-	Fallon	5N60E34	Stock
Boxelder Creek							
Water Wells (within 1 mile)	256993	Not Available	8936.000000	1686.000000	Fallon	T2NR62ES30	-
	256994	Not Available	8936.000000	1686.000000	Fallon	T2NR62ES30	-
	229020	Bart Bundic Ranch, Inc.	45.90903100	-104.05966600	Fallon	T2NR62ES30	-
Existing Groundwater Quality (within 1 mile) Aquifers, TDS	No specific data available from sources searched.[A]						-
Existing Groundwater Uses (within 1 mile)	256993	Unknown	-	-	Fallon	2N62E30	Domestic
	256994	Unknown	-	-	Fallon	2N62E30	Stock

Note: There is little groundwater information available for Routes A and A1A due to the high porosity of underlying strata. Groundwater along both of these routes will likely be found very deep and it is unlikely that aquifers are present due to high porosity. Discharge of hydrostatic test water shall be conducted at least a half mile from all streams to allow for recharge. However, if dewatering is conducted too far from the source it will filter down into the groundwater table. A buffer will be needed to allow for test water to seep into the ground and recharge adjacent streams. The discharge of test water will be left to the discretion of the Environmental Inspector.

Note: Well ID numbers in bold and italics indicate those wells for which groundwater quality reports are available from USGS and/or GWIC. These reports follow Table 2.

USGS Ground Water Quality Reports

File created on 2009-05-11 13:26:58 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 472537105324300 19N48E12BAAB01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.72537E+14
Begin date	11/18/1975
Begin time	12:05
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	1781
Temperature, water, degrees Celsius	10
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	1230
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00002
pH, water, unfiltered, field, standard units	7.8
Carbon dioxide, water, unfiltered, milligrams per liter	11
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	352
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	429
Nitrate, water, filtered, milligrams per liter as nitrogen	0.32
Hardness, water, milligrams per liter as calcium carbonate	320

Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	56
Magnesium, water, filtered, milligrams per liter	44
Sodium, water, filtered, milligrams per liter	162
Sodium adsorption ratio, water, number	3.9
Sodium fraction of cations, water, percent in equivalents of major cations	52
Potassium, water, filtered, milligrams per liter	3.8
Chloride, water, filtered, milligrams per liter	6.3
Sulfate, water, filtered, milligrams per liter	308
Fluoride, water, filtered, milligrams per liter	0.5
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	< 10
Manganese, water, filtered, micrograms per liter	50
Residue, water, filtered, sum of constituents, milligrams per liter	803
Residue, water, filtered, tons per acre-foot	1.09
Nitrate, water, filtered, milligrams per liter	1.4

File created on 2009-05-11 13:28:38 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.
To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 472555105341700 19N48E02CBDA01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.72555E+14
Begin date	11/18/1975
Begin time	10:09
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	1788
Temperature, water, degrees Celsius	10.5
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	2320
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	12
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	977
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	1190
Nitrate, water, filtered, milligrams per liter as nitrogen	0.14
Hardness, water, milligrams per liter as calcium carbonate	62
Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0

Calcium, water, filtered, milligrams per liter	9.4
Magnesium, water, filtered, milligrams per liter	9.4
Sodium, water, filtered, milligrams per liter	584
Sodium adsorption ratio, water, number	32
Sodium fraction of cations, water, percent in equivalents of major cations	95
Potassium, water, filtered, milligrams per liter	3.2
Chloride, water, filtered, milligrams per liter	17.2
Sulfate, water, filtered, milligrams per liter	344
Fluoride, water, filtered, milligrams per liter	1.7
Silica, water, filtered, milligrams per liter as SiO2	7.9
Iron, water, unfiltered, recoverable, micrograms per liter	50
Manganese, water, filtered, micrograms per liter	< 10
Residue, water, filtered, sum of constituents, milligrams per liter	1560
Residue, water, filtered, tons per acre-foot	2.13
Nitrate, water, filtered, milligrams per liter	0.6

File created on 2009-05-11 13:21:31 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd:
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
Data for the following sites are included: USGS 480742106235301 27N41E02BBDD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.80742E+14
Begin date	8/19/1978
Begin time	
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	385
Temperature, water, degrees Celsius	15.3
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	5870
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	8.6
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	700
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	850
Nitrate, water, filtered, milligrams per liter as nitrogen	0.1
Sulfide, water, unfiltered, milligrams per liter	0.1
Hardness, water, milligrams per liter as calcium carbonate	20

Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	5.5
Magnesium, water, filtered, milligrams per liter	1.6
Sodium, water, filtered, milligrams per liter	1100
Sodium adsorption ratio, water, number	110
Sodium fraction of cations, water, percent in equivalents of major cations	99
Potassium, water, filtered, milligrams per liter	3
Chloride, water, filtered, milligrams per liter	1200
Sulfate, water, filtered, milligrams per liter	48
Fluoride, water, filtered, milligrams per liter	1.5
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	50
Iron, water, filtered, micrograms per liter	20
Manganese, water, filtered, micrograms per liter	< 10
Lithium, water, filtered, micrograms per liter	170
Residue, water, filtered, sum of constituents, milligrams per liter	2790
Residue, water, filtered, tons per acre-foot	3.79
Nitrate, water, filtered, milligrams per liter	0.4

File created on 2009-05-11 13:24:21 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.
To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd:MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd:
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:< - Less than.
Data for the following sites are included:USGS 480755106233101 28N41E35DCCC01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.80755E+14
Begin date	8/19/1978
Begin time	
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	384
Temperature, water, degrees Celsius	14.8
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	5700
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	8.2
Carbon dioxide, water, unfiltered, milligrams per liter	8.4
Acid neutralizing capacity, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter as calcium carbonate	680
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	800
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, field, milligrams per liter	14
Nitrate, water, filtered, milligrams per liter as nitrogen	0.1

Sulfide, water, unfiltered, milligrams per liter	1.4
Hardness, water, milligrams per liter as calcium carbonate	21
Noncarbonate hardness, water, unfiltered, field, milligrams per liter as calcium carbonate	0
Calcium, water, filtered, milligrams per liter	5.7
Magnesium, water, filtered, milligrams per liter	1.6
Sodium, water, filtered, milligrams per liter	1100
Sodium adsorption ratio, water, number	100
Sodium fraction of cations, water, percent in equivalents of major cations	99
Potassium, water, filtered, milligrams per liter	3
Chloride, water, filtered, milligrams per liter	1200
Sulfate, water, filtered, milligrams per liter	19
Fluoride, water, filtered, milligrams per liter	1.4
Silica, water, filtered, milligrams per liter as SiO2	11
Iron, water, unfiltered, recoverable, micrograms per liter	50
Iron, water, filtered, micrograms per liter	30
Manganese, water, filtered, micrograms per liter	< 10
Lithium, water, filtered, micrograms per liter	170
Residue, water, filtered, sum of constituents, milligrams per liter	2750
Residue, water, filtered, tons per acre-foot	3.74
Nitrate, water, filtered, milligrams per liter	0.4

File created on 2009-05-11 13:33:50 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

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To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd:MST - Mountain Standard Time
Description of tm_datum_rlbty_cd:T - Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey-Water Resources Discipline
Description of medium_cd:WG - Ground water
Description of tu_id:http://www.itis.gov/
Description of body_part_id:
Description of remark_cd:
Data for the following sites are included:USGS 480840104115001 28N58E26CDCD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.8084E+14
Begin date	10/13/1947
Begin time	
End date	
End time	
Time datum	MST
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	35
Temperature, water, degrees Celsius	9.4
Agency analyzing sample, code	1028
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	2920
pH, water, unfiltered, laboratory, standard units	8.3
Nitrate, water, filtered, milligrams per liter as nitrogen	0.57
Hardness, water, milligrams per liter as calcium carbonate	67
Calcium, water, filtered, milligrams per liter	7
Magnesium, water, filtered, milligrams per liter	12
Sodium, water, filtered, milligrams per liter	740
Sodium adsorption ratio, water, number	39
Sodium fraction of cations, water, percent in equivalents of major cations	95
Potassium, water, filtered, milligrams per liter	10
Chloride, water, filtered, milligrams per liter	52

Sulfate, water, filtered, milligrams per liter	6.8
Fluoride, water, filtered, milligrams per liter	1.4
Silica, water, filtered, milligrams per liter as SiO2	7
Boron, water, filtered, micrograms per liter	190
Iron, water, filtered, micrograms per liter	20
Residue, water, filtered, sum of constituents, milligrams per liter	1810
Residue, water, filtered, tons per acre-foot	2.47
Nitrate, water, filtered, milligrams per liter	2.5
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, laboratory, milligrams per liter	1720
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, laboratory, milligrams per liter	130

File created on 2009-05-11 13:31:35 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T - Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey-Water Resources Discipline
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
Data for the following sites are included:USGS 482428105321101 31N48E30CBCD01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file.

Agency Code	USGS
Station number	4.82428E+14
Begin date	9/26/1994
Begin time	10:40
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Temperature, water, degrees Celsius	8
Agency analyzing sample, code	80020
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	355
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00001
pH, water, unfiltered, field, standard units	7.9
Nitrite, water, filtered, milligrams per liter as nitrogen	< 0.010
Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	2.6

File created on 2009-05-11 13:36:03 EDT
U.S. Geological Survey

This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.

The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.

The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.
To view additional data-quality attributes, output the results using these options: one result per row, expanded attributes. Additional precautions are at: http://waterdata.usgs.gov/nwis/qwdata?help Data_retrievals_precautions.

Description of sample_start_time_datum_cd: MDT - Mountain Daylight Time
Description of tm_datum_rlbty_cd: T- Transferred
Description of coll_ent_cd: USGS-WRD - U.S. Geological Survey - Water Resources Discipline
Description of medium_cd: WG - Ground water
Description of tu_id: http://www.itis.gov/
Description of body_part_id:
Description of remark_cd: < - Less than.
M - Presence verified but not quantified.
Data for the following sites are included: USGS 483746104260201 33N56E07ACDA01
WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval may not be imported into those programs without manually editing this file

Agency Code	USGS
Station number	4.83746E+14
Begin date	8/8/1983
Begin time	6:00
End date	
End time	
Time datum	MDT
Time datum reliability code	T
Agency Collecting Sample Code	USGS-WRD
Medium code	WG
Taxonomic unit code	
Body part code	
Sample accounting number	842
Temperature, water, degrees Celsius	8
Agency analyzing sample, code	30010
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	1600
Hydrogen ion, water, unfiltered, calculated, milligrams per liter	0.00003
pH, water, unfiltered, field, standard units	7.5
pH, water, unfiltered, laboratory, standard units	7.8
Carbon dioxide, water, unfiltered, milligrams per liter	32
Nitrate, water, filtered, milligrams per liter as nitrogen	0.04
Hardness, water, milligrams per liter as calcium carbonate	150
Calcium, water, filtered, milligrams per liter	29
Magnesium, water, filtered, milligrams per liter	19
Sodium, water, filtered, milligrams per liter	323
Sodium adsorption ratio, water, number	11

Sodium fraction of cations, water, percent in equivalents of major cations	82
Potassium, water, filtered, milligrams per liter	0.4
Chloride, water, filtered, milligrams per liter	3.1
Sulfate, water, filtered, milligrams per liter	318
Fluoride, water, filtered, milligrams per liter	0.4
Silica, water, filtered, milligrams per liter as SiO2	13
Iron, water, filtered, micrograms per liter	< 2
Manganese, water, filtered, micrograms per liter	M
Residue, water, filtered, sum of constituents, milligrams per liter	1020
Residue, water, filtered, tons per acre-foot	1.38
Specific conductance, water, unfiltered, laboratory, microsiemens per centimeter.	1720
Bicarbonate, water, unfiltered, fixed endpoint (pH 4.5) titration, field, milligrams per liter	633
Carbonate, water, unfiltered, fixed endpoint (pH 8.3) titration, laboratory, milligrams per liter	0

Montana Groundwater Information Center (GWIC) Ground Water Quality Reports

Ground-Water Information Center Water Quality Report

Site Name: JAMES MATTHEW * 7 MI NE OF CIRCLE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1975Q1788 / 2378	Sample Date:	11/18/1975 10:09:00 AM
Location (TRS):	19N 48E 02 CBDA	Agency/Sampler:	USGS / WRC
Latitude/Longitude:	47° 25' 54" N 105° 34' 16" W	Field Number:	MC-114
Datum:	NAD27	Lab Date:	1/19/1976
Altitude:	2500	Lab/Analyst:	MBMG / LAW
County/State:	MCCONE / MT	Sample Method/Handling:	PUMPED / 3120
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	125TGRV	Total Depth (ft):	109
USGS 7.5' Quad:	GLENDIVE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	86
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	9.300	0.464	Bicarbonate (HCO3)	1,191.200	19.524
Magnesium (Mg)	9.300	0.765	Carbonate (CO3)	0.000	0.000
Sodium (Na)	584.000	25.404	Chloride (Cl)	17.250	0.487
Potassium (K)	3.200	0.082	Sulfate (SO4)	344.000	7.166
Iron (Fe)	0.050	0.003	Nitrate (as N)	0.100	0.007
Manganese (Mn)	0.010	0.000	Fluoride (F)	1.000	0.053
Silica (SiO2)	7.900		Orthophosphate (OPO4)	NR	0.000
	Total Cations	26.749		Total Anions	27.236

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	<10.	Strontium (Sr):	600.000
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	<30.	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	180.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	<50.	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	30.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	<2.0	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,562.300	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	2,166.600	Hardness as CaCO3:	61.500	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2350	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2321	Akalinity as CaCO3 (mg/L):	976.82	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.933	Field Nitrate (mg/L):	NR
Lab pH:	8.15	Sodium Adsorption Ratio:	32.402	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	10.5	Langlier Saturation Index:	0.608	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition: SHALLOW GW 048*WATER WAS BROWN*

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Ground-Water Information Center Water Quality Report

Site Name: JAMES MAT* 1.2 MI E CIRCLE*

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1975Q1781 / 2379	Sample Date:	11/18/1975 12:05:00 PM
Location (TRS):	19N 48E 12 BAAB	Agency/Sampler:	USGS / WRC
Latitude/Longitude:	47° 25' 36" N 105° 32' 42" W	Field Number:	MC-106
Datum:	NAD27	Lab Date:	1/20/1976
Altitude:	2480	Lab/Analyst:	MBMG / LAW
County/State:	MCCONE / MT	Sample Method/Handling:	GRAB / 1000
Site Type:	WELL	Procedure Type:	
Geology:	125TGRV	Total Depth (ft):	80.2
USGS 7.5' Quad:	GLENDIVE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	55.700	2.779	Bicarbonate (HCO3)	429.400	7.038
Magnesium (Mg)	43.500	3.580	Carbonate (CO3)	0.000	0.000
Sodium (Na)	162.000	7.047	Chloride (Cl)	6.300	0.178
Potassium (K)	3.800	0.097	Sulfate (SO4)	307.800	6.411
Iron (Fe)	0.010	0.001	Nitrate (as N)	0.300	0.021
Manganese (Mn)	0.050	0.002	Fluoride (F)	NR	0.000
Silica (SiO2)	10.900		Orthophosphate (OPO4)	NR	0.000
	Total Cations	13.506		Total Anions	13.648

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	801.530	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,019.200	Hardness as CaCO3:	318.130	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1150	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1234	Akalinity as CaCO3 (mg/L):	351.85	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.646	Field Nitrate (mg/L):	NR
Lab pH:	7.77	Sodium Adsorption Ratio:	3.952	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	10	Langlier Saturation Index:	0.562	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition: SHALLOW GW048* WELL BEGINS IN 110ALVM*

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: TURNER KENNETH

Report Date: 5/14/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1979Q0385 / 3295	Sample Date:	8/19/1978
Location (TRS):	27N 41E 02 BBDD	Agency/Sampler:	USGS / KPK
Latitude/Longitude:	48° 7' 41" N 106° 23' 52" W	Field Number:	NGP307
Datum:	NAD27	Lab Date:	10/27/1978
Altitude:	2060	Lab/Analyst:	MBMG / FNA
County/State:	VALLEY / MT	Sample Method/Handling:	GRAB / 5320
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211JDRV	Total Depth (ft):	695
USGS 7.5' Quad:	LINDEKE COULEE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	5.500	0.274	Bicarbonate (HCO3)	848.000	13.899
Magnesium (Mg)	1.600	0.132	Carbonate (CO3)	0.000	0.000
Sodium (Na)	1,070.000	46.545	Chloride (Cl)	1,166.000	32.893
Potassium (K)	2.700	0.069	Sulfate (SO4)	48.000	1.000
Iron (Fe)	0.020	0.001	Nitrate (as N)	<.1	0.000
Manganese (Mn)	<.01	0.000	Fluoride (F)	1.500	0.079
Silica (SiO2)	10.500		Orthophosphate (OPO4)	NR	0.000
	Total Cations	47.021		Total Anions	47.870

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	170.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	<.1	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	2,724.830	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	3,155.100	Hardness as CaCO3:	20.320	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	5870	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	4737	Akalinity as CaCO3 (mg/L):	695.51	Phosphate, TD (mg/L as P):	NR
Field pH:	8.23	Ryznar Stability Index:	7.845	Field Nitrate (mg/L):	NR
Lab pH:	7.99	Sodium Adsorption Ratio:	103.291	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	15.3	Langlier Saturation Index:	0.073	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Tr (mg/L-Fe)	0.050	Sulfide Total(mg/L-S)	L.10

Notes

Sample Condition:

Field Remarks: NGP-307 * FLOWING WELL * SAMPLE TAKEN IN BARN AFTER SUB. PUMP AND TANK * WELL SOUTH OF HOUSE AND BARN *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: STEBINS MARY

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1979Q0384 / 3413	Sample Date:	8/19/1978
Location (TRS):	28N 41E 35 DCCC	Agency/Sampler:	USGS / KPK
Latitude/Longitude:	48° 7' 54" N 106° 23' 30" W	Field Number:	NGP306
Datum:	NAD27	Lab Date:	10/27/1978
Altitude:	2060	Lab/Analyst:	MBMG / FNA
County/State:	VALLEY / MT	Sample Method/Handling:	GRAB / 5320
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211JDRV	Total Depth (ft):	685
USGS 7.5' Quad:	LINDEKE COULEE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	105
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	5.700	0.284	Bicarbonate (HCO3)	800.000	13.112
Magnesium (Mg)	1.600	0.132	Carbonate (CO3)	14.400	0.774
Sodium (Na)	1,090.000	47.415	Chloride (Cl)	1,226.000	34.585
Potassium (K)	2.700	0.069	Sulfate (SO4)	18.600	0.387
Iron (Fe)	0.030	0.002	Nitrate (as N)	<.1	0.000
Manganese (Mn)	<.01	0.000	Fluoride (F)	1.400	0.074
Silica (SiO2)	10.500		Orthophosphate (OPO4)	NR	0.000
	Total Cations	47.902		Total Anions	48.932

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	170.000	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.150	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	2,765.390	Field Hardness as $CaCO_3$ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	3,171.300	Hardness as $CaCO_3$:	20.820	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	5700	Field Alkalinity as $CaCO_3$ (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	4800	Akalinity as $CaCO_3$ (mg/L):	679.49	Phosphate, TD (mg/L as P):	NR
Field pH:	8.21	Ryznar Stability Index:	7.384	Field Nitrate (mg/L):	NR
Lab pH:	8.44	Sodium Adsorption Ratio:	103.953	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	14.8	Langlier Saturation Index:	0.528	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Tr (mg/L-Fe)	0.050	Sulfide Total(mg/L-S)	1.430

Notes

Sample Condition:

Field Remarks: NGP-306 * FLOWING WELL * WELL IN SHED * WATER SMELLS LIKE SEWAGE OR SWAMPY *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO_3, CO_3, SO_4, Cl, SiO_2, NO_3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report Site Name: HARMON DAVE * IRRIGATION WELL* BAINVILLE

Report Date: 5/6/2009 Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0732 / 3481	Sample Date:	6/24/1985 5:30:00 PM
Location (TRS):	28N 58E 21 BAAA	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 10' 16" N 104° 14' 9" W	Field Number:	HARMON
Datum:	NAD27	Lab Date:	8/20/1985
Altitude:	2005	Lab/Analyst:	MBMG / WO
County/State:	ROOSEVELT / MT	Sample Method/Handling:	PUMPED / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	200
USGS 7.5' Quad:	WOLF POINT	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	170
Project:	GWAAMON		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	75.600	3.772	Bicarbonate (HCO3)	727.000	11.916
Magnesium (Mg)	31.700	2.609	Carbonate (CO3)	0.000	0.000
Sodium (Na)	463.000	20.141	Chloride (Cl)	7.400	0.209
Potassium (K)	4.800	0.123	Sulfate (SO4)	701.000	14.602
Iron (Fe)	2.060	0.111	Nitrate (as N)	0.800	0.057
Manganese (Mn)	0.059	0.002	Fluoride (F)	1.300	0.068
Silica (SiO2)	25.900		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	26.782		Total Anions	26.852

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	270.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	<100.	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,671.430	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	2,040.300	Hardness as CaCO3:	319.250	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2250	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2334	Akalinity as CaCO3 (mg/L):	596.26	Phosphate, TD (mg/L as P):	NR
Field pH:	7.45	Ryznar Stability Index:	6.052	Field Nitrate (mg/L):	NR
Lab pH:	7.64	Sodium Adsorption Ratio:	11.276	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	9.9	Langlier Saturation Index:	0.794	Field Chloride (mg/L):	NR
Air Temp (°C):	22	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	2.190	Manganese Bio (mg/L - Mn)	0.063

Notes

Sample Condition: WATER CLEAR * SLIGHT TRACE OF SAND PALE YELLOW OXIDE COLOR ON FILTER* ON FILTER

Field Remarks: 2 MILES NW OF BAINVILLE * FILTERS EASILY * SAMPLE COLLECTED AFTER 90 MINUTES PUMPING AT 900 GPM *

Lab Remarks: NO2 PRESENT

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: BAINVILLE CITY WELL #3* 1 MI NE BAINVILLE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0446 / 3482	Sample Date:	5/26/1985 12:30:00 PM
Location (TRS):	28N 58E 22 BDDD	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 9' 54" N 104° 12' 51" W	Field Number:	BAINVIL
Datum:	NAD27	Lab Date:	7/9/1985
Altitude:	2000	Lab/Analyst:	MBMG / FNA
County/State:	ROOSEVELT / MT	Sample Method/Handling:	GRAB / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	50
USGS 7.5' Quad:	WOLF POINT	SWL-MP (ft):	NR
PWS Id:	00020004	Depth Water Enters (ft):	NR
Project:	PWSINV		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	53.700	2.680	Bicarbonate (HCO3)	344.000	5.638
Magnesium (Mg)	21.700	1.786	Carbonate (CO3)	0.000	0.000
Sodium (Na)	67.100	2.919	Chloride (Cl)	2.200	0.062
Potassium (K)	3.100	0.079	Sulfate (SO4)	81.500	1.698
Iron (Fe)	0.004	0.000	Nitrate (as N)	0.160	0.011
Manganese (Mn)	0.480	0.017	Fluoride (F)	0.300	0.016
Silica (SiO2)	26.100		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	7.495		Total Anions	7.425

Trace Element Results (µg/L)

Aluminum (Al):	<30.	Cesium (Cs):	NR	Molybdenum (Mo):	<20.	Strontium (Sr):	220.000
Antimony (Sb):	NR	Chromium (Cr):	<2.	Nickel (Ni):	<10.	Thallium (Tl):	NR
Arsenic (As):	0.400	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	6.000	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	<1.
Boron (B):	90.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	<100.	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	<2.	Lithium (Li):	8.000	Silver (Ag):	<2.	Vanadium (V):	<1.
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.400	Zinc (Zn):	26.000
						Zirconiuim (Zr):	<4.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	424.890	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	599.430	Hardness as CaCO3:	223.410	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	638	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	664	Akalinity as CaCO3 (mg/L):	282.14	Phosphate, TD (mg/L as P):	NR
Field pH:	7.4	Ryznar Stability Index:	7.159	Field Nitrate (mg/L):	NR
Lab pH:	7.48	Sodium Adsorption Ratio:	1.951	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	8.8	Langlier Saturation Index:	0.160	Field Chloride (mg/L):	NR
Air Temp (°C):	16	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	L.002	Phosphate T Dis (mg/L - P)	L.1

Notes

Sample Condition: CLEAR FILTERS EASILY

Field Remarks: SWL AT WELL #1: 26.77 FEET BELOW GROUND WHILE WELL #3 PUMPING

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: LANDTECH WATER DISPOSAL SERVICE

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1985Q0444 / 3483	Sample Date:	5/25/1985 3:00:00 PM
Location (TRS):	28N 58E 26 CDBB	Agency/Sampler:	MBMG / JJD
Latitude/Longitude:	48° 8' 46" N 104° 11' 48" W	Field Number:	LANDTEC
Datum:	NAD27	Lab Date:	6/20/1985
Altitude:	1975	Lab/Analyst:	MBMG / FNA
County/State:	ROOSEVELT / MT	Sample Method/Handling:	GRAB / 4220
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	211FHHC	Total Depth (ft):	1380
USGS 7.5' Quad:	BAINVILLE	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	1340
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	2.300	0.115	Bicarbonate (HCO3)	1,121.000	18.373
Magnesium (Mg)	0.600	0.049	Carbonate (CO3)	14.600	0.784
Sodium (Na)	595.000	25.883	Chloride (Cl)	242.000	6.827
Potassium (K)	1.400	0.036	Sulfate (SO4)	<.2	0.000
Iron (Fe)	0.080	0.004	Nitrate (as N)	0.080	0.006
Manganese (Mn)	0.002	0.000	Fluoride (F)	5.200	0.274
Silica (SiO2)	15.700		Orthophosphate (OPO4)	<.1	0.000
	Total Cations	26.322		Total Anions	26.264

Trace Element Results (µg/L)

Aluminum (Al):	<20.	Cesium (Cs):	NR	Molybdenum (Mo):	180.000	Strontium (Sr):	100.000
Antimony (Sb):	NR	Chromium (Cr):	19.000	Nickel (Ni):	130.000	Thallium (Tl):	NR
Arsenic (As):	0.200	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	<2.	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	<1.
Boron (B):	2,520.000	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	3,600.000	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	18.000	Lithium (Li):	96.000	Silver (Ag):	<2.	Vanadium (V):	<1.
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	0.100	Zinc (Zn):	3.000
						Zirconiuim (Zr):	<4.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,429.120	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,997.900	Hardness as CaCO3:	8.210	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2295	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2428	Akalinity as CaCO3 (mg/L):	944.43	Phosphate, TD (mg/L as P):	NR
Field pH:	8.4	Ryznar Stability Index:	7.946	Field Nitrate (mg/L):	NR
Lab pH:	8.38	Sodium Adsorption Ratio:	90.346	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	17.9	Langlier Saturation Index:	0.217	Field Chloride (mg/L):	NR
Air Temp (°C):	22	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Iron Bio (mg/L - Fe)	0.029	Phosphate T Dis (mg/L - P)	L.1

Notes

Sample Condition: CLEAR* CO2-RICH* EFFERVESCES VIOLENTLY* WHITE PRECIP CACO3 OR SI02?

Field Remarks: 1 MILE EAST OF BAINVILLE * WELL DRILLED BY SIDNEY GENDRON IN 1983 * REPORTED YIELD 75 GPM BY PUMPING * ADJACENT DISPOSAL WELL IN DEEP FM *

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: BREKKE BAYARD & ANTELOPE MT

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1983Q0842 / 3846	Sample Date:	8/8/1983 6:00:00 AM
Location (TRS):	33N 56E 07 ACDA	Agency/Sampler:	USGS / KAD
Latitude/Longitude:	48° 37' 45" N 104° 26' 1" W	Field Number:	MBC-11
Datum:	NAD27	Lab Date:	11/1/1983
Altitude:	1980	Lab/Analyst:	MBMG / FNA
County/State:	SHERIDAN / MT	Sample Method/Handling:	/ 3120
Site Type:	WELL	Procedure Type:	
Geology:	125FRUN	Total Depth (ft):	80
USGS 7.5' Quad:	ANTELOPE 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	29.200	1.457	Bicarbonate (HCO3)	633.000	10.375
Magnesium (Mg)	19.100	1.572	Carbonate (CO3)	0.000	0.000
Sodium (Na)	323.000	14.051	Chloride (Cl)	3.100	0.087
Potassium (K)	0.400	0.010	Sulfate (SO4)	318.000	6.624
Iron (Fe)	<.002	0.000	Nitrate (as N)	0.040	0.003
Manganese (Mn)	0.003	0.000	Fluoride (F)	0.400	0.021
Silica (SiO2)	13.400		Orthophosphate (OPO4)	NR	0.000
	Total Cations	17.090		Total Anions	17.110

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1,017.120	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,338.300	Hardness as CaCO3:	151.530	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1600	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1716	Akalinity as CaCO3 (mg/L):	519.17	Phosphate, TD (mg/L as P):	NR
Field pH:	7.5	Ryznar Stability Index:	6.809	Field Nitrate (mg/L):	NR
Lab pH:	7.83	Sodium Adsorption Ratio:	11.417	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	0.511	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition:

Field Remarks: SEND ANALYSIS TO: BAYARD BREKKE BOX 40 ANTELOPE MT 59211

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center

Isotope Tracer Report

Site Name: CITY OF BAINVILLE 01

Report Date: 5/6/2009

Location Information

Sample Id/Site Id:	1997R0278 / 40305	Sample Date:	9/11/1996 3:30:00 PM
Location (TRS):	28N 58E 22 BDD	Agency/Sampler:	MBMG / KS
Latitude/Longitude:	48° 9' 56" N 104° 12' 57" W	Field Number:	M:40305
Datum:	NAD83	Lab Date:	9/12/1996
Altitude:	2002	Lab/Analyst:	MBMG / TSH
County/State:	ROOSEVELT / MT	Sample Method/Handling:	/ 1000
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	112OTSH	Total Depth (ft):	46
USGS 7.5' Quad:	BAINVILLE	SWL-MP (ft):	NR
PWS Id:	00020	Depth Water Enters (ft):	32
Project:	RADON, PWSINV		

Radon (Rn222 - pC/L):	670.000	Argon (Ar39):	NR
Carbon (C13):	NR	Silicon (Si32):	NR
Carbon (C14):	NR	Chlorine (Cl36):	NR
Tritium (H3 - TU):	NR	Lithium (Li6):	NR
H3/He3 Ratio:	NR	Krypton (Kr85):	NR
Deuterium (H2):	NR	Boron (B11)	NR
Oxygen (O18):	NR	Strontium (Sr87)	NR
Sulphur (S34):	NR	Chloro-fluorocarbon (CFC-11):	NR
Iodine (I129):	NR	Chloro-fluorocarbon (CFC-12):	NR
Nitrogen (N15):	NR	Chloro-fluorocarbon (CFC-113):	NR

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: pC/L = picocuries per Liter; TU = Tritium Units; NR = No Reading in GWIC

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Ground-Water Information Center Water Quality Report

Site Name: EERC-UND * G-11

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1995Q5010 / 151965	Sample Date:	8/9/1994
Location (TRS):	13N 53E 11 DDB	Agency/Sampler:	/
Latitude/Longitude:	46° 53' 34" N 104° 58' 4" W	Field Number:	46558
Datum:	NAD83	Lab Date:	8/24/1994
Altitude:	2173.2	Lab/Analyst:	/
County/State:	DAWSON / MT	Sample Method/Handling:	/
Site Type:	WELL	Procedure Type:	DISSOLVED
Geology:	110ALVM	Total Depth (ft):	27.6
USGS 7.5' Quad:		SWL-MP (ft):	18.33
PWS Id:		Depth Water Enters (ft):	17.5
Project:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	96.900	4.835	Bicarbonate (HCO3)	667.000	10.932
Magnesium (Mg)	117.000	9.628	Carbonate (CO3)	0.000	0.000
Sodium (Na)	90.400	3.932	Chloride (Cl)	19.900	0.561
Potassium (K)	6.300	0.161	Sulfate (SO4)	325.000	6.770
Iron (Fe)	<.2	0.000	Nitrate (as N)	NR	0.000
Manganese (Mn)	<.1	0.000	Fluoride (F)	<1.	0.000
Silica (SiO2)	NR		Orthophosphate (OPO4)	<5.	0.000
	Total Cations	18.557		Total Anions	18.263

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	983.470	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1,321.900	Hardness as CaCO3:	723.530	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	NR	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1250	Akalinity as CaCO3 (mg/L):	547.05	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	6.651	Field Nitrate (mg/L):	NR
Lab pH:	6.8	Sodium Adsorption Ratio:	1.456	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	0.074	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Ground-Water Information Center Water Quality Report

Site Name: MONTANA- DAKOTA UTIL. * WELL NO. 357

Report Date: 5/6/2009

Compare to Water Quality Standards

Location Information

Sample Id/Site Id:	1950Q0004 / 895356	Sample Date:	3/8/1950
Location (TRS):	05N 60E 27 CB	Agency/Sampler:	USGS /
Latitude/Longitude:	° ' " N ° ' " W	Field Number:	
Datum:	NAD27	Lab Date:	3/21/1950
Altitude:		Lab/Analyst:	USGS / KPM
County/State:	FALLON / MT	Sample Method/Handling:	PUMPED /
Site Type:	PETWELL	Procedure Type:	DISSOLVED
Geology:	211JDRV		
USGS 7.5' Quad:	WEBSTER NW 7 1/2'		
PWS Id:			
Project:	DEEPAQU		
Sample Water Use:			

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	134.000	6.687	Bicarbonate (HCO3)	257.000	4.212
Magnesium (Mg)	26.000	2.140	Carbonate (CO3)	NR	0.000
Sodium (Na)	4,266.000	185.571	Chloride (Cl)	6,672.000	188.217
Potassium (K)	NR	0.000	Sulfate (SO4)	99.000	2.062
Iron (Fe)	NR	0.000	Nitrate (as N)	NR	0.000
Manganese (Mn)	NR	0.000	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (OPO4)	NR	0.000
	Total Cations	194.397		Total Anions	194.492

Trace Element Results (µg/L)

Aluminum (Al):	NR	Cesium (Cs):	NR	Molybdenum (Mo):	NR	Strontium (Sr):	NR
Antimony (Sb):	NR	Chromium (Cr):	NR	Nickel (Ni):	NR	Thallium (Tl):	NR
Arsenic (As):	NR	Cobalt (Co):	NR	Niobium (Nb):	NR	Thorium (Th):	NR
Barium (Ba):	NR	Copper (Cu):	NR	Neodymium (Nd):	NR	Tin (Sn):	NR
Beryllium (Be):	NR	Gallium (Ga):	NR	Palladium (Pd):	NR	Titanium (Ti):	NR
Boron (B):	NR	Lanthanum (La):	NR	Praseodymium (Pr):	NR	Tungsten (W):	NR
Bromide (Br):	NR	Lead (Pb):	NR	Rubidium (Rb):	NR	Uranium (U):	NR
Cadmium (Cd):	NR	Lithium (Li):	NR	Silver (Ag):	NR	Vanadium (V):	NR
Cerium (Ce):	NR	Mercury (Hg):	NR	Selenium (Se):	NR	Zinc (Zn):	NR
						Zirconiuim (Zr):	NR

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	441.610	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	NR	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Akalinity as CaCO3 (mg/L):	NR	Phosphate, TD (mg/L as P):	NR
Field pH:	NR	Ryznar Stability Index:	13.998	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	88.336	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	NR	Langlier Saturation Index:	-6.999	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	NR
		Hydroxide (mg/L as OH):	NR		

Additional Parameters

Diss Solids (rpt mg/L) 11,320.000

Notes

Sample Condition:

Field Remarks:

Lab Remarks: JUDITH RIVER FORMATION WATER * SIMILAR TO OTHER WATERS FROM CEDAR CREEK ANTICLINE *

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Attachment Q

Bald Eagle Roost Report
Grouse and Raptor Survey Report

September 2009 Filing

Contents

Prepared for:
Keystone XL Pipeline Project

A Summary Report of the February 2009 Bald Eagle Winter Roost Survey Completed for the Steele City Segment of the Keystone XL Pipeline Project Right-of-Way in Montana

Contents

List of Tables

Executive Summary

An aerial survey was conducted along the Montana portion of the Steele City Segment of the TransCanada Keystone Pipeline, L.P. (Keystone) XL Project (Project) Right-of-Way (ROW) on February 11, 2009, to identify bald eagle winter roost sites. The aerial surveys were conducted in a helicopter with a pilot and a 2-person survey team. The surveys covered an area at least 1 mile upstream and downstream of major waterbody crossings and within all suitable bald eagle nest and winter roost habitat.

Three bald eagle winter roost sites were observed within the proposed ROW in Montana along the Yellowstone River, Missouri River, and Frenchman Reservoir. No active bald eagle nest sites were identified during the surveys but one potential bald eagle nest was located within 1 mile of the ROW at the Missouri River crossing.

Introduction

Keystone is proposing to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada, to the Port Arthur and east Houston areas of Texas in the United States (US). The Project will have a capacity to deliver up to 900,000 barrels per day of crude oil from an oil supply hub near Hardisty to existing terminals in Nederland near Port Arthur and the Houston Ship Channel in Houston, Texas. The Steele City Segment extends from Hardisty, Alberta, southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma, south to Nederland, Texas. The Houston Lateral extends from the Gulf Coast Segment, Liberty County, Texas, southwest to Moore Junction, Harris County, Texas. In total, the Project will consist of approximately 1,707 miles of new, 36-inch-diameter pipeline, consisting of about 327 miles in Canada and 1,380 miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project. The Project is planned to be placed into service in phases. The Gulf Coast segment is planned to be in service by the second quarter of 2011 and the Steele City Segment and Houston Lateral are planned to be in service in 2012.

Background Information

Effective August 8, 2007, the bald eagle was removed from the list of federal threatened or endangered species in the lower 48 states (72 Federal Register 37345). The Department of State has no further requirement to consult on the bald eagle under Section 7. However, the bald eagle remains a species of concern in Montana.

Bald eagles also are protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). The BGEPA not only protects eagles, their young, eggs, and active nests as the MBTA does, it also protects eagles from harm and harassment. “Take” under the BGEPA is defined as to pursue, shoot, shoot at, poison, kill, capture, trap, collect, molest, or disturb. Because bald and golden eagles are afforded more protection than birds protected solely under the MBTA, there was a need to conduct these surveys in order to assess Project-related impacts to the species.

Bald eagles use mature, forested, riparian areas near rivers, streams, lakes, wetlands, and reservoirs. They nest, migrate, and winter in all three states and within most of the counties along the Project route. They generally nest from early February through mid-August, and often return to use the same nest and winter roost year after year. The bald eagle’s diet consists mostly of fish. Eagles also forage opportunistically on waterfowl, dead fish, jackrabbits, and big game carrion – especially in winter.

Southward migration begins as early as October, and the wintering period extends from December to March.

Methods

Federal and state agencies were consulted on the location of historic communal roost sites along the Project route prior to the surveys. A historic communal roost site is located on the Missouri River near the School Trust Fishing Access Site, approximately 2 miles upstream of the proposed Missouri River crossing (Bureau of Land Management [BLM] 2009; Montana Fish, Wildlife, and Parks 2009).

The 2009 aerial bald eagle winter roost survey focused on locating bald eagle winter roost sites along major waterbodies within 1 mile of the Project. Aerial survey methods for the 2009 surveys followed those outlined by Call (1978). Two surveyors (seated in left- and right-hand positions of the helicopter) examined suitable habitat within 1 mile (on each side) of the centerline. Prior to initiating the survey, the most up-to-date centerline track for the pipeline was downloaded onto the helicopter's global positioning system (GPS) unit. Aircraft navigation along the proposed pipeline ROW and maintenance of appropriate aircraft position in relation to the ROW was then facilitated using a pilot-operated and monitored GPS unit. Aircraft position and location along the ROW was further monitored by the rear, right-hand observer using a separate GPS unit that displayed real time position. Aerial maps also were utilized by the front, left-hand observer to make notes on features observed.

The February 11, 2009 survey started at the southern border of Montana in Fallon County and proceeded northward to the northern terminus in Phillips County.

Surveys were conducted between sunrise and sunset (approximately 0730 to 1730 Central Time). The date, temperature, wind, and cloud cover were recorded at the beginning of each survey day and at the end of each survey day; changes in overall weather conditions during the survey also were recorded.

Temperatures during the survey ranged from highs of approximately 60 degrees Fahrenheit (°F) to lows of 27°F. Skies were generally clear to partly cloudy with little to no precipitation. Winds were inconsistent, ranging from 15 to 40 mph out of the Northwest during the survey period.

Complete coverage of the entire ROW was obtained by traveling down the centerline and visually scanning all areas of potential bald eagle nesting and winter roost habitat. This typically involved slowing aircraft speed to 25 to 40 mph within the vicinity of waterbody and riparian areas. All perennial rivers crossed by the ROW were initially selected as potential areas to be searched for bald eagle winter roosting activity (**Table 1**). However, during the February 2009 aerial survey, a number of these crossings were determined not to support suitable bald eagle winter roosting habitat, either because the river was completely frozen over and there was no open water for bald eagle foraging and/or there were no suitably sized roost trees along the river within 1 mile of the ROW (**Table 1**). At major river crossings where suitable bald eagle winter roosting habitat (large trees and open water) was present, a 2-mile survey corridor centered on the ROW was obtained by flying 1 mile from the ROW centerline along one side of the river and returning along the opposite side of the river to the ROW centerline. The same process was then repeated on the opposite side of the ROW. Only raptor nests large enough to support eagle nesting activity were recorded within 1 mile of the ROW centerline. The observers also noted and recorded perched bald eagles in trees as well as bald eagles flying along the river corridor. GPS location coordinates were recorded for all bald eagle roost and nest sites observed. In addition, general GPS coordinates were recorded for areas along the river where bald eagles were observed in flight. General observations on bald eagle behavior and numbers also were recorded where birds were observed. Once a bald eagle was located, a second pass-over was made to confirm the use of the site, and to obtain accurate GPS location coordinates using the front observer's GPS unit. Observers recorded notes on habitat, activity, and nearest pipeline milepost.

Initially, the focus of the bald eagle roosting portion of the surveys was to survey major river crossings either early in the morning (within an hour after sunrise) or late in the afternoon (1 hour before sunset) when eagles were most likely to be found using nighttime roost sites. However, as the survey progressed, it was noted that bald eagles were observed along the major rivers during most of the day, signifying the importance of the site to nesting, roosting, or foraging activities. In addition, it also was noted that bald eagles often flushed from perch sites as the helicopter flew into the vicinity making accurate identification of specific roosts difficult. As a result, survey emphasis shifted to recording bald eagle presence rather than specific roost trees although eagle perch site locations were still recorded. It was assumed that if bald eagles were located within 1 mile of the ROW, then nighttime roost sites likely also were present within 1 mile of the ROW.

Results

Bald Eagle Winter Roost and Nest Sites

The USFWS defines two types of bald eagle winter roost sites. Transitory roosts are described as sites with 3 or more eagles, within 100 meters of each other, for at least 2 nights in an area with no previous history of winter communal roosting. Communal roosts are defined as six or more eagles in a small area for extended periods of time or used for multiple years. Since a one-time winter aerial survey cannot distinguish between transitory roosts versus communal roosts, it was assumed that if bald eagles were observed perching along a river within 1 mile of the ROW, then at least some type of roosting activity occurs within 1 mile of the ROW. Follow-up ground surveys would be required to determine if identified roosting areas represent transitory or communal roost sites.

Out of the 20 perennial waterbody crossings initially selected as survey locations for bald eagle winter roost areas within the vicinity of the Project in Montana, 17 were found to be frozen solid and/or supported no suitable-sized perch trees near the proposed ROW. These river crossings were eliminated from further surveys for bald eagle winter roosting use (**Table 1**). Bald eagles and bald eagle perch/roost trees were recorded at three waterbodies either crossed or approached by the ROW in Montana. These waterbodies included Frenchmen Creek, the Missouri River, and the Yellowstone River (**Table 2**). In addition, a potential eagle nest was located 0.6 mile west of the ROW crossing of the Missouri River.

Discussion

The intent of the February 2009 aerial surveys was to identify bald eagle winter roost locations within 1 mile of the proposed pipeline ROW. The data will aid in project planning in two ways: 1) provide information to avoid the disturbance roost sites located within the construction ROW during the winter roost period, and 2) provide historic roost location information for specific follow-up surveys that may need to be completed to determine activity status immediately prior to construction. Follow-up surveys will be conducted at major waterbody crossings with documented eagle activity to confirm the location of transitory or communal winter roost sites, if pipeline construction will occur at any of these crossings between October 1 and January 31. Winter roost surveys will be conducted at least 1 day prior to the first date of construction.

Keystone is confident that the data provided in this report and for the 2009 survey will be sufficient for project planning and application of appropriate mitigation measures, if warranted. The next important step in the protection of bald eagle winter roosts from construction and operation will be consultation with the

USFWS, BLM, and Montana Fish, Wildlife and Parks, and the development of an agency approved mitigation plan and implementation process.

Mitigation Planning

The data from these surveys will allow Keystone and appropriate wildlife agencies to plan construction along the ROW to avoid the disturbance of roosting bald eagles, where possible. Bald eagle winter roost surveys were conducted during the 2009 winter roosting period to obtain complete coverage for the ROW. However, mainline construction currently is proposed to commence in 2011. It is likely that activity status of roost sites will change in the interim between survey completion and pipeline construction in 2011. It is Keystone's intent to minimize impacts to wildlife species, including roosting eagles; therefore, all attempts will be made to construct during periods with the least impact to wintering birds. In the event that construction occurs during the roosting season, it may be necessary to provide a biological monitor or clearance surveys along certain portions of the route that would be scheduled for construction between October 1 and January 31 to prevent disturbance to wintering bald eagles. However, these measures would depend on a number of site-specific factors and would be determined on a case-by-case basis with the applicable agencies.

It is anticipated that areas that would be disturbed by construction would be resurveyed prior to commencement of construction activities, or a biological monitor would be present to determine whether wintering bald eagles could be affected by project activities. Based on these survey results, Keystone would coordinate with the applicable agencies to determine whether additional protection measures may be warranted. It is possible that construction could proceed in certain areas near known roost sites depending the distance between construction and the roost site, line-of-sight implications between the roost site and construction activities, duration and type of construction activity, and/or the presence of a qualified biologist to monitor bird behavior and response to construction activity.

References

Bureau of Land Management (BLM). 2009. Meeting Notes. Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between J. Carlson (BLM) and P. Lorenz, P. Swartzinski (AECOM). February 3, 2008.

Call, M. W. 1978. Nesting Habitat and Surveying Techniques for Common Raptors. Bureau of Land Management, Denver, Colorado. 115 pp.

Montana Fish, Wildlife, and Parks (MFWP). 2009. Meeting Notes. Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between W. Davis, P. Gunderson, R. Rauscher, S. Dalbey, H. Wentland, W. Baxter (MFWP) and P. Lorenz, P. Swartzinski (AECOM). February 3, 2008.

Table 1 Status of Waterbodies Along the Keystone XL Project that were Evaluated for Bald Eagle Winter Roost Sites – February 2009

State	County	From MP*	To MP*	Waterbody Type	Name	Status
MT	Valley	25.91	25.92	Perennial	Frenchmen Creek	Limited open water
MT	Valley	39.23	39.25	Perennial	Rock Creek	Frozen
MT	Valley	40.41	40.43	Perennial	Willow Creek	Frozen
MT	Valley	66.88	66.89	Perennial	Cherry Creek	Frozen
MT	Valley	82.67	82.70	Perennial	Milk River	Frozen
MT	Valley	88.79	88.99	Perennial	Missouri River	Open
MT	McCone	93.66	93.67	Perennial	Struple Coulee	Frozen
MT	McCone	94.51	94.53	Perennial	Unnamed Stream	Frozen
MT	McCone	127.48	127.50	Perennial	East Fork of Prairie Elk Creek	Frozen
MT	McCone	146.49	146.51	Perennial	Redwater River	Frozen, no trees
MT	McCone	153.20	153.23	Perennial	Buffalo Springs Creek	Frozen
MT	Dawson	159.15	159.18	Perennial	Berry Creek	Frozem
MT	Dawson	175.10	175.13	Perennial	Clear Creek	Not Perennial, No Trees
MT	Dawson	195.58	195.97	Perennial	Yellowstone River	Limited open water
MT	Prairie	201.32	201.33	Perennial	Cabin Creek	Frozen, Small, Poor Habitat
MT	Prairie	201.87	201.89	Perennial	Cabin Creek	Frozen, Small, Poor Habitat
MT	Prairie	201.93	201.95	Perennial	Spring Creek	Frozen
MT	Fallon	226.70	226.72	Perennial	Dry Fork Creek	Frozen
MT	Fallon	234.21	234.22	Perennial	Pennel Creek	Frozen, Small, Poor Habitat
MT	Fallon	262.17	262.18	Perennial	Little Beaver Creek	Frozen, no trees
MT	Fallon	281.19	281.21	Perennial	Boxelder Creek	Limited open water

* Based on the February 15, 2009, issuance of the centerline and milepost. This February 15, 2009, version was sent to AECOM 2 weeks early for use during this overflight.

Table 2 Bald Eagle Winter Roost Survey Results – Keystone XL Project – February 2009

Waypoint Number	Milepost	Survey Date	Waterbody Name	Coordinates		Observation (roost type, nest)	Distance from CL	Description / Comments
				Lat	Long			
14	195.8	2/11/2009	Yellowstone River	46.873710	-104.979080	Transitory Roost	0.4 mile west	2 adults
15	89.0	2/11/2009	Missouri River	48.050430	-106.336320	Transitory Roost	0.6 mile west	1 adult
16	89.0	2/11/2009	Missouri River	48.049580	-106.338910	Possible Nest	0.6 mile west	Inactive nest near the area where the adult was flushed
17	89.0	2/11/2009	Missouri River	48.050890	-106.327390	Transitory Roost	1.0 mile west	1 juvenile
18	89.0	2/11/2009	Missouri River	48.048000	-106.301850	Transitory Roost	1.0 mile east	1 juvenile
19	25.7	2/11/2009	Frenchmen Reservoir	48.718310	-107.211710	Transitory Roost	on CL	1 juvenile

Prepared for:
TransCanada Keystone Pipeline, LP

A Summary Report of the April 2009 Aerial Greater Sage Grouse / Sharp-tailed Grouse Lek and Raptor Nest Surveys Completed for the Steele City Segment of the Keystone XL Project Right-of-Way in Montana

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Executive Summary

Aerial surveys were conducted along the Montana portion of the Steele City Segment of the proposed TransCanada Keystone Pipeline, LP (Keystone) XL Project (Project) right-of-way (ROW) between April 15 and April 21, 2009, to identify greater sage grouse (*Centrocercus urophasianus*)/sharp-tailed grouse (*Tympanuchus phasianellus jamesi*) lek sites and raptor nest sites. Additionally, two alternative routes (Routes A and A1A) were surveyed in compliance with the Montana Major Facilities Siting Act.

Raptor Nest Surveys

One aerial survey was previously completed to collect raptor nest occurrence information along the Steele City Segment of the proposed Project ROW from April 7 through April 10, 2008 (Keystone 2008). This report covers a second additional raptor nest aerial survey conducted along the Montana portion of the Steele City Segment of the Project ROW in addition to greater sage grouse and sharp-tailed grouse lek surveys. All aerial surveys were conducted in a helicopter with a pilot and a 2-person survey team. Based on agency recommendations, the 2008 surveys covered an area of at least 0.25 mile on each side of the proposed ROW alignment. The 2009 survey addressed a 1.0 mile corridor (at least 0.5 mile) on each side of the proposed ROW alignment in Montana based on recommendations provided by Montana Fish, Wildlife, and Parks (MFWP) (AECOM 2008). At major river crossings, survey coverage was expanded to 1 mile on each side of the ROW to search for bald eagle nest sites.

The 2009 survey documented 171 raptor nests in Montana. Additionally, one great blue heron rookery was identified during the surveys.

Greater Sage Grouse/Sharp-tailed Grouse Lek Surveys

Surveys for greater sage grouse and sharp-tailed grouse leks were conducted within suitable habitat along the entire Project route through Montana. Surveys addressed greater sage grouse habitat within 0.6 mile on each side of the proposed ROW. No active greater sage grouse or sharp-tailed grouse lek sites were identified in Montana.

Introduction

Keystone is proposing to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada, to the Port Arthur and east Houston areas of Texas in the US. The Project will have a capacity to deliver up to 900,000 barrels per day of crude oil from an oil supply hub near Hardisty to existing terminals in Nederland near Port Arthur and the Houston Ship Channel in Houston, Texas. The Steele City Segment extends from Hardisty, Alberta, southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma, south to Nederland, Texas. The Houston Lateral extends from the Gulf Coast Segment, Liberty County, Texas, southwest to Moore Junction, Harris County, Texas. In total, the Project will consist of approximately 1,707 miles of new, 36-inch-diameter pipeline, consisting of about 327 miles in Canada and 1,380 miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project. The Project is planned to be placed into service in phases. The Gulf Coast segment is planned to be in service by the second quarter of 2011 and the Steele City Segment and Houston Lateral are planned to be in service in 2012.

Background Information

Prior to the 2009 aerial surveys, Keystone representatives consulted with federal and state wildlife agencies in a series of meetings, telephone calls, and email conversations regarding appropriate survey protocols for raptors and grouse species. The results of these consultations are found in **Appendix A**.

Raptor Nest Surveys

A variety of raptor species are known to nest in the region of the proposed Project. These species include eagles, buteos, falcons, owls, harriers, osprey, and other birds of prey. Breeding and nest building/tending activities can begin as early as February for some raptor species, and the rearing of young and fledgling dependency can last into early August for some of the later nesting species. Protected raptor species occurring along the proposed route include the bald eagle and the peregrine falcon. Other raptors identified as species of special concern include the ferruginous hawk, Swainson's hawk, and burrowing owl.

Greater Sage Grouse/Sharp-tailed Grouse Lek Surveys

Greater sage grouse surveys have been required by the Bureau of Land Management (BLM) and recommended by the MFWP to assess potential impacts to this BLM-sensitive species and Montana Species of Concern as a result of the implementation of the proposed Project. Additionally, incidental surveys for the plains sharp-tailed grouse were recommended during consultation. Sage grouse occur within sagebrush grasslands of the project area. Sharp-tailed grouse are found with grasslands interspersed with shrub and brush-filled coulees. Both are considered lekking birds and utilize sensitive strutting grounds or lek sites for breeding activities. Breeding typically occurs from March 15 to May 15, with nesting and brooding possibly extending to June 15.

Methods

Aerial survey methods followed those outlined by Call (1978). Two surveyors (seated in left- and right-hand positions of the helicopter) examined the area within 0.6 mile of the Project centerline along the entire ROW in Montana to locate lek sites and existing raptor nest sites. Additionally, a 2-mile buffer was surveyed around proposed pump station locations for lek sites, and a 1-mile area on each side of the ROW was surveyed to locate potential bald eagle nest sites where the ROW intercepted major river crossings. Prior to initiating the survey, the most up-to-date centerline (i.e., the February 15, 2009, version) track for the routes was downloaded into the helicopter's global positioning system (GPS) unit. Aircraft navigation along the proposed pipeline ROW and maintenance of appropriate aircraft position in relation to the ROW was then facilitated using a pilot operated and monitored GPS unit and real time GPS tracking with an on-board computer. Aircraft position and location along the survey corridor was further monitored by the rear, right-hand observer using a separate GPS unit that displayed real time position and the ROW centerline on digital raster graphic (DRG) 7.5-minute US Geological Survey topographic maps. In addition, raptor nest sites identified during the 2008 aerial surveys and historic greater sage-grouse lek sites provided by MFWP (MFWP 2008) were plotted onto 1:24,000 scale aerial maps and downloaded on the DRG topographic maps.

Raptor Nest Surveys

The 2009 aerial raptor survey focused on locating raptor nests constructed in trees in riparian zones, shelterbelts, and other wooded areas and areas of cliffs, rock outcrops, knolls, and other topographic features suitable for raptor nesting. Surveys were conducted in April, which facilitated locating nests in deciduous trees prior to leaf-out and the open terrain facilitated locating ferruginous hawk ground nests. The surveys started at the southern terminus of the Montana portion of the Steele City Segment in Fallon County and continued northwest to the Canadian border. Surveys then proceeded along alternative routes A and A1A.

Surveys were conducted between sunrise and sunset (approximately 0600 to 2000 Central and Mountain Standard Time). Temperatures during the survey ranged from highs of approximately 60 degrees Fahrenheit (°F) to lows of 32°F. Skies ranged from clear to cloudy with little precipitation. Winds shifted from southeast to west/northwest and ranged from 0 to 15 miles per hour (mph) during most of the survey period.

Complete coverage of the survey corridor along the entire ROW was obtained by traveling down the ROW centerline and visually scanning all areas of potential nesting habitat. This typically involved slowing aircraft speed to 25 to 40 mph when woodlands, shelterbelts, riparian areas, isolated trees, cliffs, or rock outcrops were encountered. Once a possible nest site was located, a second pass-over was made to confirm nest type and condition, and to obtain accurate GPS location coordinates using the front observer's GPS unit. Observers recorded notes on nest configuration, condition, possible species, habitat, and nearest pipeline milepost (MP).

The habitat surrounding all waterbodies crossed by the proposed ROW was surveyed for bald eagle nesting activity. At major river crossings where suitable bald eagle nesting habitat (large trees and open water) was present, a 2-mile survey corridor, centered on the ROW, was conducted by first flying 1 mile from the ROW centerline along one side of the river and returning along the opposite side of the river back to the ROW centerline. The same process was then repeated along the river on the opposite side of the ROW. The observers noted and recorded perched bald eagles in trees as well as bald eagles flying along the river corridor. GPS location coordinates were recorded for all bald eagle nest and roost sites observed. In addition, general GPS coordinates were recorded for areas along the river where bald eagles were observed in flight. General observations on bald eagle behavior and numbers also were recorded where birds were observed.

Greater Sage-Grouse/Sharp-tailed Grouse Lek Surveys

Surveys for lek sites followed the protocol established between Keystone, the BLM, and MFWP (AECOM 2009a,b) along the entire route in Montana, including 11 proposed pump station sites. Surveys were conducted from 0.5 hour before sunrise to 2 hours after sunrise unless it was overcast or birds were still active, in which case the surveys were extended. A distance of 0.6 mile on each side of the proposed centerline (1.2-mile survey corridor) was surveyed. This involved flying two transects at 0.6 mile apart (one 0.6 mile to the east of the centerline and one on centerline to survey 0.6 mile to the west). Surveys were conducted within a 2-mile radius (8 transects each 4 miles long at 0.5 mile apart) of each pump station location. In addition, any historic lek sites identified on the 1:24,000 aerial map books were surveyed to verify activity. The survey corridor was established based on current greater sage grouse mitigation measures and based on Keystone's original plan to construct outside the entire nesting period (i.e., after June 15) along the survey corridor in Montana. Should Keystone construct prior to June 15, MFWP recommends using a survey corridor of 4 miles on each side of the centerline and the BLM recommends using a survey corridor of 2 miles on each side of the centerline.

The helicopter was positioned to maximize the sun's early morning horizontal light. Altitude was approximately 100 to 150 feet above the ground, and air speed was from 40 to 70 mph, depending on habitat quality. Altitudes and speeds were adjusted by the observer, as necessary. It was determined that surveys would not be conducted if snow cover was complete (i.e., no open areas), snow depth was greater than 1 inch, precipitation was occurring (snow or rain), or winds were greater than 20 mph. Weather conditions were recorded prior to the start of each survey day.

All sage grouse activity was recorded, including bird behavior, number of birds observed, and females versus males (if possible). Habitat quality was recorded and notes on lek location relative to the overall landscape also were taken, in order to more easily locate the lek in the future. In addition, active lek sites were recorded using a GPS point and mapped on 1:8,000 scale aerial maps.

Results

Raptor Nest Surveys

Appendix B, Tables B-1 through **B-3** provides a listing of all nest locations identified during the April 2009 aerial survey. A total of 171 nest sites were documented within the survey area in Montana. Additionally, one great blue heron rookery and three historic raptor nests occupied by Canada geese were identified. Alternative routes A, A1A, and B were surveyed in Montana. Of the 171 raptor nests identified along the alternative routes in Montana, 109 raptor nests were identified along Route B (preferred route), 26 raptor nests along Route A, and 36 raptor nests along Route A1A. **Tables B-1** through **B-3** also include universal transverse mercator (UTM) coordinates for each nest location as well as information on species ownership and nest activity (**Tables B-1** through **B-3)**.

Of the 171 potential raptor nest sites, 51 nests were considered occupied (presence of adults on or around the nest, in incubation posture, or eggs/chicks in the nest). The 51 occupied nests included 15 red-tailed hawks, 12 great horned owls, 2 bald eagles, 4 golden eagles, 17 ferruginous hawks, and 1 prairie falcon. Species ownership determinations for remaining nests were based on nest size, configuration, and location.

Bald eagles were recorded at two major waterbodies along the proposed ROW in Montana (see **Tables B-1** through **B-3**). One juvenile eagle was perched at the Yellowstone River crossing. Approximately 10 juvenile and adult eagles were observed roosting on the north shore of the Frenchmen Reservoir to the west of the ROW (see **Tables B-1** through **B-3**).

Greater Sage-Grouse/Sharp-tailed Grouse Lek Sites

No active lek sites were recorded within 1.2 miles of the centerline in Montana during the sage grouse surveys.

Discussion

Raptor Nest Surveys

Based on the results of the April 2009 aerial surveys, a number of raptor species breed and forage within and near the Project ROW. The most common species include red-tailed hawks and great-horned owls, with scattered breeding records for the ferruginous hawk, golden eagle, and bald eagle. Given the aerial survey method employed for the Project, nests of some species such as cavity nesters (American kestrel), ground nesters (short-eared owl, burrowing owl, turkey vulture, and northern harrier), and woodland nesters in evergreens (accipiters, long-eared owl, and great horned owl) could not be effectively located. Survey emphasis was placed on locating nests of eagles, buteos, accipiters, and owls that nest in deciduous trees and along cliff formations. These are the most common species that could be affected by construction, particularly if construction were to occur within the breeding season (February through August).

The intent of these surveys was to identify as many raptor nests as possible within or adjacent to the proposed pipeline ROW. The surveys were conducted in anticipation of construction in 2011. Nest data will aid in project planning in two ways: 1) it will provide information to avoid the disturbance of nest sites located within the construction ROW during the breeding season or, if necessary, identify nests that may need to be removed outside of the nesting season; and 2) it will provide historic nest location information for specific follow-up surveys that may need to be completed to determine activity status immediately prior to construction. For the purposes of avoiding adverse impacts to wintering bald eagles, follow-up surveys will be conducted at major waterbody crossings with documented eagle use to confirm the location of transitory or communal winter roost sites, if pipeline construction will occur at any of these crossings between October 1 and January 31.

Greater Sage-Grouse/Sharp-tailed Grouse Lek Sites

Based on the findings of the April 2009 aerial surveys, the Project crosses minimal suitable lekking habitat. Although the survey corridor was determined to be 0.6 mile on either side of the ROW, survey crews confirmed that visibility was actually 1.0 mile on either side of the transects, resulting in a larger survey corridor.

The next important step in the protection of breeding raptors and greater sage grouse/sharp-tailed grouse from construction and operation will be consultation with the USFWS, as well as applicable state game and fish departments, and the development of an agency-approved mitigation plan and implementation process.

Use of GPS

GPS provides an advanced, practical method for precise navigation and to obtain accurate location data, particularly in areas with little to no topographic relief or prominent landmarks. However, use of GPS can occasionally have limitations. Due to wind movement and positioning of the helicopter, GPS coordinate locations could be up to 100 to 200 feet in error from the actual nest location. All efforts were made to obtain the most accurate GPS coordinate locations possible during the aerial surveys. Keystone is confident that the data provided in this report for the April 2009 survey will be sufficient for future lek and nest identification, project planning, and application of appropriate mitigation measures, if warranted.

References

AECOM. 2009a. Personal communication between J. Carlson, Bureau of Land Management (BLM); W. Davis, Montana Fish, Wildlife, and Parks (MFWP); P. Gunderson, MFWP; and P. Lorenz, AECOM. February 26, 2009.

_____. 2009b. Personal communication between K. Undlin, BLM, and P. Lorenz, AECOM. March 26, 2009.

_____. 2008. Personal communication between W. Davis, MFWP, and P. Lorenz, AECOM. August 14, 2008.

Call, M. W. 1978. Nesting Habitat and Surveying Techniques for Common Raptors. Bureau of Land Management, Denver, Colorado. 115 pp.

Keystone. 2008. A summary report of the 2008 aerial raptor nest / bald eagle nest and winter roost survey completed for the Steele City Segment of the Keystone XL Project right-of-way. AECOM, Fort Collins, Colorado. 12 pp.

Montana Fish, Wildlife, and Parks (MFWP). 2008. Data Request for historical greater sage grouse lek sites. Received 7/10/2008.

Appendix A

Agency Correspondence

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location	ENSR
Date/Time of Contact	August 14, 2008
KXL Team Member(s)	Patti Lorenz

Contact Information:

Name	Windy Davis
Title	Energy Specialist
Organization	Montana Fish Wildlife and Parks
Address	FWP Region 7 Headquarters Industrial Site West Miles City, MT 59301
County	
Phone	(406) 234-0900
Email address	widavis@mt.gov

Contact Information:

Type of Contact (phone, in-person, etc.): ___email__Phone________________________________

Issue: Exclusion windows___ Concern Level: High___Moderate_x_Low__.

Description:

Hi Patty,

Our current recommendations for timing exclusions are no surface use or disturbance :

Timing dates: Big game winter range (all): December 1 to March 31
Sharp-tail grouse (within 2 miles of a lek): March 1 to June 15th
Sage grouse (within 4 miles of a lek): March 1 to June 15th
Raptor nests (within 1/2 mile of nest): March 1 to August 1

Windy

-----Original Message-----
From: Lorenz, Patricia [mailto:plorenz@ensr.aecom.com]
Sent: Tuesday, August 12, 2008 8:41 AM
To: Smith, T.O. (FWP); Gunderson, Pat; Davis, Windy
Subject: KXL - Information Request - Game Exclusion dates

T.O., Pat, and Windy:

Could you please provide exclusion dates for big game winter ranges and sage / sharp-tailed grouse lek sites? Currently, we are crossing winter range for mule deer, white-tailed deer, and antelope. Windy, I believe you mentioned mid March to late April for the grouse, but just wanted to confirm.

Also, I haven't forgotten about getting you information on the type/amount of habitat crossed by the proposed project. We received an update of the route on July 31st and are running the numbers to correlate with the latest information.

Thank you for your help.

Patti Lorenz
Biologist
ENSR | AECOM
1601 Prospect Parkway
Fort Collins, CO 80525
T: (970) 493-8878 x3410
F: (970) 493-0213
plorenz@ensr.aecom.com

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__ Low__.**

Description:

Follow-up Required / Requested

Additional Comments

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location	ENSR – Fort Collins
Date/Time of Contact	2/26/2009, 12:50 p.m.
KXL Team Member(s)	Patti Lorenz

Contact Information:

Name	John C. Carlson
Title	Wildlife Biologist
Organization	BLM - Glasgow Field Station
Address	5 Laser Drive Glasgow, MT 59230
County	
Phone	(406) 228-3762
Email address	john_carlson@blm.gov

Contact Information:

Type of Contact (phone, in-person, etc.): _Phone_

Issue: _Sage Grouse Survey Protocol__ **Concern Level: High_x__Moderate__Low__.**

Description:

I called John to discuss the protocol for aerial sage grouse surveys. Modifications were made based on a previous discussion with John Phillips from TROW agreeing not to construct in Montana until after the June 15 breeding/nesting window for sage grouse. Therefore the focus will now be on impacts to actual lek sites with construction activities. The proposed protocol is as follows:

- Aerial surveys will begin on April 15, 2009.
- Within known suitable sagebrush habitat, surveys will be conducted within 0.6 miles (1 km) from the centerline construction corridor. This is approximately the entire route with the exception of Dawson County.
- Surveys will still be conducted within 2 miles (transects flown at half mile apart) at pump stations due to their permanent structure.
- Surveys will be conducted 30 minutes prior to sunrise to 2 hours after sunrise (the exact times will be weather specific).
- The helicopters will be flown between 100 and 500 ft above the ground and between 40 and 70 mph depending

on the habitat quality and specific landowner requests/landuse (i.e., higher for areas with cattle).

- Ground verification of potential lek sites identified from the air will be surveyed pending landowner access to the site.

John concurred with the above protocol but did note that discussion are ongoing about increasing the buffer to 4 miles around permanent structures.

Follow-up Required / Requested

Additional Comments

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location ENSR

Date/Time of Contact 2/26/09

KXL Team Member(s) Patti Lorenz

Contact Information:

Name	Windy Davis
Title	Energy Specialist
Organization	Montana Fish Wildlife and Parks
Address	FWP Region 7 Headquarters Industrial Site West Miles City, MT 59301
County	
Phone	(406) 234-0900
Email address	widavis@mt.gov

Contact Information:

Type of Contact (phone, in-person, etc.): ___ Telephone________________________________

Issue: Sage Grouse Surveys___ Concern Level: High__x__Moderate___Low___.

Description:

I called Windy to discuss the protocol for aerial sage grouse surveys. Modifications were made based on a previous discussion with John Phillips from TROW agreeing not to construct in Montana until after the June 15 breeding/nesting window for sage grouse. Therefore the focus will now be on impacts to actual lek sites with construction activities. The proposed protocol is as follows:

- Aerial surveys will begin on April 15, 2009.
- Within known suitable sagebrush habitat, surveys will be conducted within 0.6 miles (1 km) from the centerline construction corridor. This is approximately the entire route with the exception of Dawson County.
- Surveys will still be conducted within 2 miles (transects flown at half mile apart) at pump stations due to their permanent structure.
- Surveys will be conducted 30 minutes prior to sunrise to 2 hours after sunrise (the exact times will be weather specific).
- The helicopters will be flown between 100 and 500 ft above the ground and between 40 and 70 mph depending

on the habitat quality and specific landowner requests/landuse (i.e., higher for areas with cattle).

- Ground verification of potential lek sites identified from the air will be surveyed pending landowner access to the site.

Windy concurred with the above protocol.

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__ Low__.**

Description:

Follow-up Required / Requested

Additional Comments

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location ENSR

Date/Time of Contact 2/26/2009

KXL Team Member(s) Patti Lorenz

Contact Information:

Name	Pat Gunderson
Title	Region 6 Supervisor
Organization	Montana Fish Wildlife and Parks
Address	54078 Hwy 2 West Glasgow, MT 59230
County	
Phone	(406) 228-3700
Email address	pgunderson@mt.gov

Contact Information:

Type of Contact (phone, in-person, etc.): ___ Phone________________________________

Issue: Sage Grouse Survey Protocol Concern Level: High__x__Moderate__Low__.

Description:

I called Pat to discuss the protocol for aerial sage grouse surveys. Modifications were made based on a previous discussion with John Phillips from TROW agreeing not to construct in Montana until after the June 15 breeding/nesting window for sage grouse. Therefore the focus will now be on impacts to actual lek sites with construction activities. The proposed protocol is as follows:

- Aerial surveys will begin on April 15, 2009.
- Within known suitable sagebrush habitat, surveys will be conducted within 0.6 miles (1 km) from the centerline construction corridor. This is approximately the entire route with the exception of Dawson County.
- Surveys will still be conducted within 2 miles (transects flown at half mile apart) at pump stations due to their permanent structure.
- Surveys will be conducted 30 minutes prior to sunrise to 2 hours after sunrise (the exact times will be weather specific).
- The helicopters will be flown between 100 and 500 ft above the ground and between 40 and 70 mph depending on the habitat quality and specific landowner requests/landuse (i.e., higher for areas with cattle).

- Ground verification of potential lek sites identified from the air will be surveyed pending landowner access to the site.

Pat concurred with the above protocol.

Pat also mentioned that he had attended the public scoping meeting that day and said that it was a positive meeting. He stated that MFWP will work with the project to make sure impacts to wildlife will be minimized.

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__Low__.**

Description:

Issue:____ **Concern Level: High__Moderate__ Low__.**

Description:

Follow-up Required / Requested

Additional Comments

TransCanada – KXL Phase II Pipeline
Contact Summary Form

Communication Location	ENSR – Fort Collins
Date/Time of Contact	3/26/09 / 10:45 a.m.
KXL Team Member(s)	Patti Lorenz

Contact Information:

Name	Kent Undlin
Title	BLM
Organization	BLM – Miles City Field Office
Address	
County	
Phone	406-233-2845
Email address	

Contact Information:

Type of Contact (phone, in-person, etc.): Telephone

Issue: Greater Sage Grouse Survey Protocols **Concern Level: High X Moderate __ Low __.**

Description:

Kent called to discuss the survey protocol for the aerial sage grouse lek surveys planned for April 2009. He concurred with the current protocol but would suggest doing three rounds of surveys on future efforts. He also concurred with using staff that is familiar with sage grouse but unfamiliar with aerial surveys as long as a helicopter is being used. Also recommends using the data sheet provided by MFWP.

The following email chain is related to the above telephone conversation:

Hello Patti - i've been meaning to call you for over a week now and things just get busier! Just to clarify things as far as grouse surveys go - are you going to complete aerial surveys within a 4 mile buffer of the proposed line in sagebrush habitat or only a .6 mile buffer (I assume this means 1.2 miles total width) in the sagebrush habitat? I thought your last e-mail in feb. said 4 miles but I might have misinterperated that one. Also there are leks just of the proposed line in mccone county - will the line be moved or mitigated?? Only 1 aerial survey?? I know we probably went over this in the conference call but just making sure. Thanks for your help and feel free to give a call - I do have meetings the next couple days but will get back to you. I'm also just starting the review of the POD and environ. reports. cheers, kent

"Lorenz, Patricia" <Patricia.Lorenz@aecom.com>

03/04/2009 03:01 PM

To <Kent_Undlin@blm.gov>, <Fritz_Prellwitz@blm.gov>

cc

Subject Keystone XL Project - Sage Grouse Surveys

Kent and Fritz,

I have some great news regarding the KXL Project and sage grouse surveys. I spoke with MFWP and John Carlson last week regarding this update and everyone seemed pretty happy.

The client has agreed not to construct in Montana until after the June 15 breeding/nesting window for sage grouse. Therefore our focus will now be impacts to actual lek sites with construction activities. The proposed protocol is as follows:

Aerial surveys will begin on April 15, 2009.

Within known suitable sagebrush habitat, surveys will be conducted within 0.6 miles (1 km) from the centerline construction corridor. This is approximately the entire route with the exception of Dawson County.

Surveys will still be conducted within 2 miles (transects flown at half mile apart) at pump stations due to their permanent structure.

Surveys will be conducted 30 minutes prior to sunrise to 2 hours after sunrise (the exact times will be weather specific).

The helicopters will be flown between 100 and 500 ft above the ground and between 40 and 70 mph depending on the habitat quality and specific landowner requests/landuse (i.e., higher for areas with cattle).

Ground verification of potential lek sites identified from the air will be surveyed pending landowner access to the site.

Please let me know if you concur with this approach. Feel free to give me a call with any questions or comments.

Thanks,

Patti Lorenz, Wildlife Biologist
AECOM Environment
D 970-530-3410
patricia.lorenz@aecom.com

AECOM
1601 Prospect Parkway
Fort Collins, CO 80525
T 970-493-8878 F 970-493-0213
www.aecom.com

Issue:______________________________________ **Concern Level: High__Moderate__Low__.**

Issue:____ **Concern Level:** **High__Moderate__Low__.**

Description:

Issue:____ **Concern Level:** **High__Moderate__ Low__.**

Description:

Follow-up Required / Requested

Additional Comments

Appendix B

Survey Result Tables

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/16/09	MT	385.0	Owl	13	680715	4986937	0.5 W	Tree	Fair	Unoccupied	Wind Row	
4/16/09	MT	369.7	RTHA	13	675078	4991999	0.2 E	Tree	Good	Unoccupied	Riparian	
4/16/09	MT	369.7	GHOW	13	674946	4992063	0.2 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/16/09	MT	364.4	GOEA	13	667642	4996424	0.7 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/16/09	MT	361.2	RTHA	13	664952	5000704	200 feet E	Tree	Fair	Unoccupied	Lone Cottonwood	
4/16/09	MT	357.2	RTHA	13	659711	5004836	0.2 W	Tree	Good	Unoccupied	Riparian	
4/16/09	MT	297.2	Owl / crow	13	593733	5070153	200 feet W	Tree	Good	Unoccupied	Riparian	
4/16/09	MT	286.8	FEHA	13	579280	5078434	0.1 E	Ground	Good	Unoccupied	Rocky/ Bluff	
4/16/09	MT	286.7	FEHA	13	579078	5078588	0.1 E	Ground	Fair	Unoccupied	Rocky/ Bluff	
4/16/09	MT	286.3	FEHA	13	578655	5078684	0.1 E	Ground	Fair	Unoccupied	Rocky/ Bluff	
4/16/09	MT	281.4	BAEA	13	572101	5082774	04. W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/16/09	MT	277.5	Owl / crow	13	569342	5087901	0.2 W	Tree	Good	Unoccupied	Lone Cottonwood	
4/16/09	MT	270.0	FEHA	13	566938	5099690	0.1 E	Rock ledge	Fair	Unoccupied	Rocky/ Bluff	
4/16/09	MT	270.0	GHOW	13	567316	5100096	0.4 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/16/09	MT	267.5	FEHA	13	566217	5103215	0.5 E	Ground	Good	Unoccupied	Rocky/ Bluff	None
4/16/09	MT	267.0	FEHA	13	565005	5103915	0.2 E	Ground	Good	Occupied	Rocky/ Bluff	No nest contents; adult observed nearby

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/16/09	MT	266.3	GOEA	13	564065	5104851	0.2 W	Tree	Good	Occupied	Rocky/ Bluff	No nest contents; feathers in nest and fresh whitewash
4/16/09	MT	266.0	FEHA	13	563733	5105348	0.3 W	Ground	Fair	Unoccupied	Rocky/ Bluff	
4/16/09	MT	264.5	FEHA	13	563015	5107856	0.5 W	Ground	Poor	Unoccupied	Rocky/ Bluff	
4/16/09	MT	262.6	FEHA	13	564213	5110660	0.2 E	Ground	Good	Unoccupied	Rocky/ Bluff	
4/17/09	MT	256.0	FEHA	13	559827	5120388	0.5 W	Ground	Good	Unoccupied	Rocky/ Bluff	
4/17/09	MT	256.0	FEHA	13	559984	5120385	0.5 W	Ground	Poor	Unoccupied	Rocky/ Bluff	
4/17/09	MT	256.0	FEHA	13	560175	5120598	0.5 W	Ground	Fair	Unoccupied	Rocky/ Bluff	
4/17/09	MT	255.4	FEHA	13	560486	5121347	0.1 W	Ground	Good	Unoccupied	Rocky/ Bluff	
4/17/09	MT	254.6	FEHA	13	559330	5121813	0.3 W	Ground	Poor	Unoccupied	Rocky/ Bluff	
4/17/09	MT	254.6	FEHA	13	559298	5121859	0.3 W	Ground	Fair	Unoccupied	Rocky/ Bluff	
4/17/09	MT	255.1	FEHA	13	560581	5122615	0.5 E	Ground	Good	Occupied	Rocky/ Bluff	Adult perched near MP 255.1
4/17/09	MT	255.1	FEHA	13	560748	5122365	0.5 E	Ground	Fair	Occupied	Rocky/ Bluff	Adult perched near MP 255.1
4/17/09	MT	248.7	GHOW	13	555684	5131265	0.5 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/17/09	MT	246.4	RTHA	13	552609	5132958	0.1 E	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	244.1	RTHA	13	551514	5136120	0.1 E	Tree	Poor	Unoccupied	Lone Cottonwood	
4/17/09	MT	244.2	Unknown	13	551142	5136010	0.1 W	Tree	Poor	Unoccupied	Riparian	
4/17/09	MT	238.9	FEHA	13	546628	5142871	300 feet E	Ground	Good	Occupied	Lone Cottonwood	Adult perched on nest; no contents
4/17/09	MT	237.1	FEHA	13	544853	5145080	0.6 E	Ground	Good	Occupied	Rocky/ Bluff	Adult perched on nest; no contents

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/17/09	MT	237.1	FEHA	13	544825	5145117	0.6 E	Ground	Good	Occupied	Rocky/ Bluff	Very near nest at MP 237.1
4/17/09	MT	234.7	RTHA	13	541969	5147442	500 feet E	Tree	Good	Occupied	Riparian	1 egg; no adults observed
4/17/09	MT	232.7	RTHA	13	539953	5149764	0.2 E	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	231.7	RTHA	13	538720	5150837	0.3 E	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	231.1	Unknown	13	537262	5150866	0.3 W	Tree	Poor	Unoccupied	Riparian	
4/17/09	MT	231.2	RTHA	13	537242	5150446	0.4 W	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	231.4	RTHA	13	537248	5150486	0.2 W	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	231.4	RTHA	13	537627	5150514	0.2 W	Tree	Good	Unoccupied	Riparian	
4/17/09	MT	230.2	GOEA	13	537064	5152304	0.2 E	Tree	Fair	Unoccupied	Ponderosa Pine Woodland	
4/18/09	MT	228.1	GHOW	13	534840	5155346	0.5 E	Tree	Good	Occupied	Riparian	2 downy young
4/18/09	MT	227.3	FEHA	13	532832	5154615	0.5 W	Ground	Good	Unoccupied	Rocky/ Bluff	
4/18/09	MT	226.0	Unknown	13	530971	5155952	0.6 W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	225. 1	FEHA	13	530512	5157318	0.4 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	223.6	CAGO	13	529468	5159675	0.2 W	Tree	Good	Occupied	Riparian	8 eggs - on old raptor nest
4/18/09	MT	223.2	RTHA	13	530494	5160926	0.6 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	219.5	GOEA	13	527772	5166336	0.6 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	217.3	RTHA	13	524632	5168136	0.1 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/18/09	MT	215.7	RTHA	13	522299	5169742	0.4 W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	206.0	RTHA	13	511372	5180258	0.3 W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	205.8	CAGO	13	511126	5180665	0.4 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture - on old raptor nest
4/18/09	MT	196.1	RTHA	13	500583	5190350	1.1 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	192.1	RTHA	13	499401	5196336	0.1 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	187.3	RTHA	13	497085	5203632	0.3 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	177.3	RTHA	13	486916	5215731	0.2 W	Tree	Good	Unoccupied	Riparian	No nest contents; adult observed nearby
4/18/09	MT	170.2	RTHA	13	480690	5224852	0.1 E	Tree	Good	Unoccupied	Cottonwood Woodland	
4/18/09	MT	164.0	RTHA	13	477126	5233740	0.2 W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	161.0	FEHA	13	474386	5237774	0.2 W	Ground	Poor	Unoccupied	Rocky/ Bluff	
4/18/09	MT	156.5	RTHA	13	470104	5243361	0.4 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	151.8	RTHA	13	463606	5247452	0.2 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	149.2	SWHA	13	461077	5250547	200 feet W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	145.8	GHOW	13	457768	5254388	0.1 E	Tree	Good	Occupied	Riparian	1 + downy young; adult

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
												on nest brooding
4/18/09	MT	142.6	RTHA	13	453897	5257861	0.3 W	Tree	Good	Occupied	Riparian	No nest contents; adult observed nearby
4/18/09	MT	136.3	SWHA	13	448753	5266576	0.3 E	Tree	Fair	Unoccupied	Riparian	
4/18/09	MT	135.2	GHOW	13	446546	5267126	0.2 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	135.2	RTHA	13	446722	5267296	0.3 E	Tree	Good	Occupied	Riparian	No nest contents; adult flushed from nest
4/18/09	MT	133.5	RTHA	13	446200	5270262	0.6 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	133.5	RTHA	13	446174	5270305	0.6 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	128.9	FEHA	13	440324	5274771	200 feet E	Ground	Good	Unoccupied	Rocky/ Bluff	
4/18/09	MT	122.9	RTHA	13	434946	5282972	0.6 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	121.1	RTHA	13	431642	5283976	0.3 W	Tree	Fair	Unoccupied	Riparian	
4/18/09	MT	120.1	RTHA	13	431740	5285509	0.1 E	Tree	Fair	Unoccupied	Riparian	
4/18/09	MT	112.9	GOEA	13	424133	5293787	0.1 E	Tree	Poor	Unoccupied	Rocky/ Bluff	
4/18/09	MT	110.9	RTHA	13	423452	5297457	0.8 E	Tree	Poor	Unoccupied	Riparian	
4/18/09	MT	110.4	GHOW	13	421461	5296738	0.4 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/18/09	MT	99.5	RTHA	13	410463	5309724	0.4 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	99.2	RTHA	13	409563	5309884	0.2 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	97.9	Unknown	13	408425	5311100	0.3 E	Tree	Poor	Unoccupied	Riparian	
4/18/09	MT	97.8	Unknown	13	408395	5311375	0.3 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	97.0	RTHA	13	408051	5312782	0.5 E	Tree	Good	Occupied	Riparian	1 egg; no adults observed
4/18/09	MT	96.6	Unknown	13	406947	5312502	0.1 W	Tree	Fair	Unoccupied	Riparian	

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/18/09	MT	96.2	Unknown	13	406791	5313140	0.1 E	Tree	Fair	Unoccupied	Riparian	2 nests
4/18/09	MT	96.0	RTHA	13	406718	5313777	0.4 E	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	95.1	Unknown	13	405546	5314616	0.2 E	Tree	Fair	Unoccupied	Riparian	2 nests
4/18/09	MT	94.8	RTHA	13	404792	5314700	0.2 W	Tree	Good	Unoccupied	Riparian	
4/18/09	MT	94.5	Unknown	13	404825	5315141	CL	Tree	Fair	Unoccupied	Riparian	2 nests
4/18/09	MT	93.8	Unknown	13	403950	5316027	0.2 W	Tree	Poor	Unoccupied	Riparian	
4/18/09	MT	90.0	RTHA	13	402319	5321842	200 feet E	Tree	Fair	Unoccupied	Riparian	
4/18/09	MT	88.9	BAEA	13	400271	5322716	0.7 W	Tree	Good	Occupied	Riparian	No nest contents; adult flushed from nest
4/18/09	MT	88.9	Osprey	13	401938	5323751	0.5 E	Power pole	Partial nest	Unoccupied	Riparian	
4/18/09	MT	71.3	GHOW	13	386452	5346103	0.5 E	Tree	Good	Occupied	Riparian	1 + downy young; adult on nest brooding
4/18/09	MT	65.3	FEHA	13	380446	5352800	0.6 E	Tree	Good	Occupied	Riparian	No nest contents; adult flushed from nest
4/18/09	MT	67.0	Owl / magpie	13	380693	5349709	0.1 W	Tree	Fair	Unoccupied	Riparian	
4/18/09	MT	55.5	Unknown	13	369300	5363493	0.2 W	Tree	Fair	Unoccupied	Riparian	Raptor nest on old magpie nest
4/18/09	MT	53.0	Unknown	13	367126	5366926	0.2 E	Tree	Fair	Unoccupied	Riparian	Raptor nest on old magpie nest
4/18/09	MT	39.1	RTHA	13	351987	5382928	0.4 W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	38.9	RTHA	13	352261	5384092	0.4 E	Tree	Good	Occupied	Riparian	3 eggs; adult flushed from nest
4/19/09	MT	36.1	Unknown	13	349019	5386575	300 feet W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	28.9	RTHA	13	340692	5395015	0.5 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	27.2	Unknown	13	339604	5397381	0.1 W	Tree	Poor	Unoccupied	Riparian	

Table B-1 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route B

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/19/09	MT	25.5	GBHE	13	336640	5397043	1.0 W	Trees	Good	Occupied		Undetermined – rookery with approximately 15 nests
4/19/09	MT	24.4	Unknown	13	336772	5400177	0.3 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	24.4	Unknown	13	336772	5400177	0.3 E	Tree	Partial nest	Unoccupied	Riparian	
4/19/09	MT	23.0	RTHA	13	334742	5400290	0.6 W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	22.4	Unknown / magpie	13	334242	5401944	0.2 W	Tree	Fair	Unoccupied	Riparian	
4/19/09	MT	21.2	Accipiter	13	332242	5402970	0.3 W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	21.0	GHOW	13	332559	5403367	0.1 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/19/09	MT	7.5	FEHA / SWHA	13	320424	5420453	0.2 E	Small tree / shrub	Good	Unoccupied	Riparian	
4/19/09	MT	1.0	FEHA	13	314320	5428744	0.4 W	Small tree	Good	Occupied	Riparian	1 egg; adult flushed from nest

* LEOW = Long-eared owl
RTHA = Red-tailed hawk
GHOW = Great-horned owl
BAEA = Bald eagle
GBHE = Great blue heron
CAGO = Canada goose
FEHA = Ferruginous hawk
SWHA = Swainson's hawk
PRFA = Prairie falcon

Table B-2 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route A

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/20/09	MT	33.0	PRFA	13	349511	5395650	0.5 E	Cliff ledge	Good	Occupied	Rocky/ Bluff	1 egg; adult flushed from eyrie
4/20/09	MT	32.8	GOEA	13	349153	5394945	CL	Cliff ledge	Good	Occupied	Rocky/ Bluff	Undetermined; adult on nest in incubation posture
4/20/09	MT	54.9	FEHA	13	380962	5385198	0.2 W	Small tree / shrub	Good	Occupied	Lone Cottonwood	3 eggs; adult flushed from nest
4/20/09	MT	66.1	FEHA	13	398175	5381151	0.2 E	Ground	Good	Occupied	Rocky/ Bluff	No nest contents; adult flushed from nest
4/20/09	MT	67.0	RTHA	13	399568	5379990	0.1 W	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	86.4	FEHA	13	429546	5371611	0.1 W	Small tree	Good	Occupied	Rocky/ Bluff	4 eggs; adult flushed from nest
4/20/09	MT	90.7	FEHA	13	436092	5369734	0.3 W	Ground	Good	Unoccupied	Rocky/ Bluff	
4/20/09	MT	92.9	FEHA	13	439582	5369269	0.2 W	Ground	Good	Unoccupied	Rocky/ Bluff	
4/20/09	MT	108.0	FEHA	13	462851	5363119	0.3 E	Ground	Good	Occupied	Rocky/ Bluff	No nest contents; adult flushed from nest
4/20/09	MT	123.8	FEHA	13	486868	5355216	0.5	Ground	Good	Occupied	Rocky/ Bluff	4 eggs; adult flushed from nest
4/20/09	MT	142.2	SWHA	13	516220	5351494	CL	Tree	Fair	Unoccupied	Cottonwood Woodland	
4/20/09	MT	142.2	SWHA	13	516257	5351617	0.1 E	Tree	Good	Unoccupied	Cottonwood Woodland	
4/20/09	MT	145.3	SWHA	13	520982	5350150	0.2 E	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	150.8	RTHA	13	528435	5345895	CL	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture

Table B-2 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route A

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles)/ Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/20/09	MT	151.8	RTHA	13	529839	5344625	0.5 W	Tree	Fair	Unoccupied	Riparian	
4/20/09	MT	151.9	Unknown	13	529886	5344541	0.5 W	Tree	Poor	Unoccupied	Riparian	
4/20/09	MT	153.7	Accipiter / crow	13	532831	5344961	0.1 E	Tree	Fair	Unoccupied	Riparian	
4/20/09	MT	153.8	RTHA	13	532807	5344773	0.1 E	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	153.8	Accipiter	13	532938	5344845	0.1 E	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	164.5	SWHA	13	549053	5338596	350 feet E	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	164.5	SWHA	13	549053	5338596	350 feet E	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	165.7	Accipiter	13	550449	5337234	0.3 W	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	166.2	RTHA	13	550978	5336808	0.4 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/20/09	MT	166.5	GHOW	13	551451	5336507	0.5 W	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/20/09	MT	178.8	RTHA	13	567659	5326769	0.5	Tree	Good	Unoccupied	Riparian	
4/20/09	MT	180.2	Unknown	13	571050	5327154	0.3	Tree	Poor	Unoccupied	Riparian	

* LEOW = Long-eared owl
RTHA = Red-tailed hawk
GHOW = Great-horned owl
BAEA = Bald eagle
GBHE = Great blue heron
CAGO = Canada goose
FEHA = Ferruginous hawk
SWHA = Swainson's hawk
PRFA = Prairie falcon

Table B-3 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route A1A

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles) / Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/19/09	MT	153.0	SWHA	13	570642	5340605	0.1 E	Small tree	Fair	Unoccupied	Riparian	
4/19/09	MT	151.8	RTHA	13	569532	5342433	0.2 E	Small tree	Good	Unoccupied	Riparian	
4/19/09	MT	149.4	RTHA	13	567075	5344483	0.1 E	Tree	Good	Occupied	Riparian	1 egg; adult flushed from nest
4/19/09	MT	147.2	RTHA	13	563026	5344668	0.2 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	147.0	RTHA	13	562610	5344418	CL	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	146.9	RTHA	13	562366	5344444	CL	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	143.0	FEHA	13	556129	5344029	0.3 W	Small tree	Good	Occupied	Wind Row	2 eggs; adult flushed from nest
4/19/09	MT	142.8	RTHA	13	555831	5344694	CL	Tree	Good	Unoccupied	Wind Row	
4/19/09	MT	140.2	RTHA	13	551776	5345607	0.4 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	139.9	Unknown	13	551031	5344200	0.3 W	Tree	Poor	Unoccupied	Riparian	
4/19/09	MT	140.1	RTHA	13	551355	5344532	0.2 W	Tree	Fair	Unoccupied	Riparian	
4/19/09	MT	140.0	Unknown	13	551373	5344694	380 feet	Tree	Poor	Unoccupied	Riparian	
4/19/09	MT	140.1	RTHA	13	551580	5345049	0.1 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/19/09	MT	138.8	CAGO	13	549295	5344500	0.2 W	Tree	Good	Occupied	Lone Cottonwood	Undetermined; adult on nest in incubation posture – on old raptor nest
4/19/09	MT	137.9	Unknown	13	547619	5345128	0.2 W	Tree	Fair	Unoccupied	Lone Cottonwood	
4/19/09	MT	133.1	GHOW	13	542363	5350174	0.3 W	Tree	Good	Occupied	Cottonwood Woodland	Undetermined; adult on nest in incubation posture
4/19/09	MT	133.1	Unknown	13	542363	5350174	0.3 W	Tree	Fair	Unoccupied	Cottonwood Woodland	
4/19/09	MT	129.9	Unknown	13	538640	5353814	0.4 W	Tree	Good	Unoccupied	Wind Row	
4/19/09	MT	129.9	Unknown / magpie	13	538463	5354051	0.4 W	Tree	Fair	Unoccupied	Wind Row	

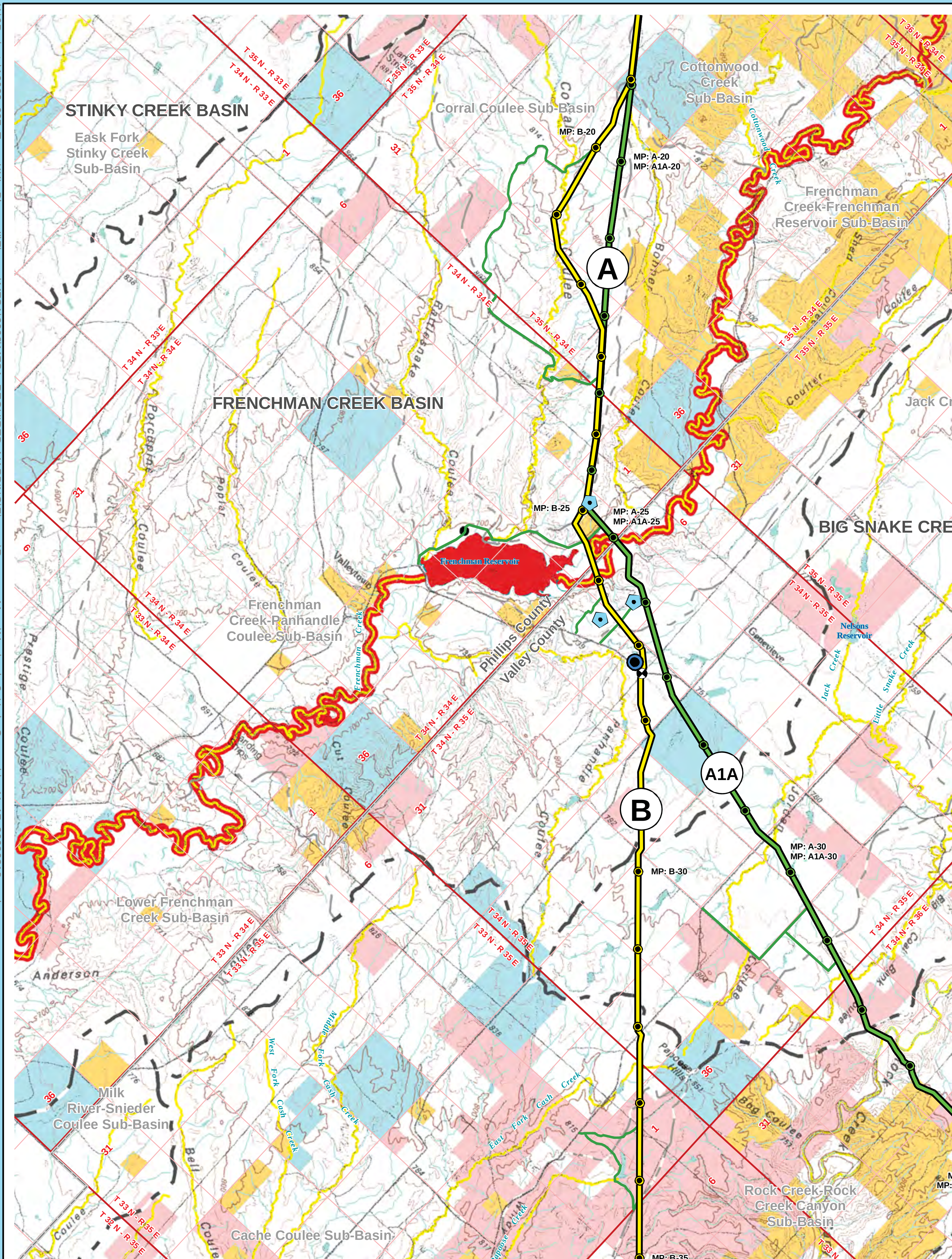
Table B-3 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route A1A

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles) / Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/19/09	MT	122.1	RTHA	13	535316	5364194	0.5 E	Tree	Good	Unoccupied	Lone Cottonwood	
4/19/09	MT	110.2	Unknown / magpie	13	542188	5380018	0.1 W	Tree	Fair	Unoccupied	Riparian	
4/19/09	MT	106.2	Accipiter	13	543160	5386088	0.3 W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	106.5	Accipiter	13	543012	5386050	0.2 W	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	101.8	RTHA	13	537705	5388484	0.3 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	101.5	Unknown	13	537191	5389040	0.4 E	Tree	Fair	Unoccupied	Riparian	
4/19/09	MT	101.0	RTHA	13	536420	5388696	0.4 E	Tree	Poor	Unoccupied	Riparian	
4/19/09	MT	101.0	RTHA	13	536115	5388973	0.5 E	Tree	Poor	Unoccupied	Riparian	
4/19/09	MT	100.7	RTHA	13	535555	5388988	0.5 E	Tree	Poor	Unoccupied	Riparian	
4/19/09	MT	100.0	RTHA	13	535271	5389089	0.5 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	100.0	RTHA	13	535271	5389089	0.5 E	Tree	Good	Unoccupied	Riparian	
4/19/09	MT	95.2	Accipiter / crow	13	527426	5389413	0.2 E	Tree	Good	Unoccupied	Cottonwood Woodland	
4/19/09	MT	67.9	FEHA	13	484093	5388538	0.3 W	Small tree	Good	Unoccupied	Wind Row	
4/19/09	MT	64.4	FEHA	13	478934	5389554	CL	Tree	Good	Occupied	Riparian	2 eggs; adult flying nearby
4/19/09	MT	55.9	GHOW	13	465259	5390113	0.2 E	Tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture
4/20/09	MT	44.9	FEHA	13	447621	5390696	0.5 E	Broken tree	Good	Occupied	Riparian	Undetermined; adult on nest in incubation posture

Table B-3 Raptor Nest Survey Results – Keystone XL Project – 2009 Aerial Surveys – Route A1A

Date	State	Approx. MP	Species*	UTM Zone	Easting	Northing	Distance (miles) / Direction from CL	Nest Type	Nest Condition	Activity Status and Behavior	Habitat	Comments
4/20/09	MT	44.0	Accipiter / crow	13	447071	5390069	0.3 E	Tree	Poor	Unoccupied	Riparian	
4/20/09	MT	34.1	SWHA	13	431027	5391736	0.4 E	Tree	Good	Unoccupied	Cottonwood Woodland	

* LEOW = Long-eared owl
RTHA = Red-tailed hawk
GHOW = Great-horned owl
BAEA = Bald eagle
GBHE = Great blue heron
CAGO = Canada goose
FEHA = Ferruginous hawk
SWHA = Swainson's hawk
PRFA = Prairie falcon



STINKY CREEK BASIN
Eask Fork Stinky Creek Sub-Basin
Corral Coulee Sub-Basin
Cottonwood Creek Sub-Basin
Frenchman Creek-Frenchman Reservoir Sub-Basin
FRENCHMAN CREEK BASIN
Frenchman Creek-Panhandle Coulee Sub-Basin
BIG SNAKE CRE
Lower Frenchman Creek Sub-Basin
Milk River-Snieder Coulee Sub-Basin
Cache Coulee Sub-Basin
Rock Creek-Rock Creek Canyon Sub-Basin
Frenchman Reservoir
Nelsons Reservoir
Phillips County
Valley County
A
A1A
B
MP: B-20
MP: A-20
MP: A1A-20
MP: B-25
MP: A-25
MP: A1A-25
MP: A-30
MP: A1A-30
MP: B-30
MP: B-35
T 35 N - R 33 E
T 34 N - R 33 E
T 34 N - R 34 E
T 35 N - R 34 E
T 35 N - R 35 E
T 34 N - R 35 E
T 33 N - R 34 E
T 33 N - R 35 E
T 34 N - R 36 E
T 36 N - R 34 E
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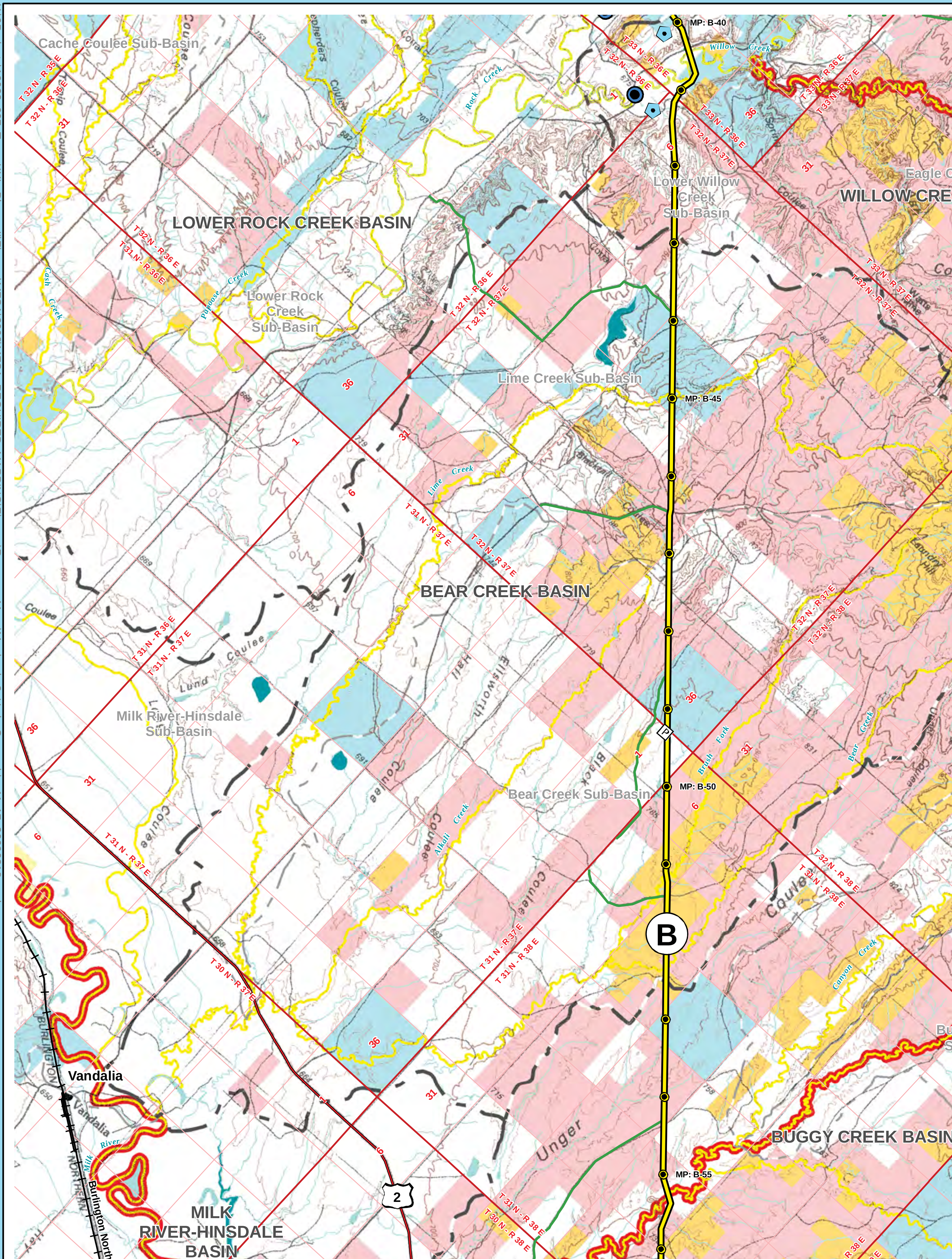
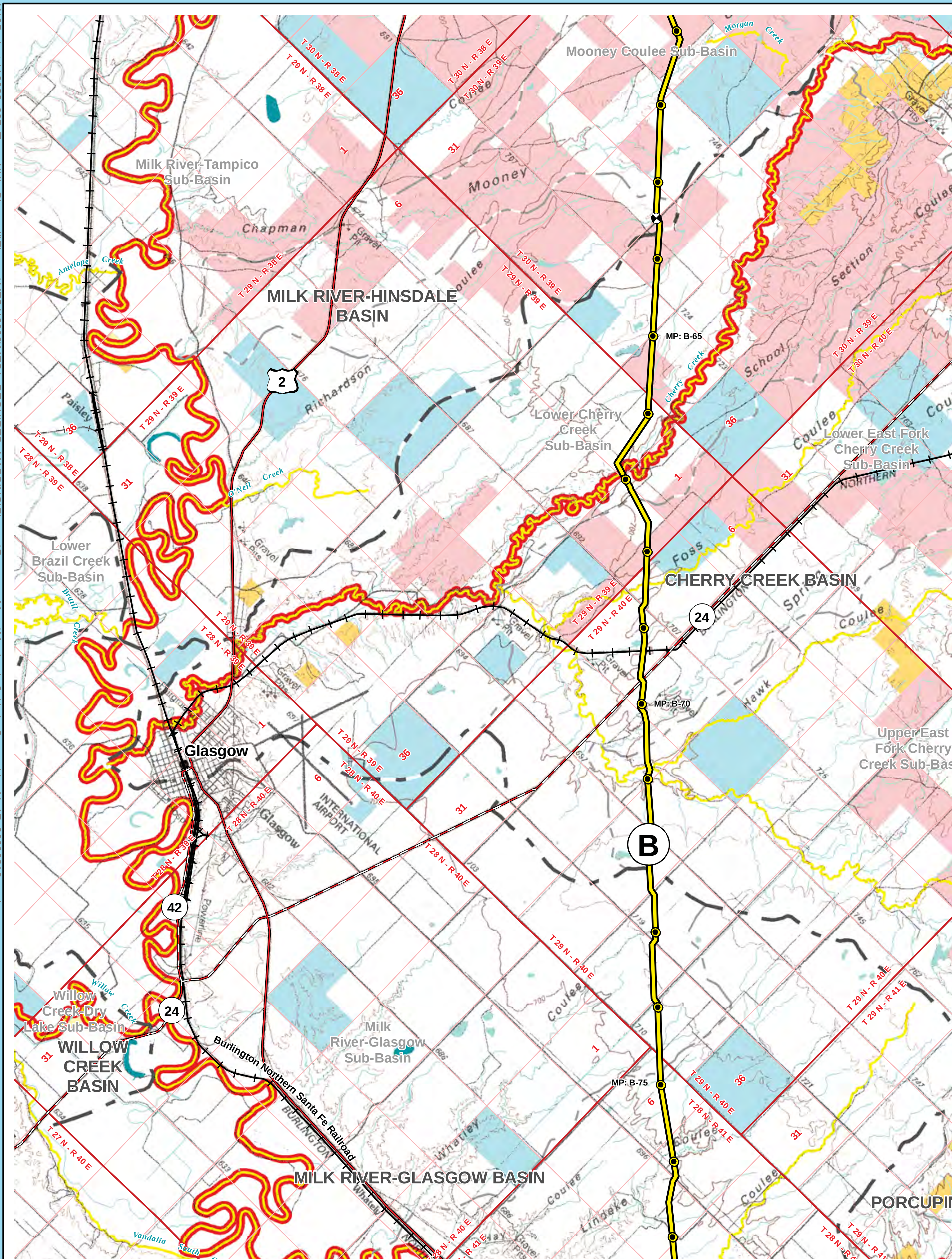

LOWER ROCK CREEK BASIN
Cache Coulee Sub-Basin
Lower Rock Creek Sub-Basin
Lower Willow Creek Sub-Basin
WILLOW CRE
Eagle C
Lime Creek Sub-Basin
BEAR CREEK BASIN
Milk River-Hinsdale Sub-Basin
Bear Creek Sub-Basin
BUGGY CREEK BASIN
MILK RIVER-HINSDALE BASIN
Vandalia
MP: B-40
MP: B-45
MP: B-50
MP: B-55
B
2
T 32 N - R 35 E
T 32 N - R 36 E
T 33 N - R 36 E
T 33 N - R 37 E
T 32 N - R 37 E
T 31 N - R 36 E
T 31 N - R 37 E
T 31 N - R 38 E
T 32 N - R 38 E
T 30 N - R 37 E
T 30 N - R 38 E
Burlington North
BURLINGTON NORTHERN
Milk River
Rock Creek
Willow Creek
Lime Creek
Alkali Creek
Brush Fork
Bear Creek
Canyon Creek
Cash Creek
Papoose Creek
Lund Coulee
Ellsworth
Unger
Coulee



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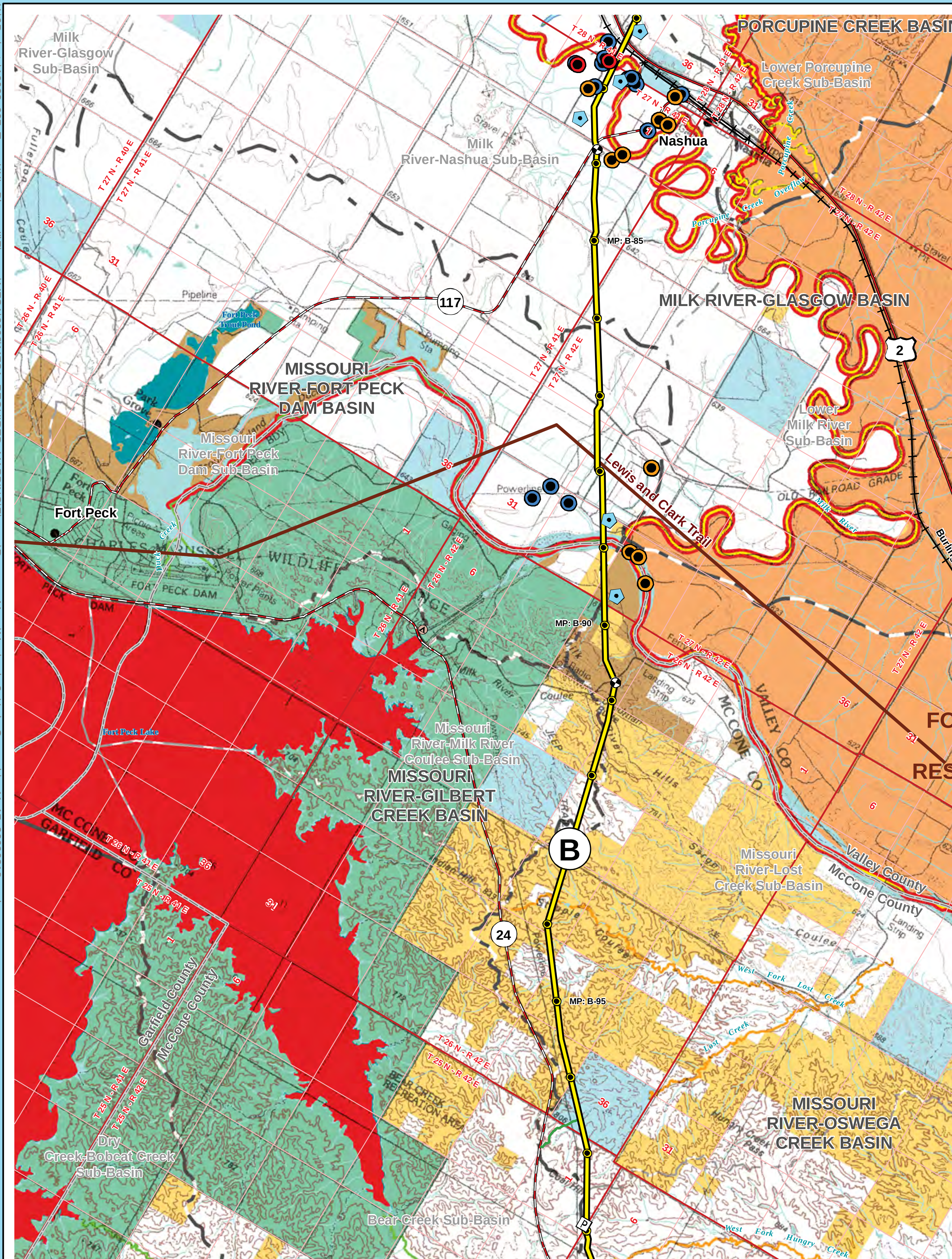

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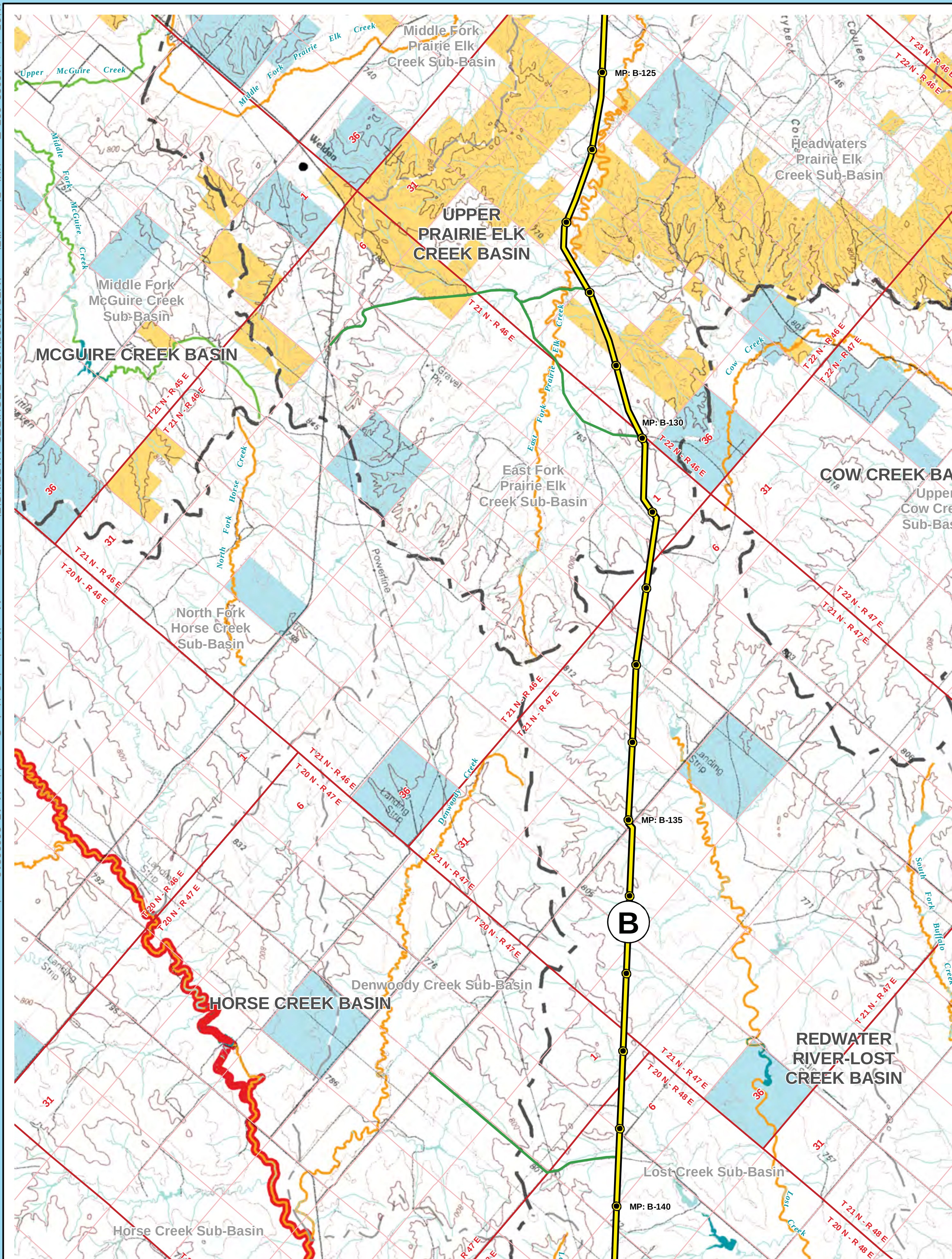

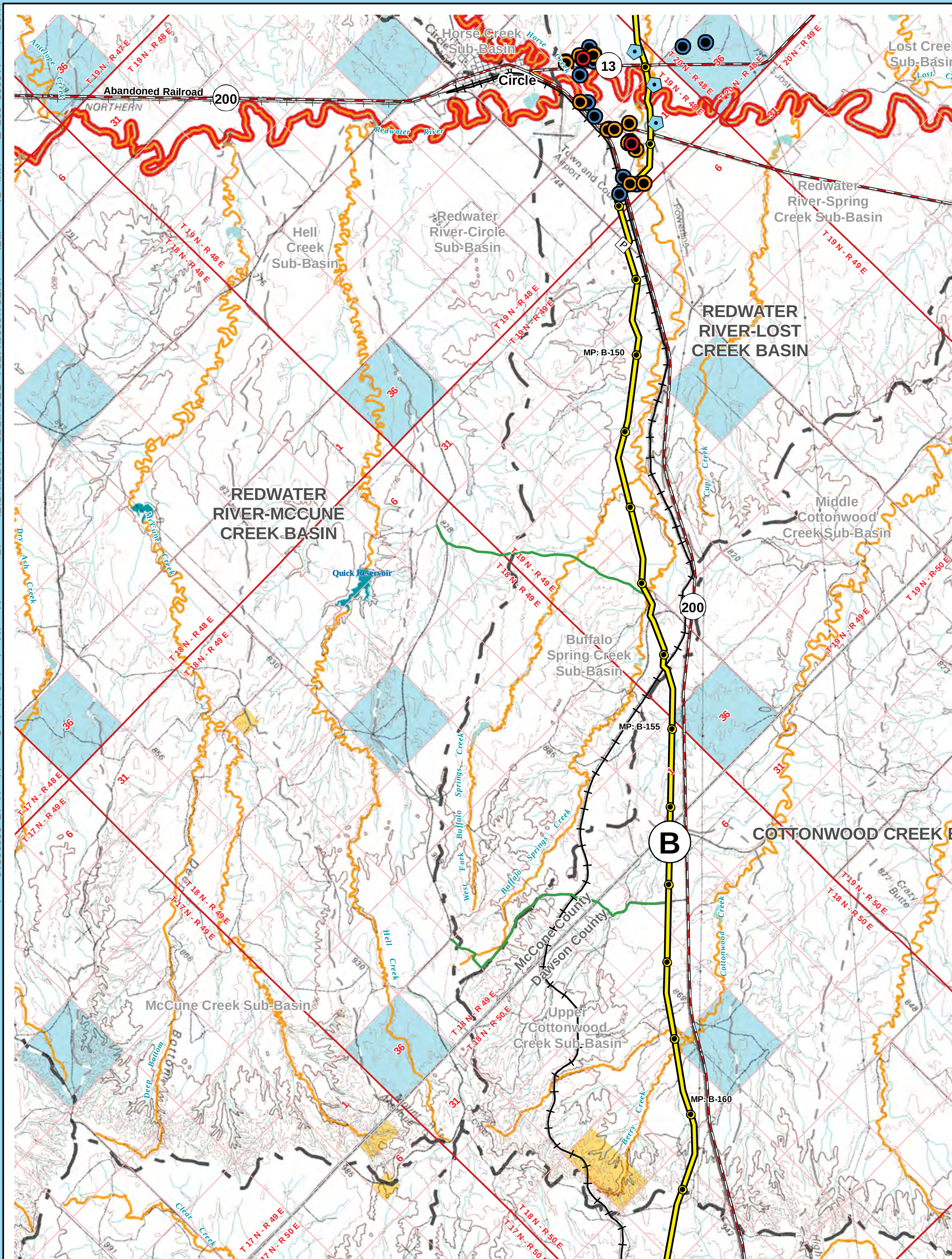

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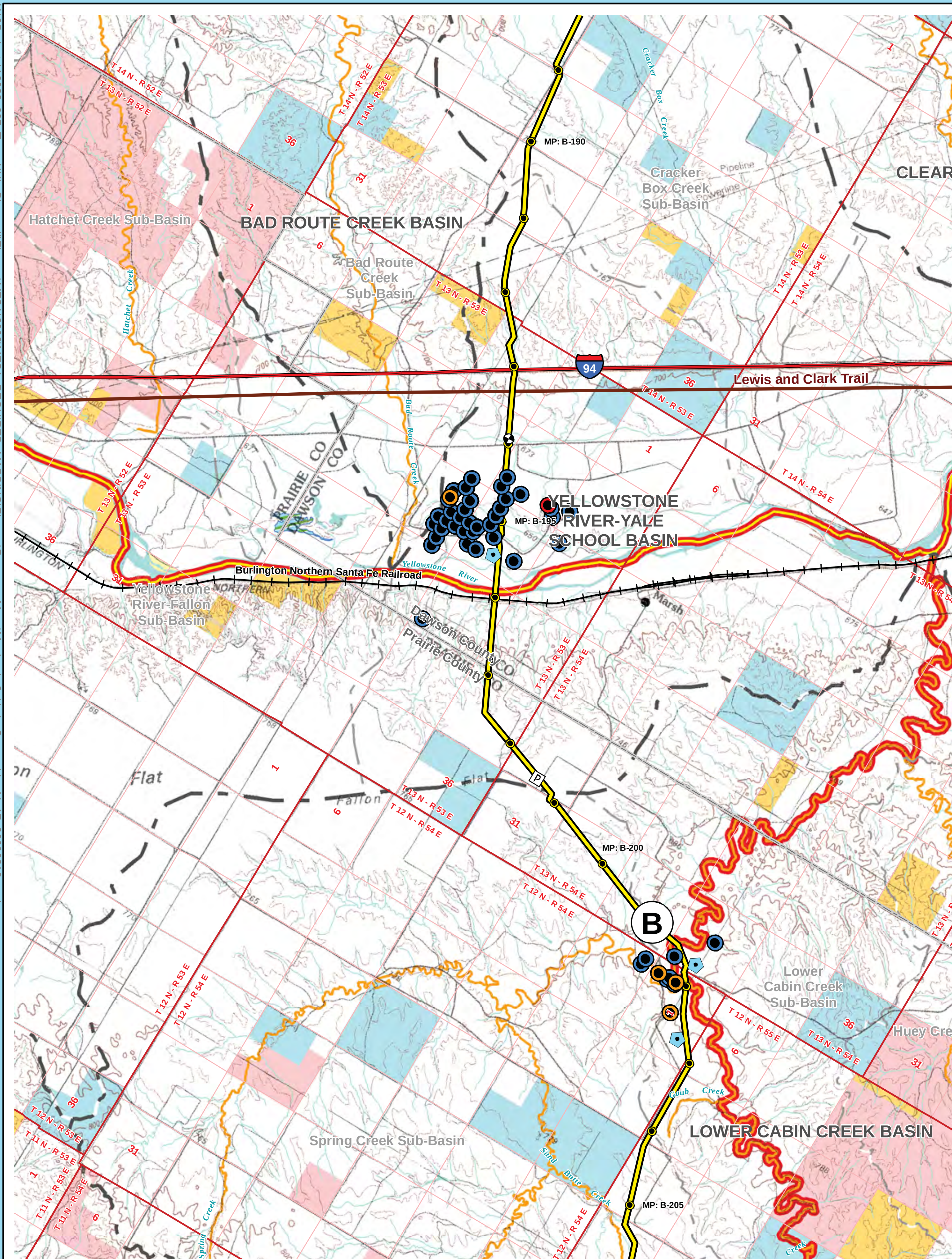

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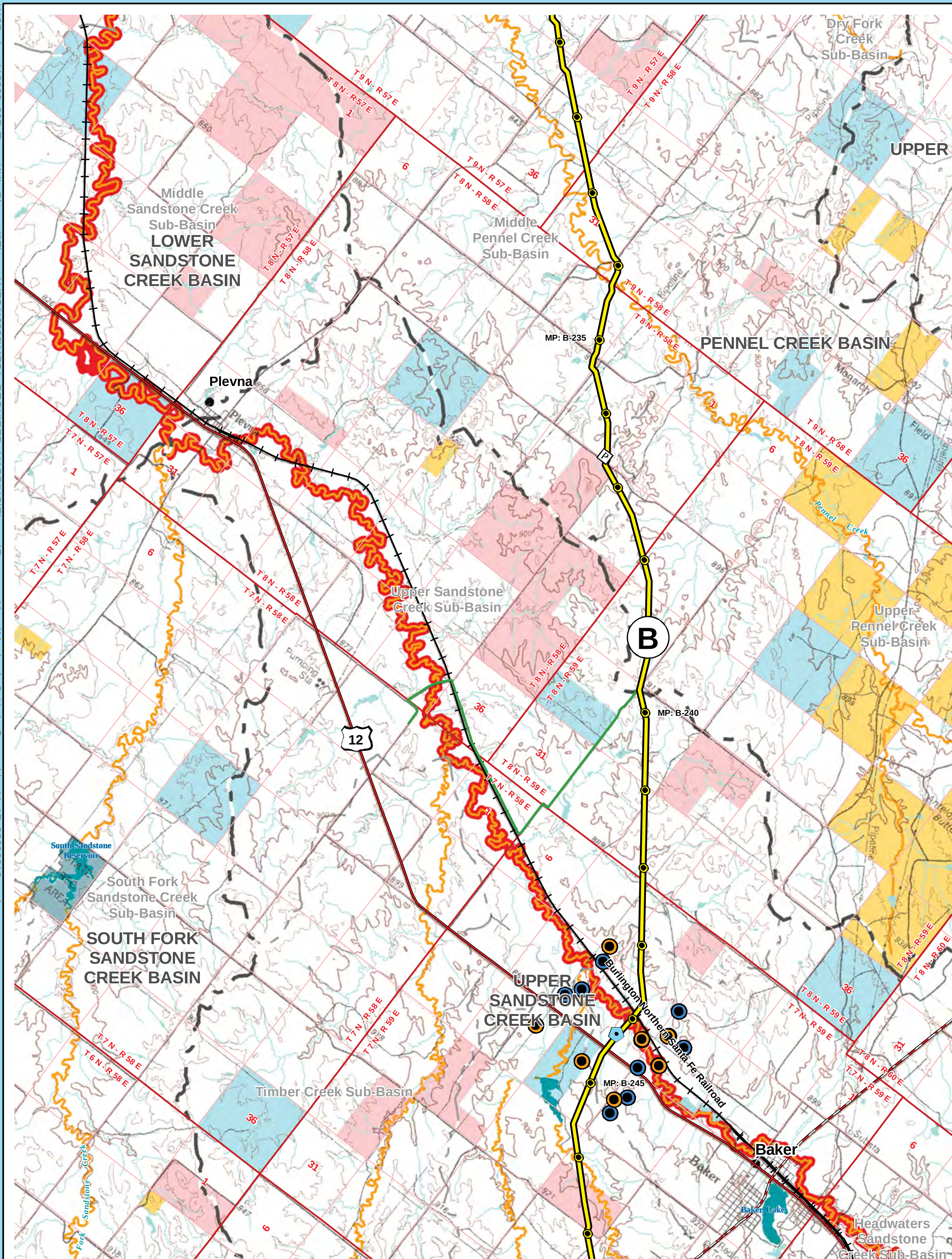

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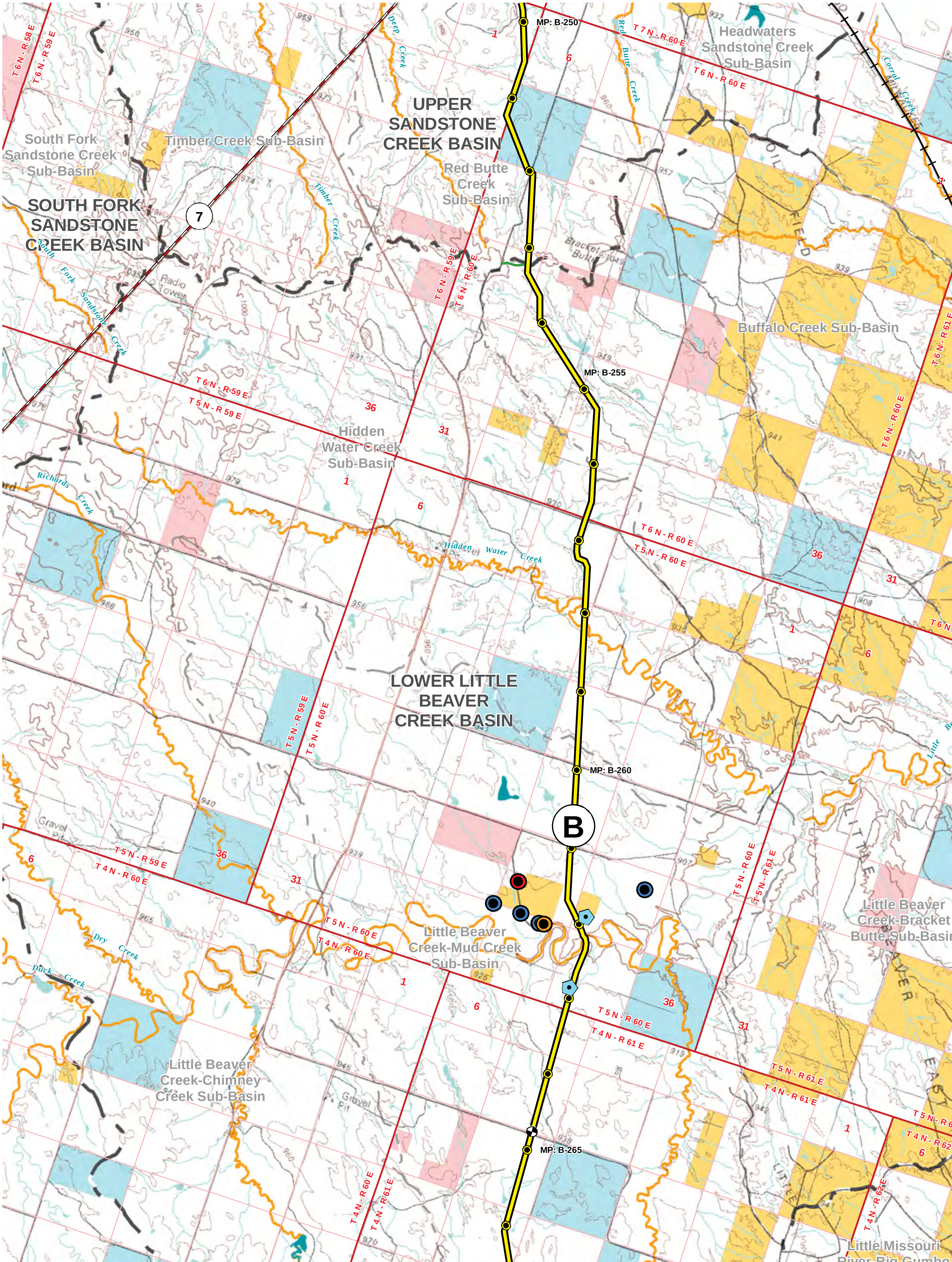

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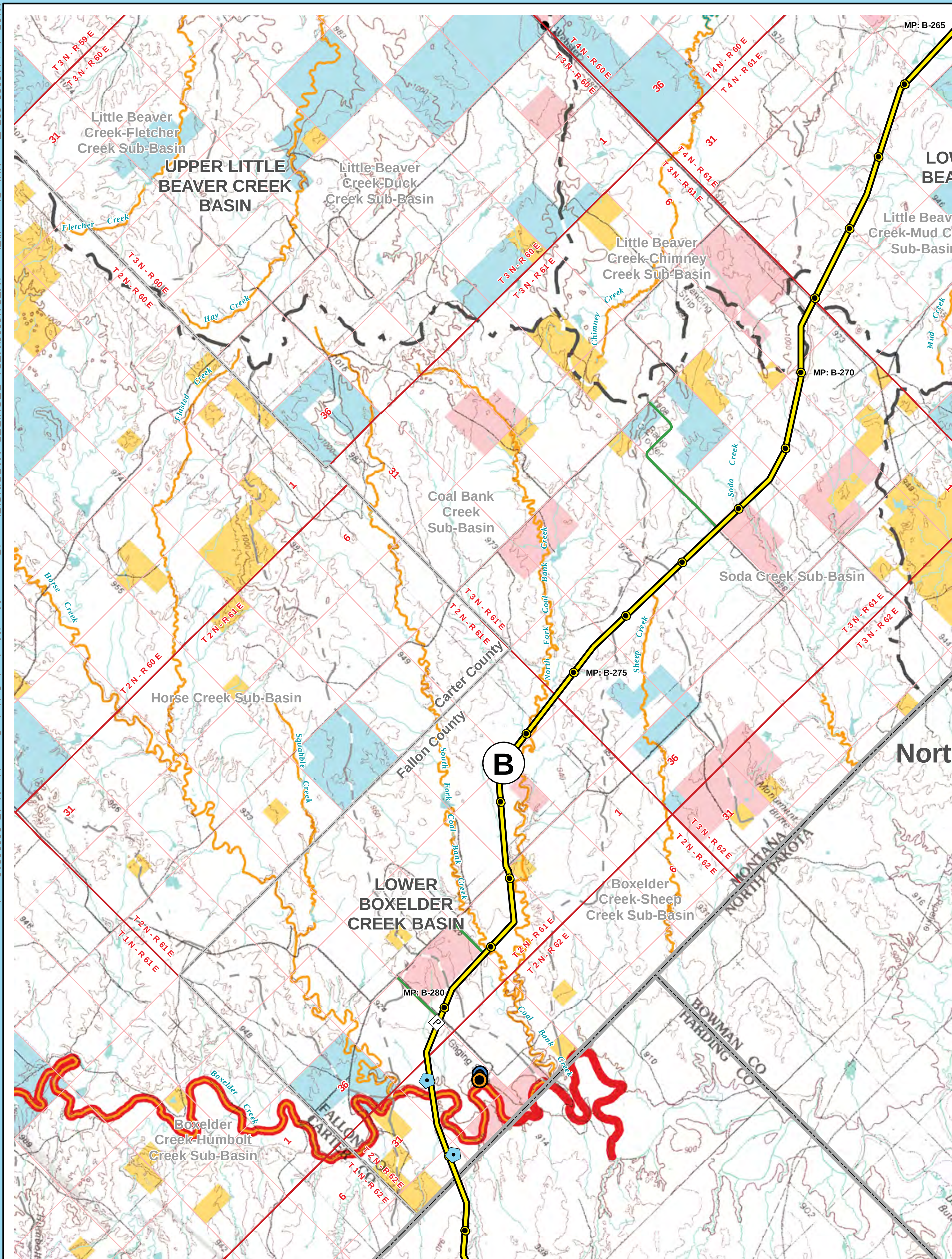

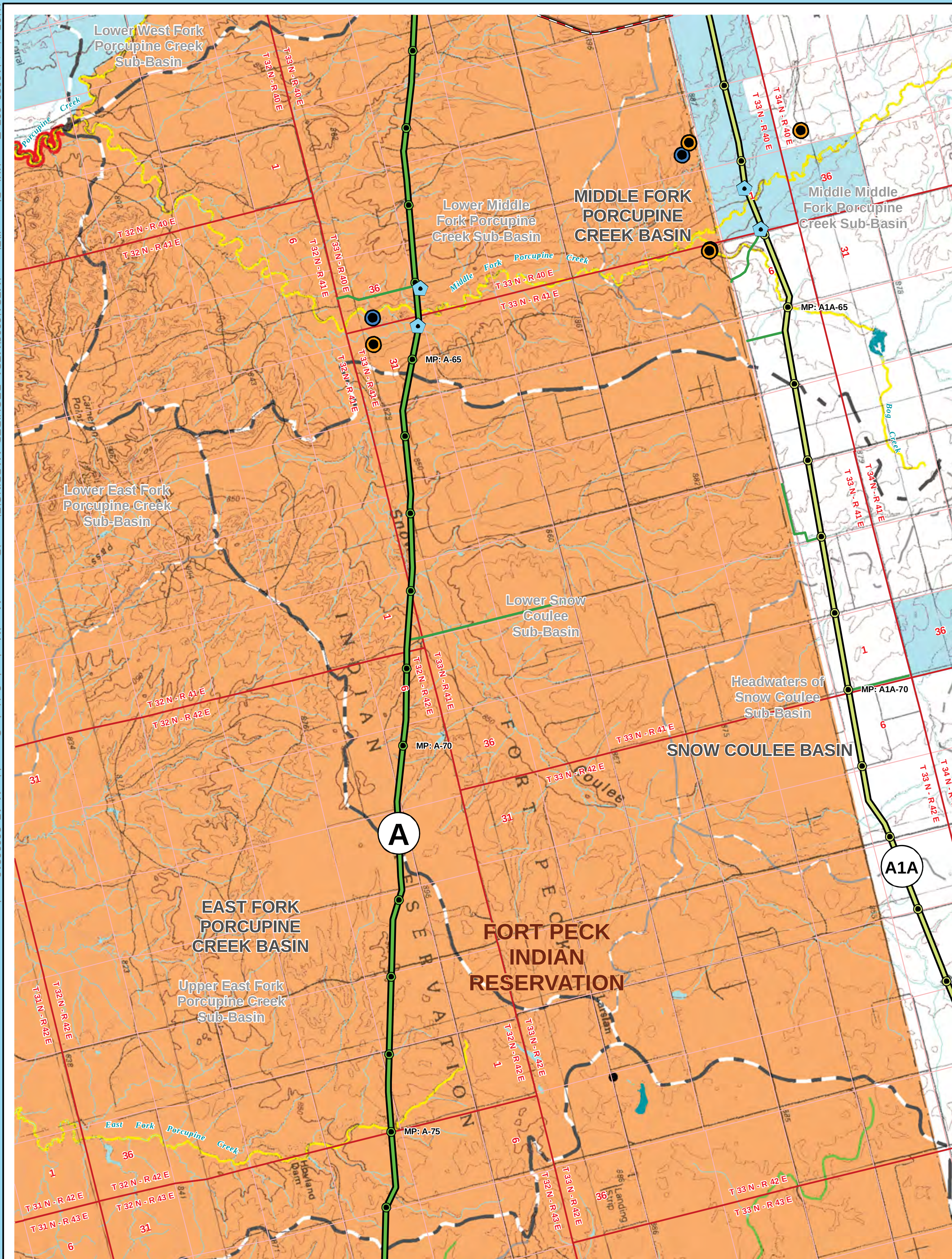

Lower West Fork Porcupine Creek Sub-Basin
Lower Middle Fork Porcupine Creek Sub-Basin
MIDDLE FORK PORCUPINE CREEK BASIN
Middle Middle Fork Porcupine Creek Sub-Basin
Lower East Fork Porcupine Creek Sub-Basin
Lower Snow Coulee Sub-Basin
Headwaters of Snow Coulee Sub-Basin
SNOW COULEE BASIN
EAST FORK PORCUPINE CREEK BASIN
Upper East Fork Porcupine Creek Sub-Basin
FORT PECK INDIAN RESERVATION
Middle Fork Porcupine Creek
East Fork Porcupine Creek
Bog Creek
MP: A-65
MP: A-70
MP: A-75
MP: A1A-65
MP: A1A-70
A
A1A
T 32 N - R 40 E
T 33 N - R 40 E
T 32 N - R 41 E
T 33 N - R 41 E
T 34 N - R 40 E
T 34 N - R 41 E
T 32 N - R 42 E
T 33 N - R 42 E
T 31 N - R 42 E
T 31 N - R 43 E
T 32 N - R 43 E
T 33 N - R 43 E

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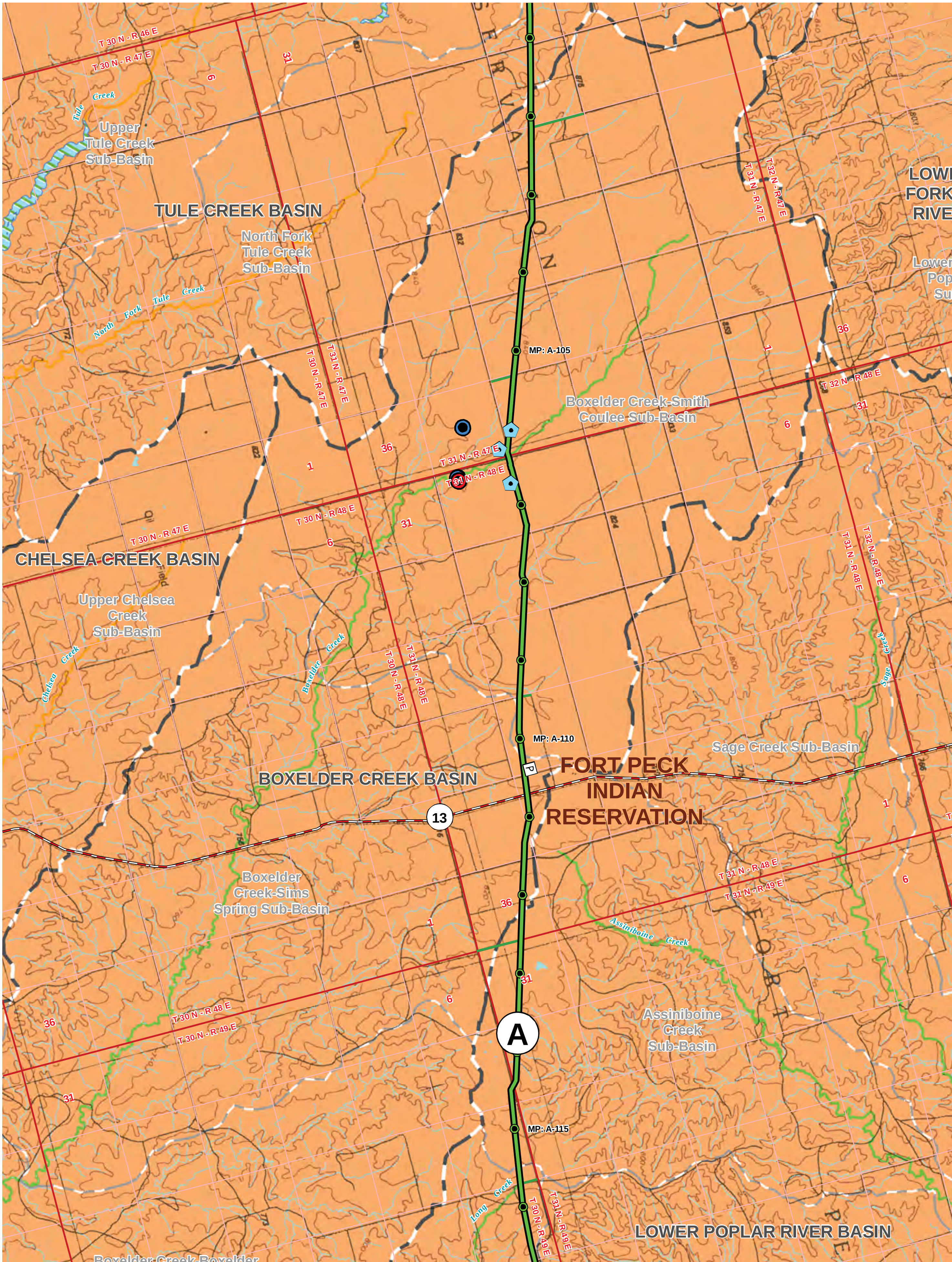

BOXELDER CREEK BASIN
Long Creek Sub-Basin
Badger Creek Sub-Basin
Horseshoe Lake
Poplar River-Short Creek Sub-Basin
Poplar River-Swank Coulee Sub-Basin
LOWER POPLAR RIVER BASIN
Poplar River-Kirns Coulee Sub-Basin
Hay Creek Sub-Basin
Poplar River-Culbertson Creek Sub-Basin
Geddart Lake
FORT PECK INDIAN RESERVATION
Geddart Lake Sub-Basin
Upper Lake Creek Sub-Basin
Spring Creek Sub-Basin
MP: A-125
MP: A-130
MP: A-135
A
Long Creek
Badger Creek
Culbertson Creek
Poplar River
Lake Creek
T 29 N - R 50 E
T 30 N - R 50 E
T 30 N - R 51 E
T 29 N - R 51 E
T 31 N - R 50 E
T 31 N - R 51 E
T 30 N - R 52 E
T 29 N - R 52 E
T 31 N - R 52 E

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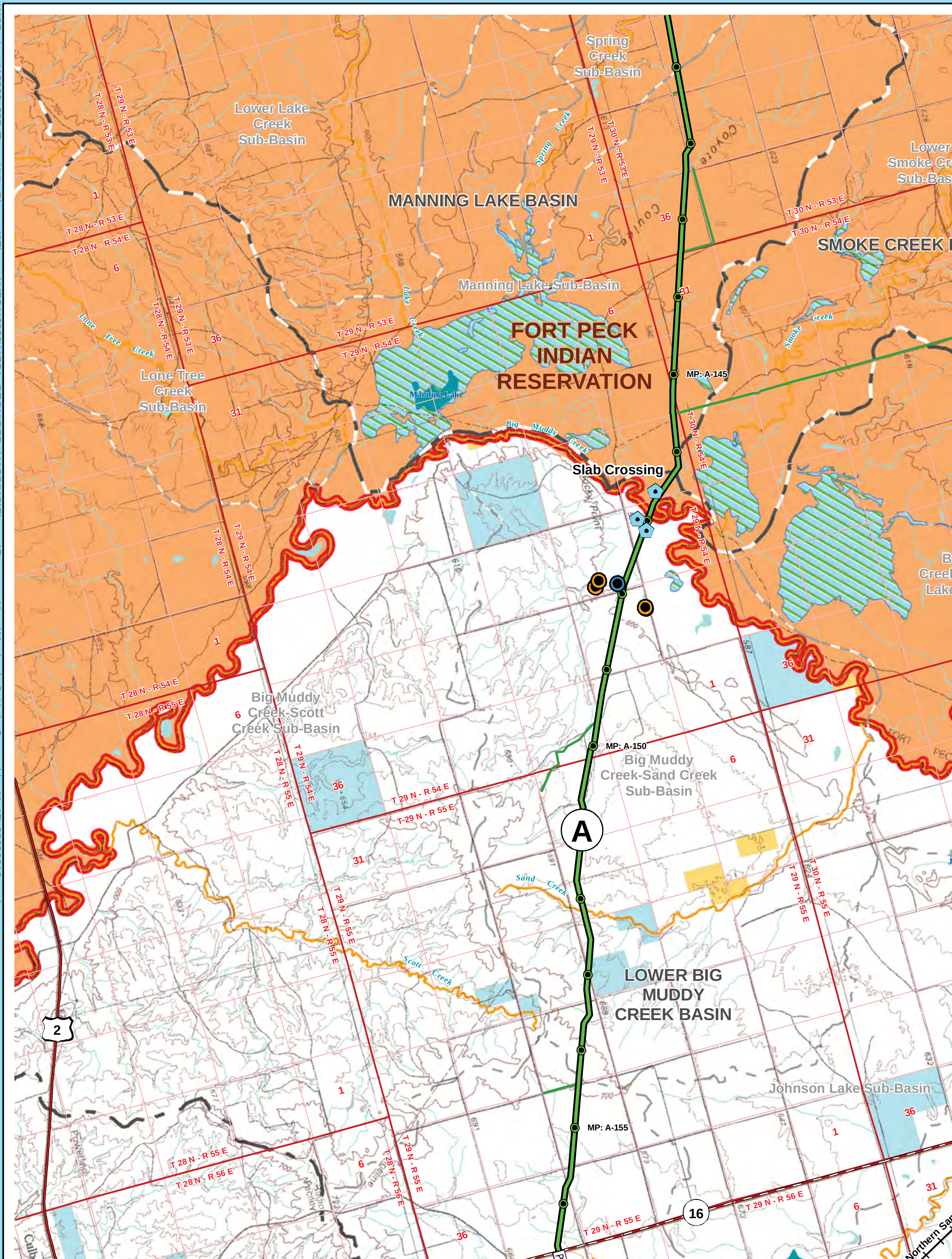

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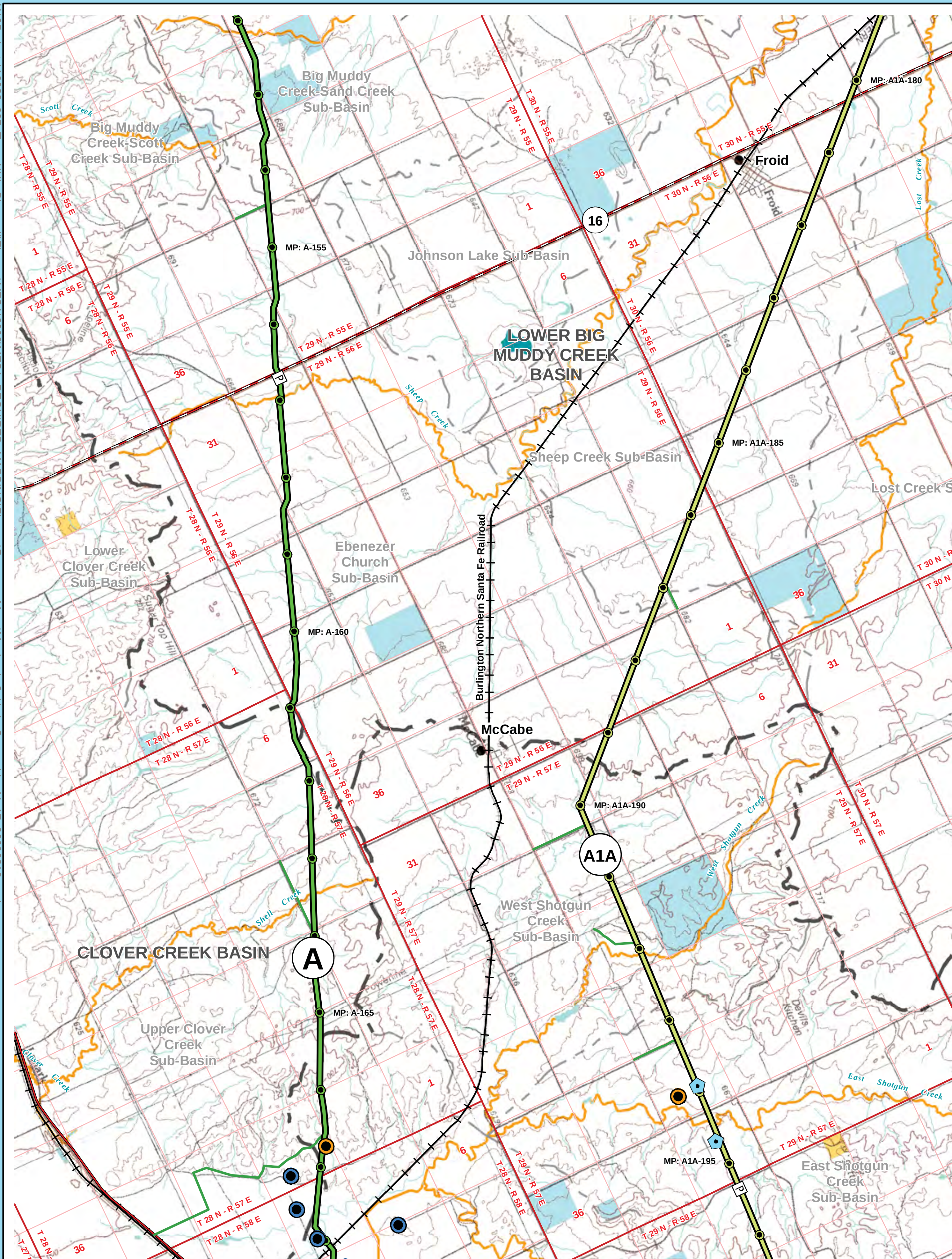

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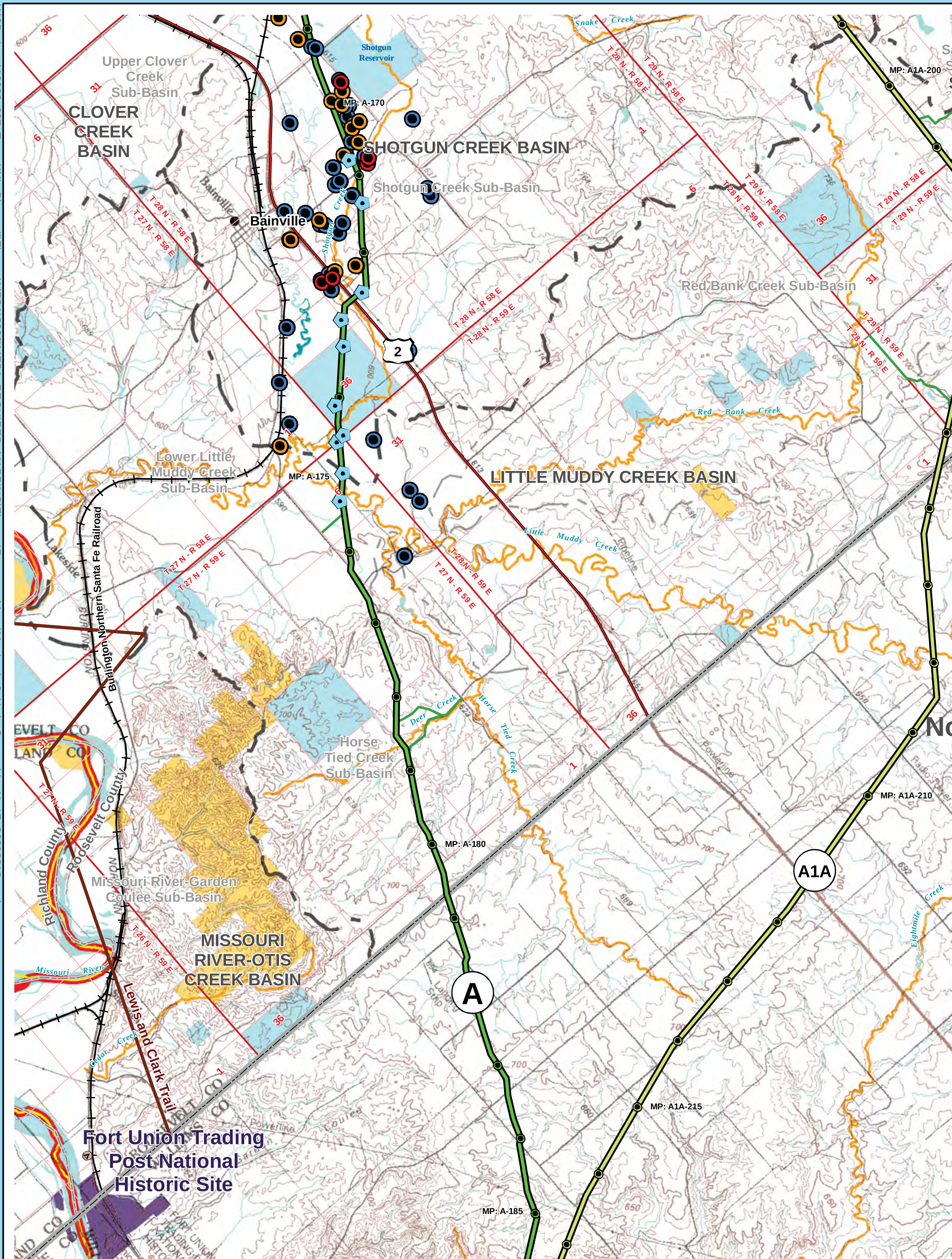

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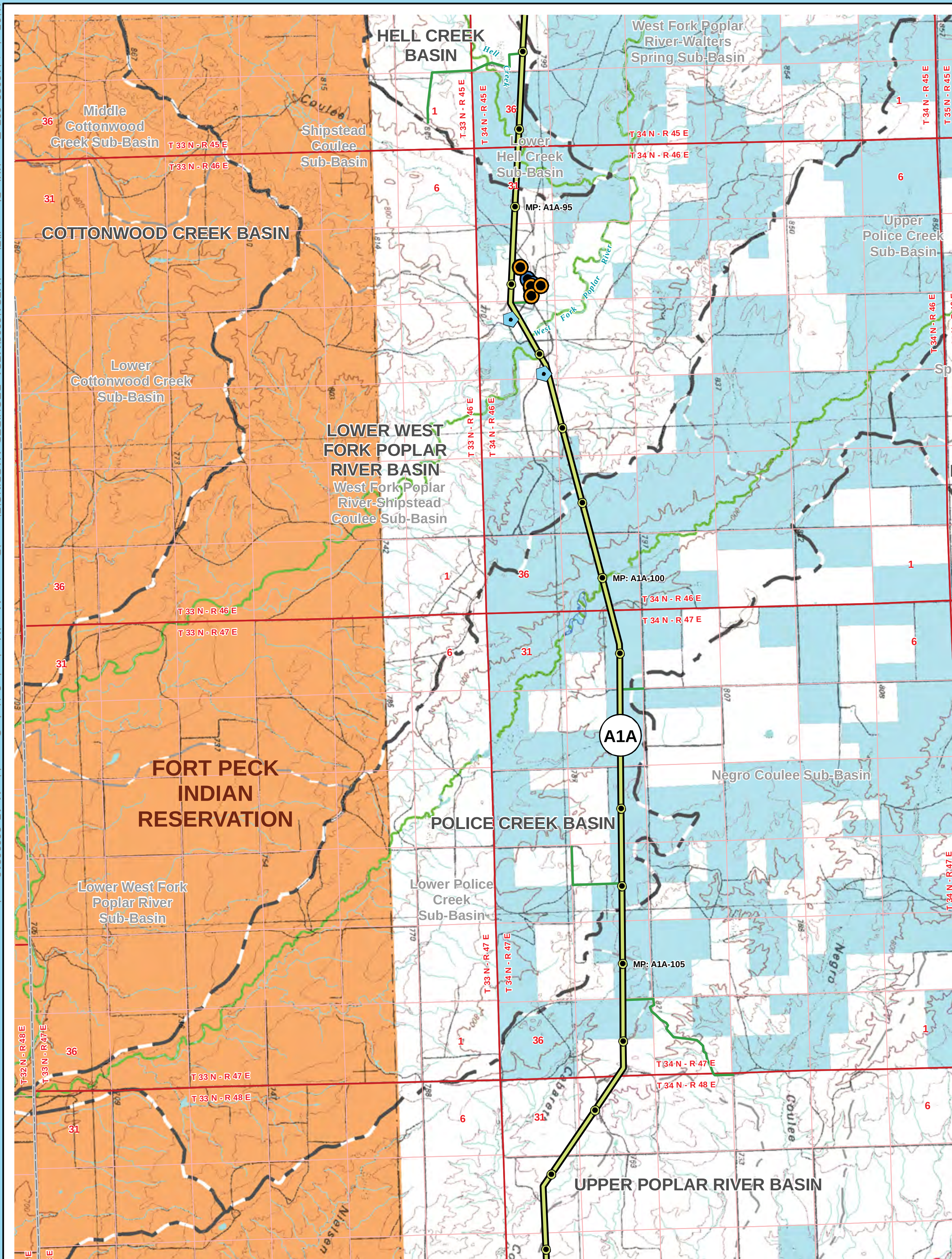

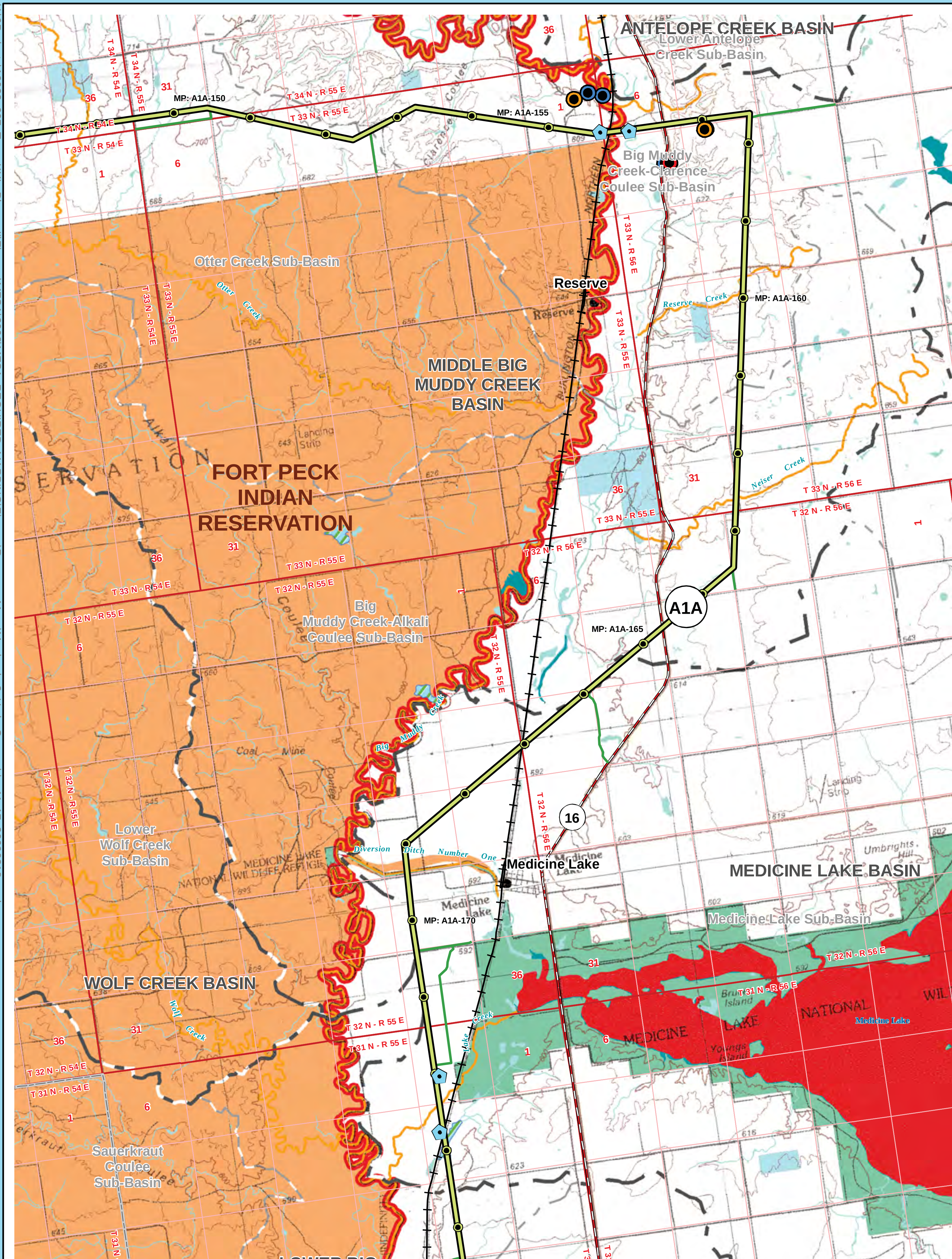

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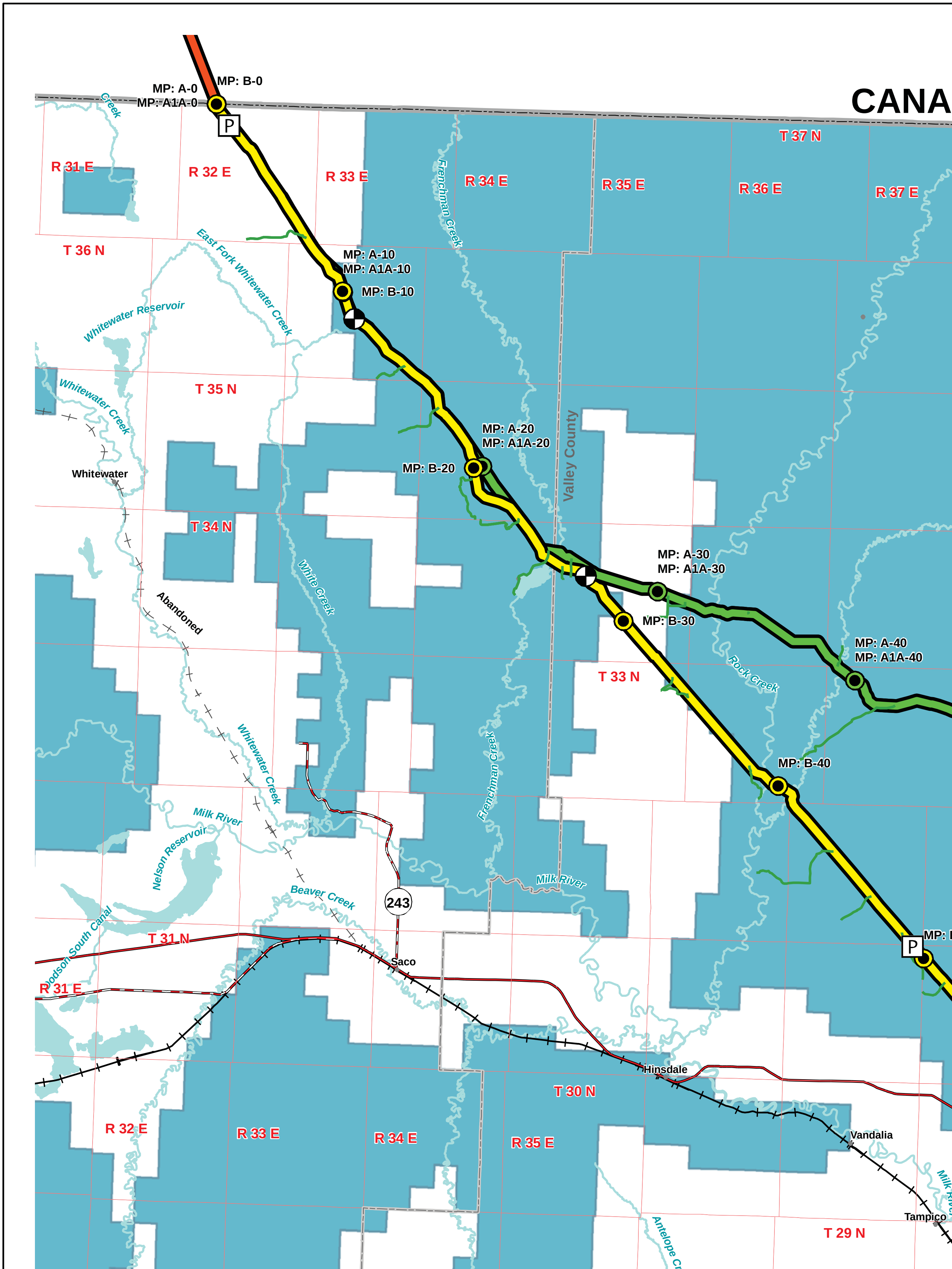

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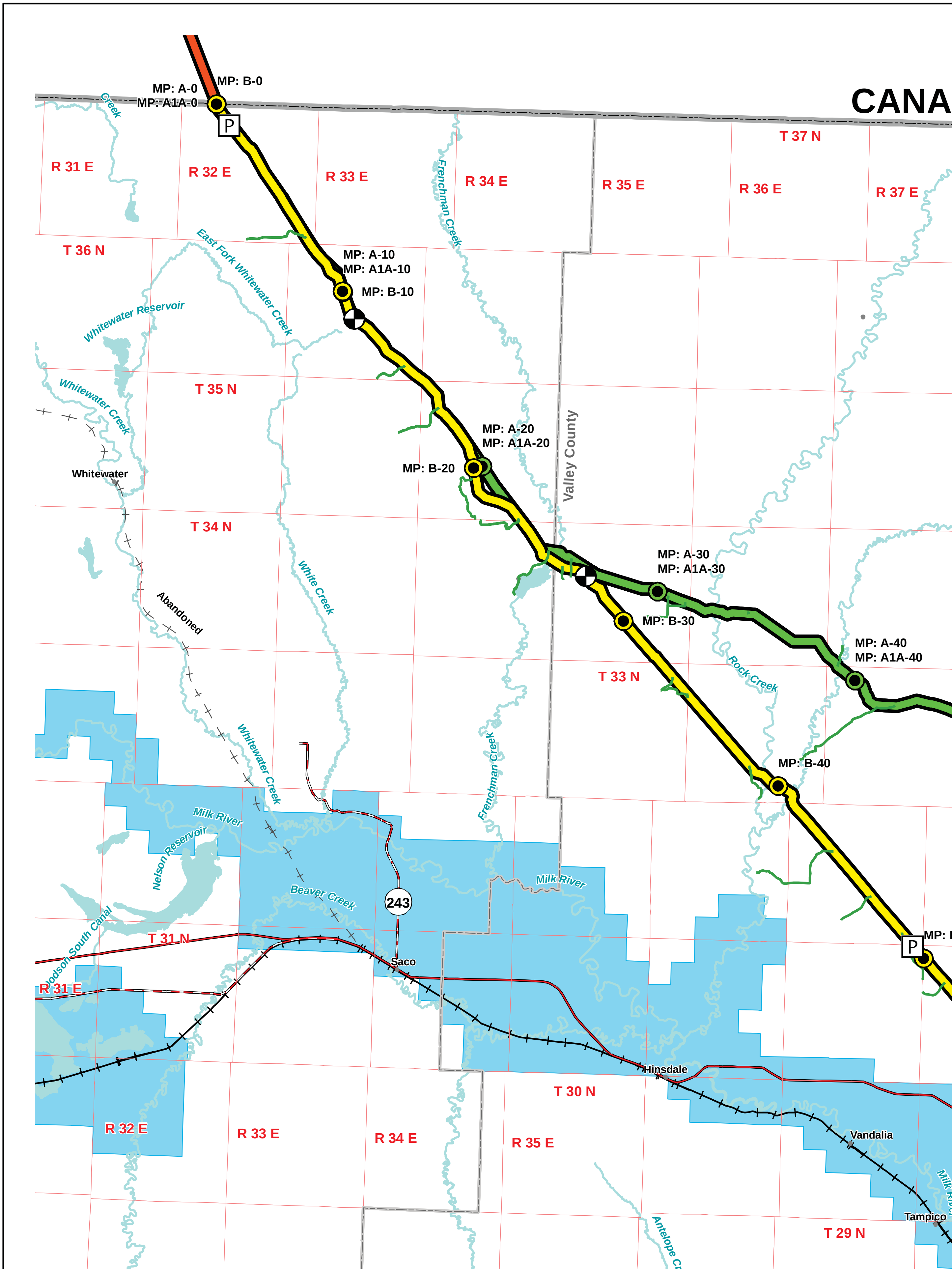

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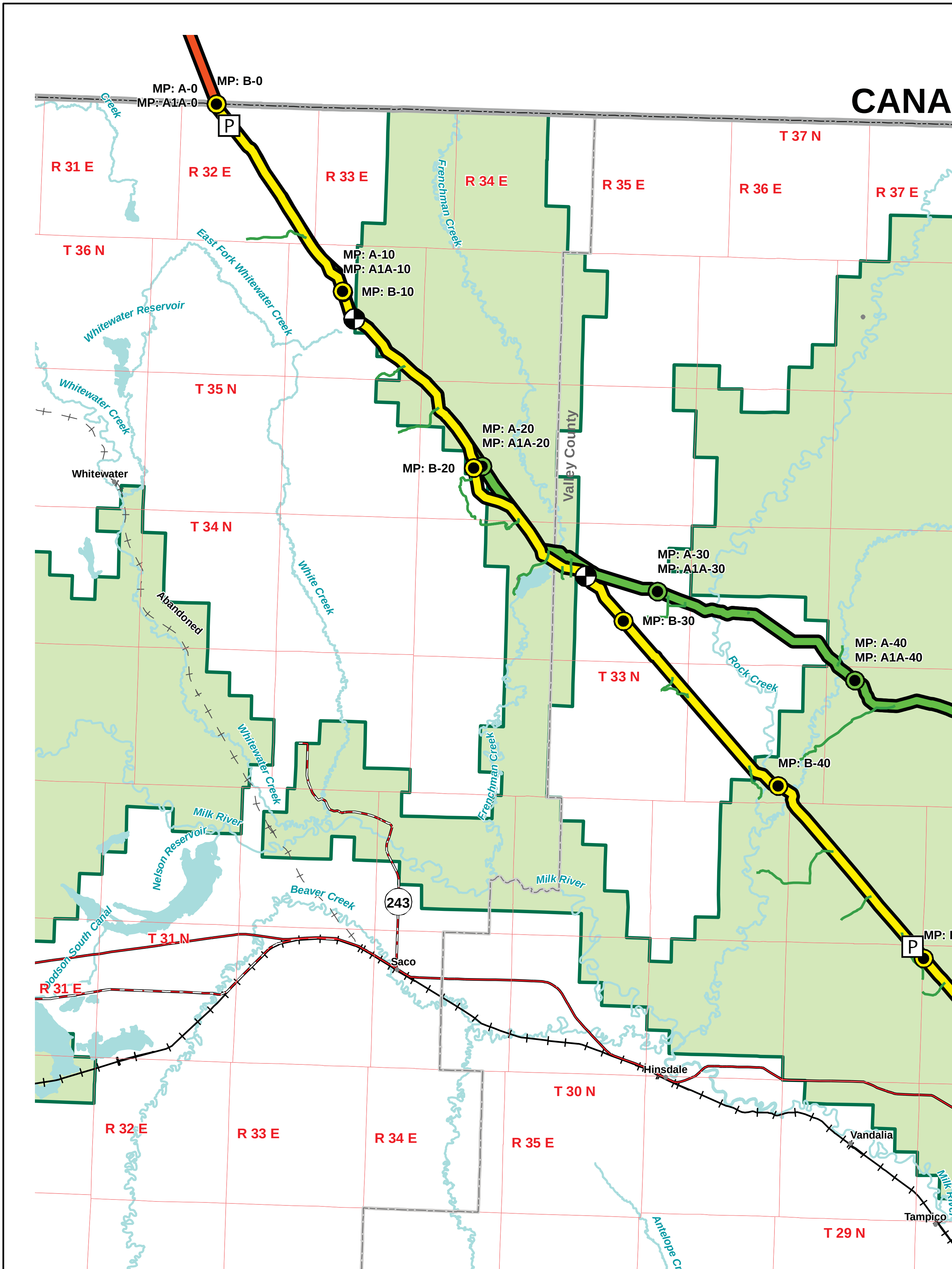

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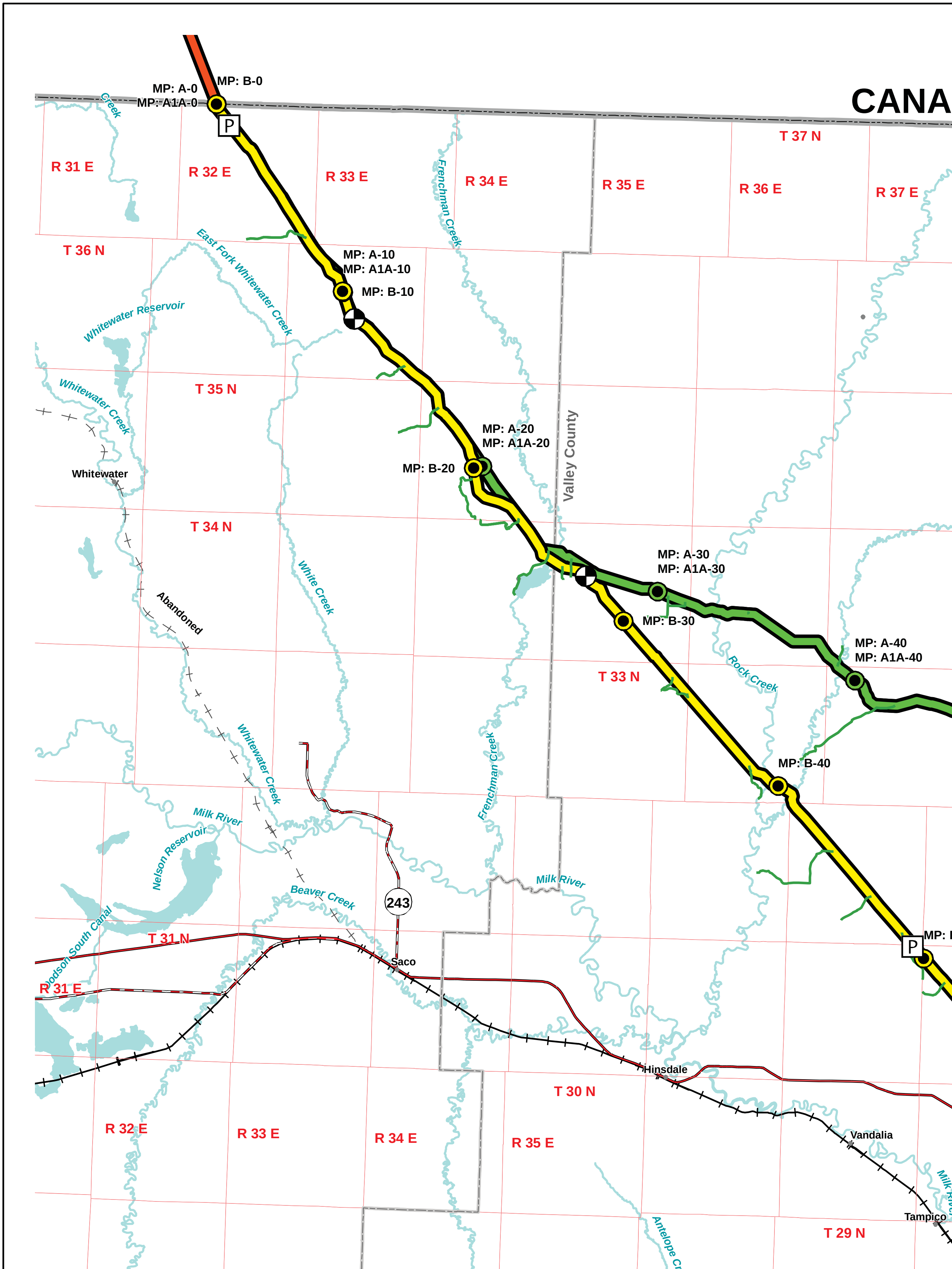

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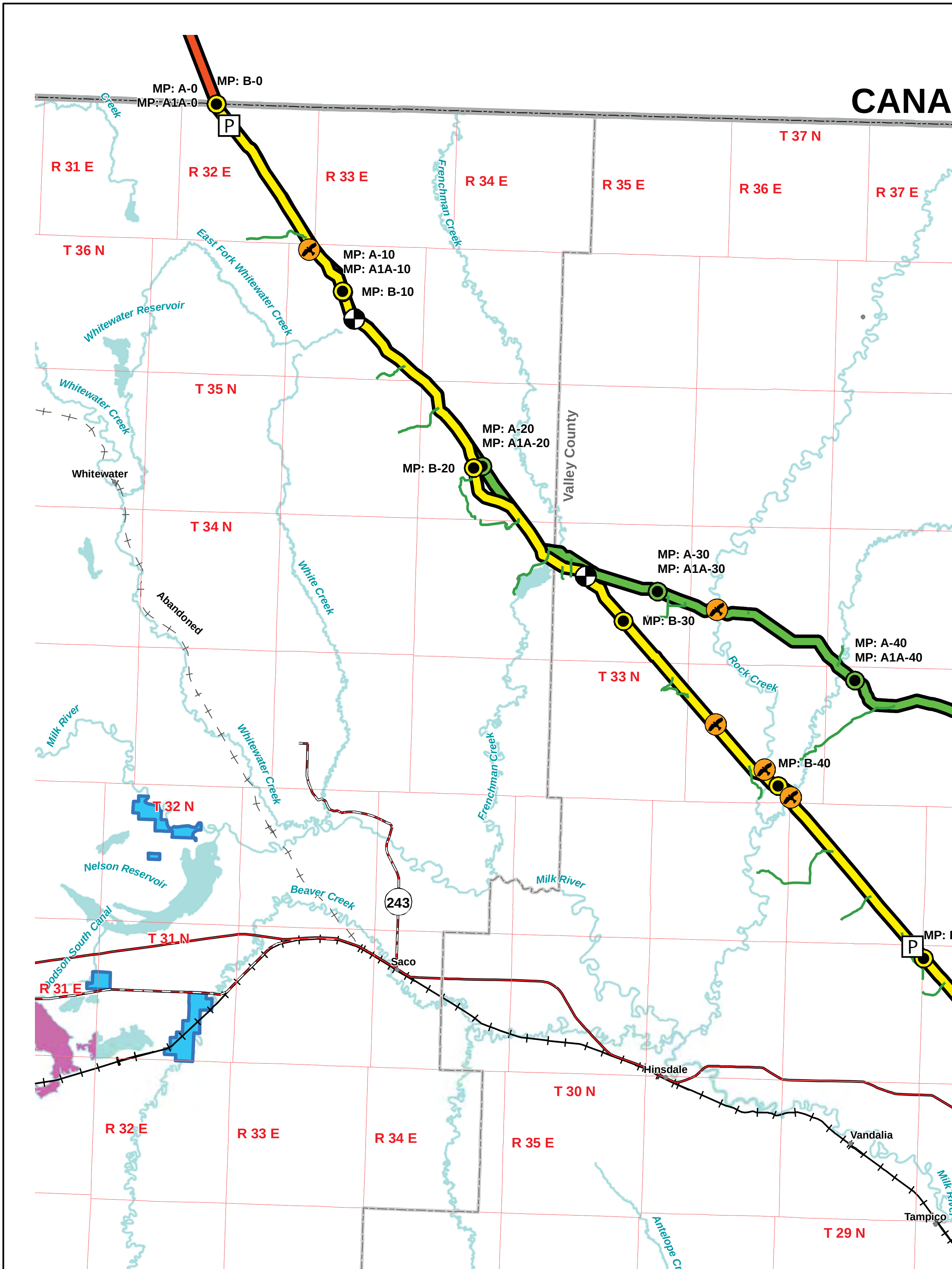

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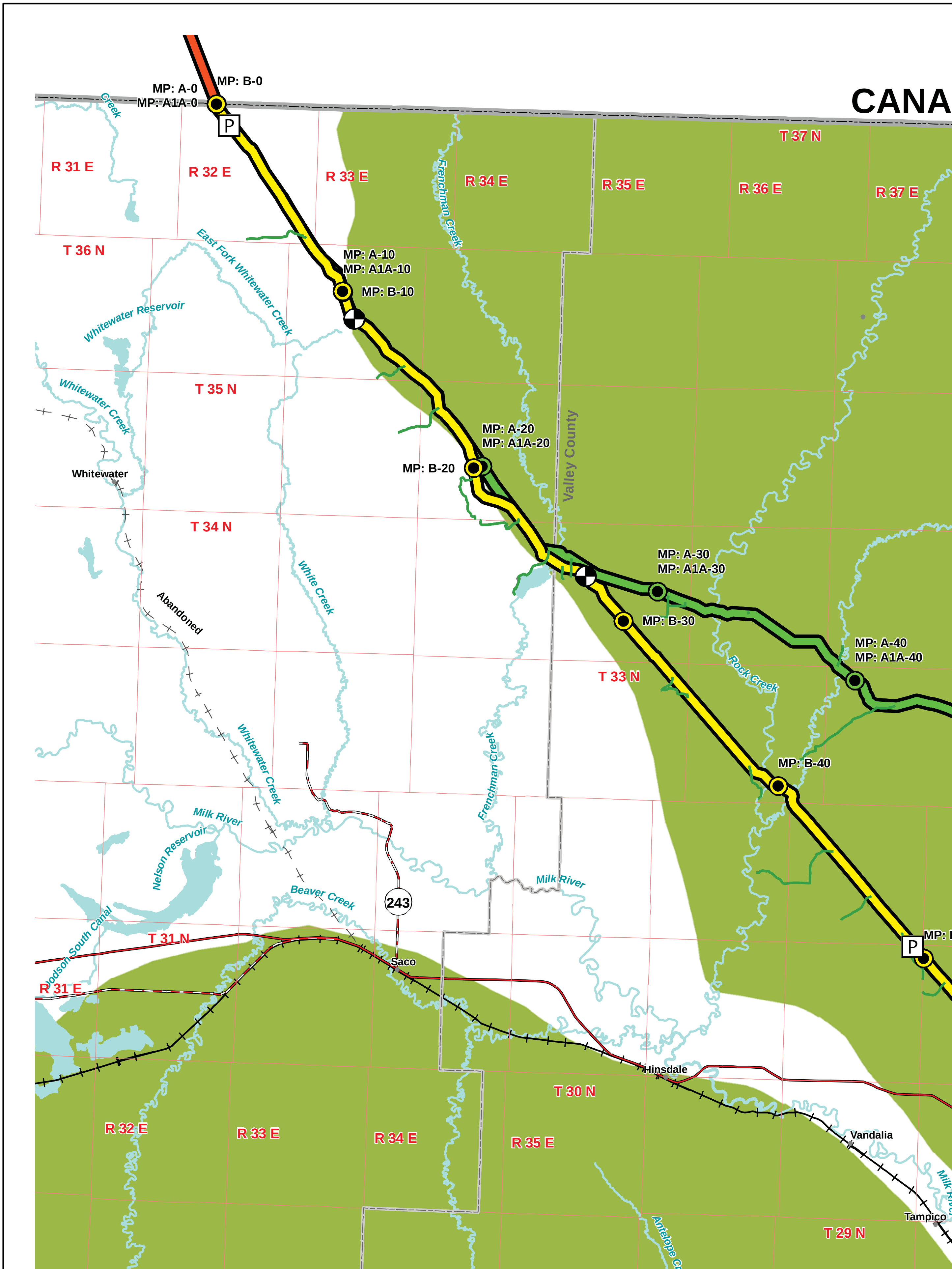

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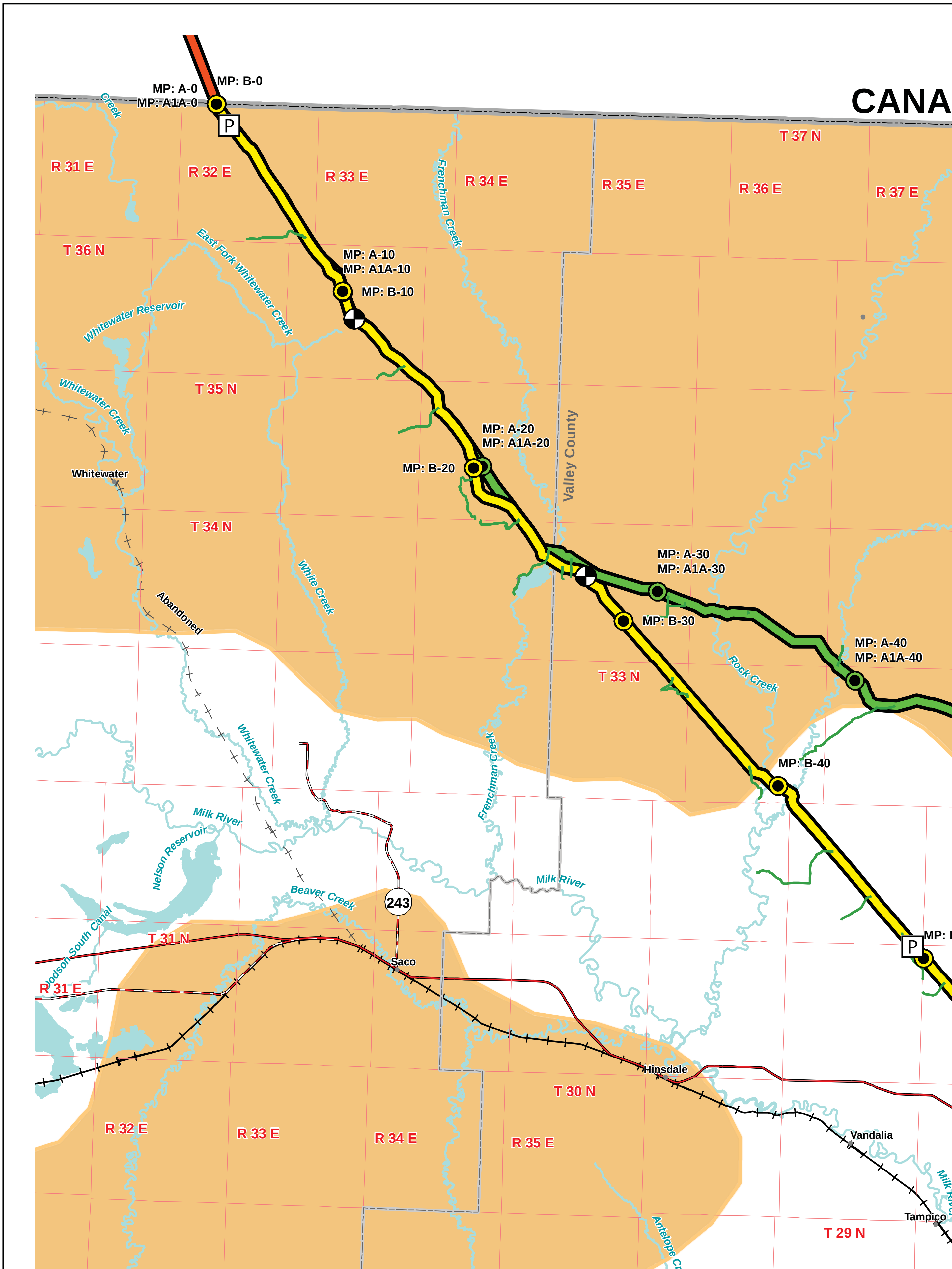

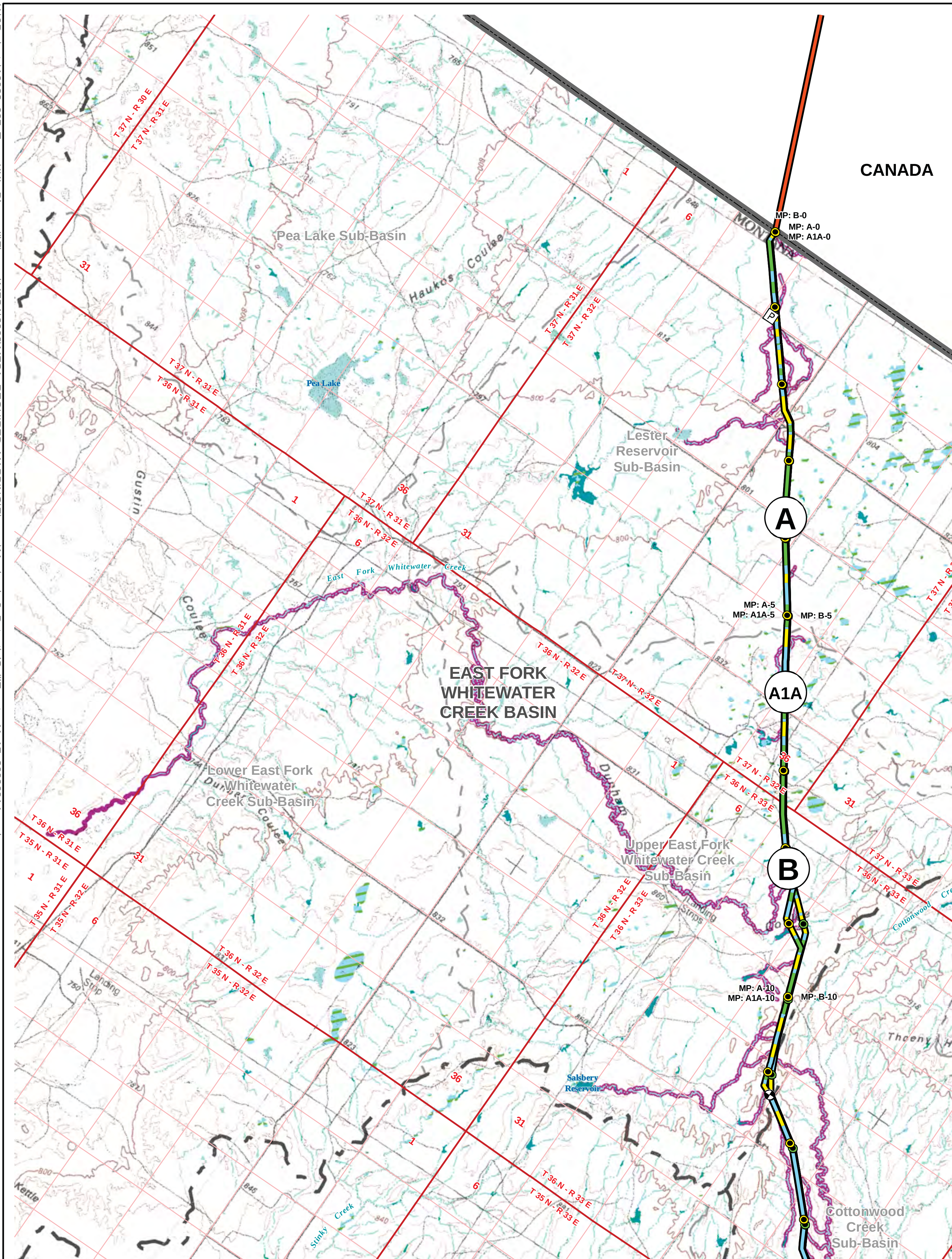

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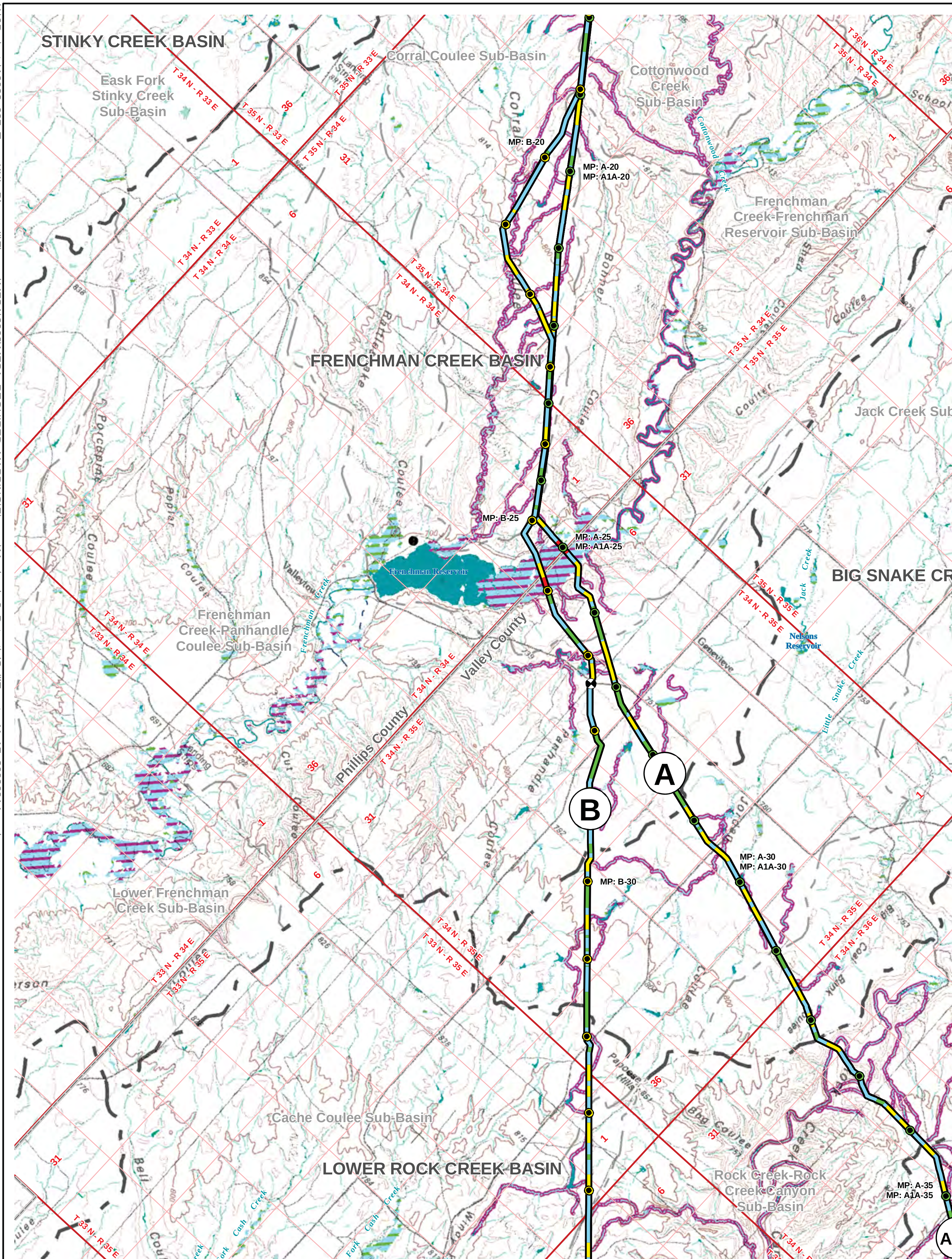

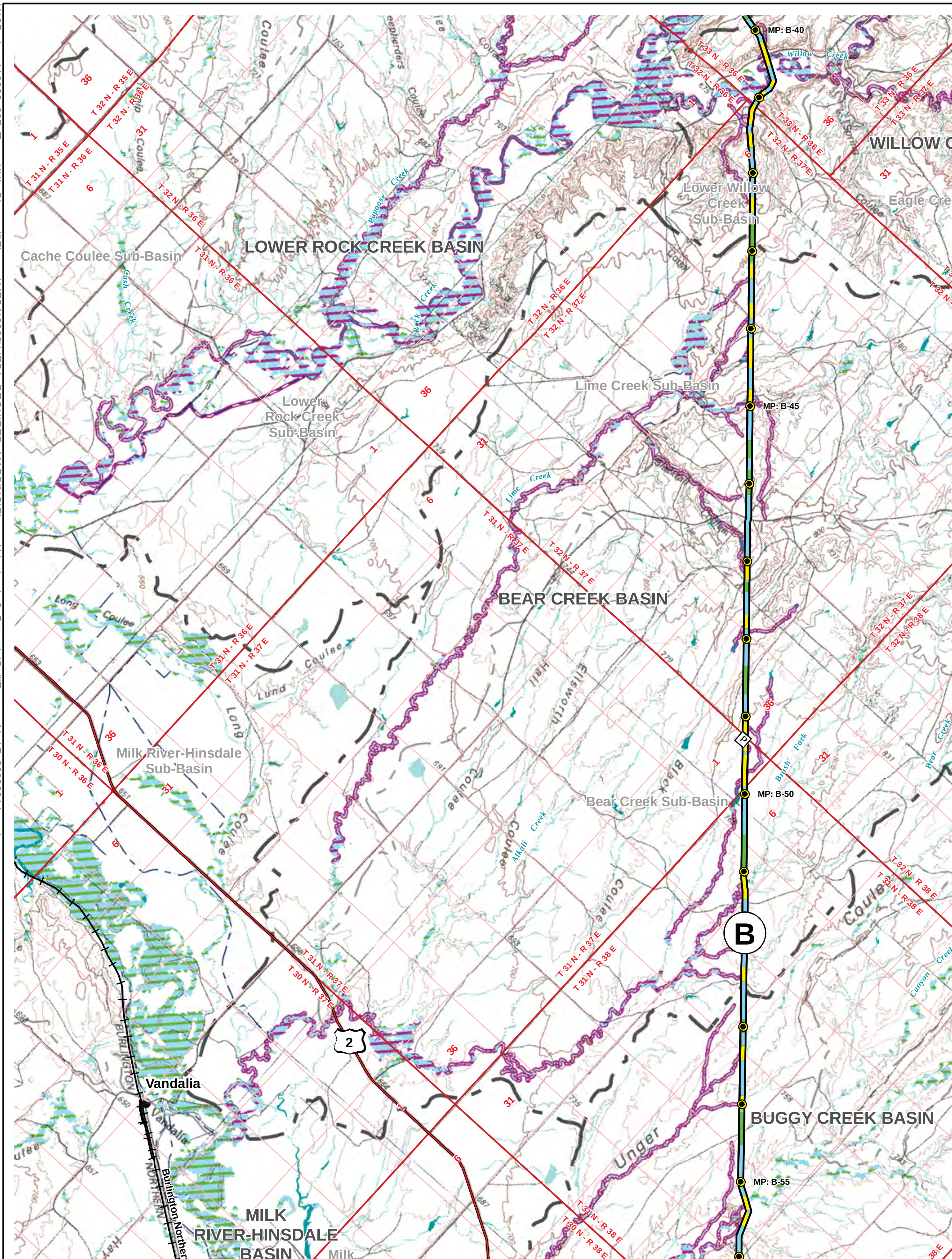

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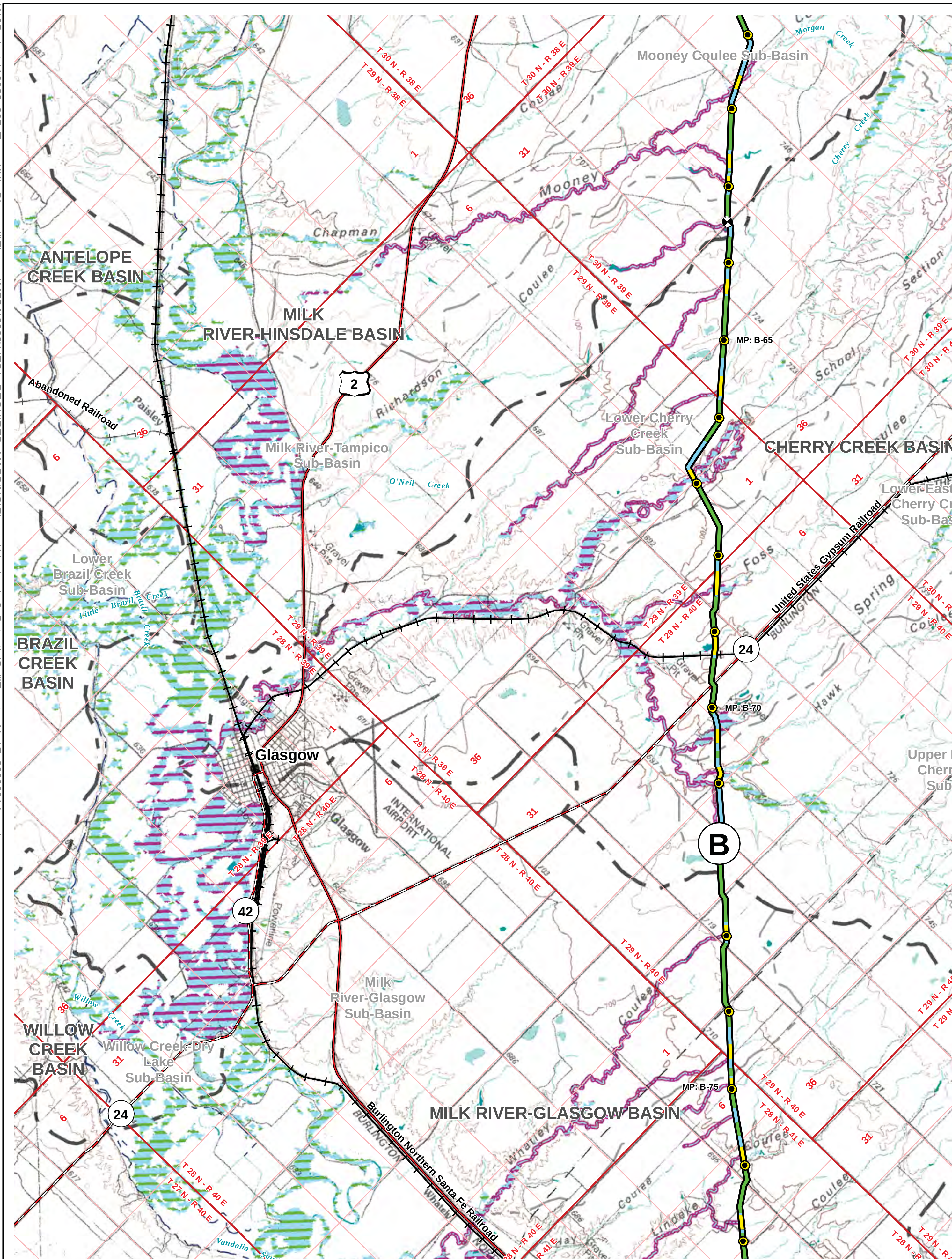

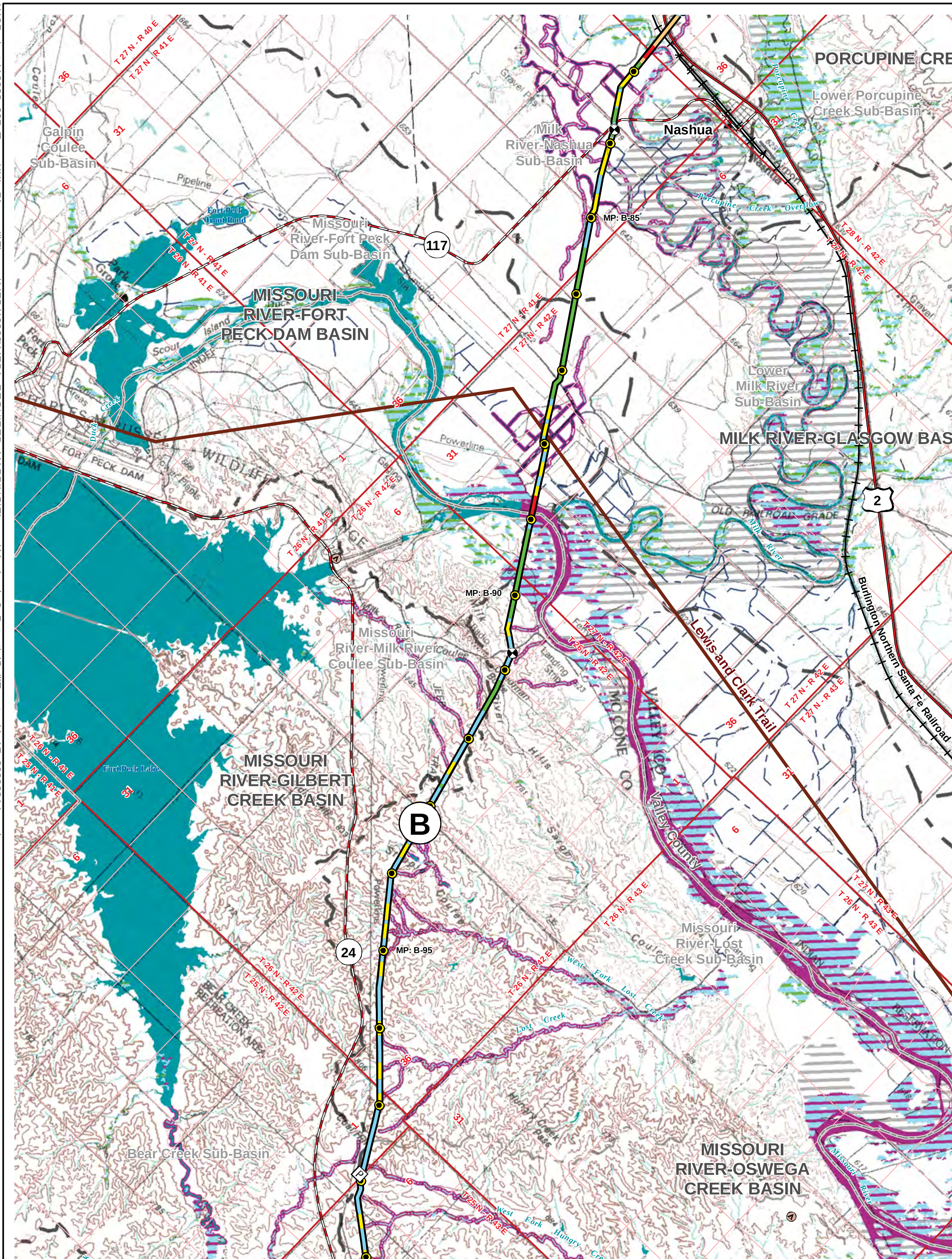

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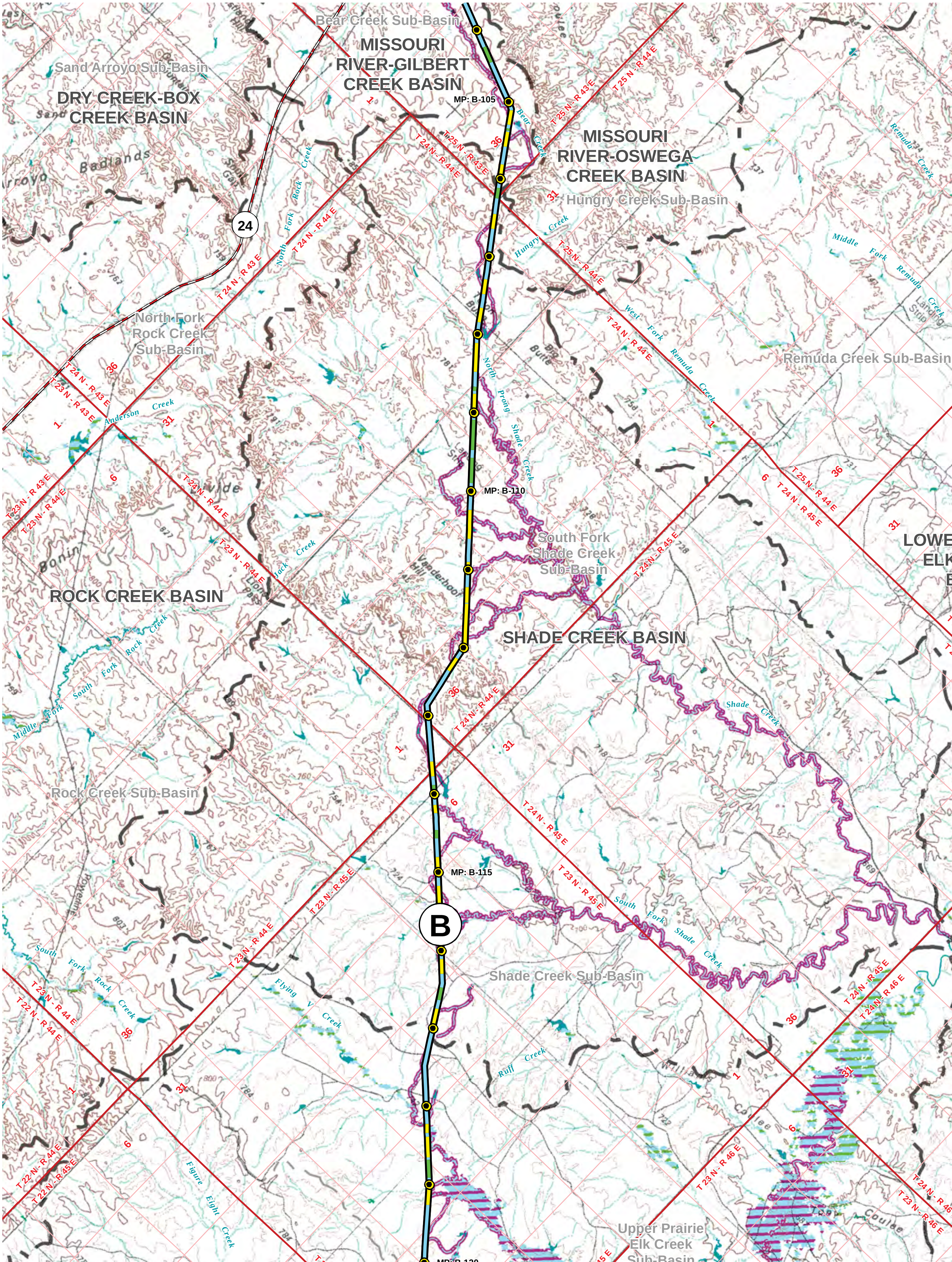

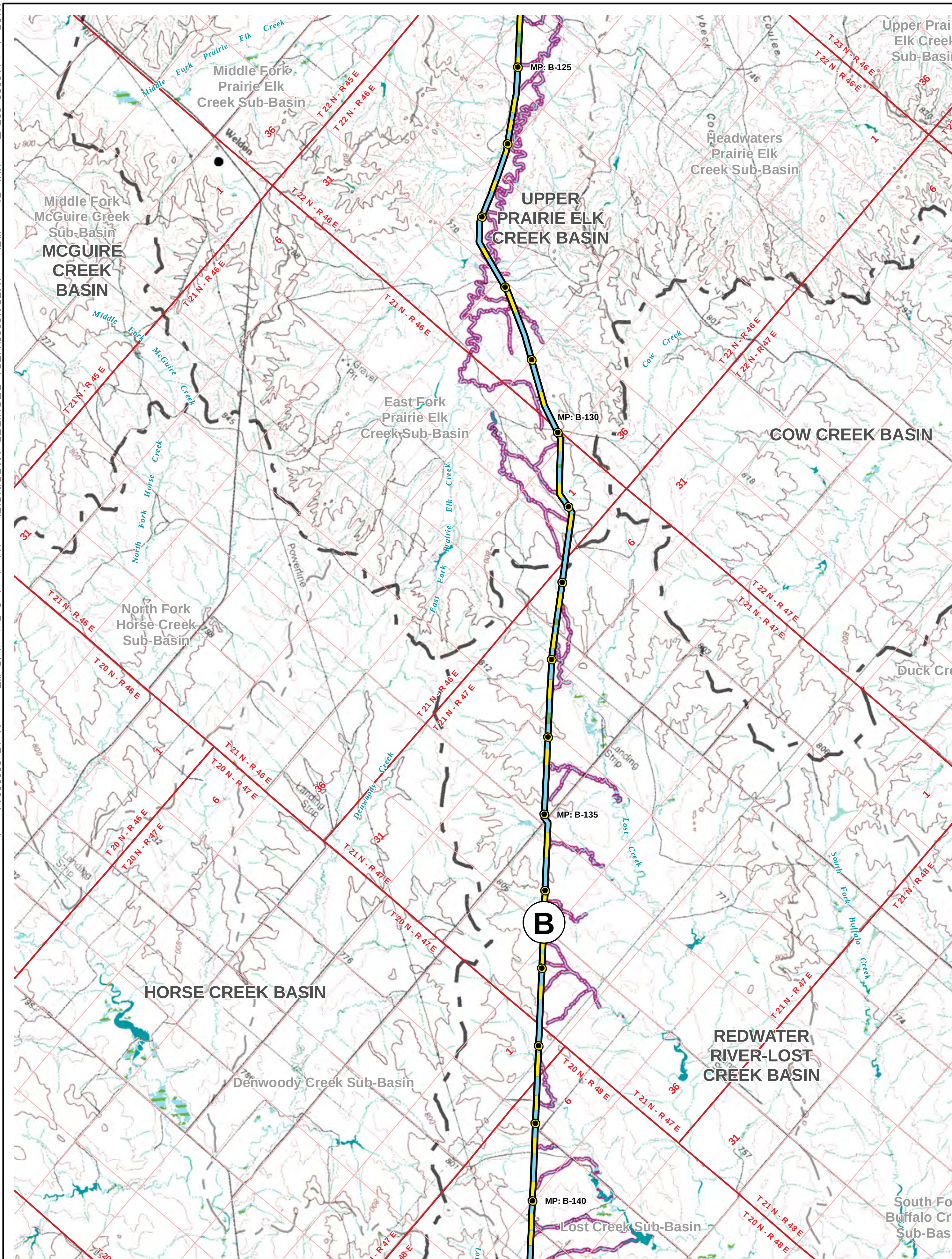
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Middle Fork Prairie Elk Creek Sub-Basin
Middle Fork McGuire Creek Sub-Basin
MCGUIRE CREEK BASIN
UPPER PRAIRIE ELK CREEK BASIN
Headwaters Prairie Elk Creek Sub-Basin
Upper Prairie Elk Creek Sub-Basin
East Fork Prairie Elk Creek Sub-Basin
COW CREEK BASIN
North Fork Horse Creek Sub-Basin
Duck Creek
HORSE CREEK BASIN
Denwoody Creek Sub-Basin
REDWATER RIVER-LOST CREEK BASIN
Lost Creek Sub-Basin
South Fork Buffalo Creek Sub-Basin
MP: B-125
MP: B-130
MP: B-135
MP: B-140
B
Weldon
Gravel Pit
Powerline
Landing Strip

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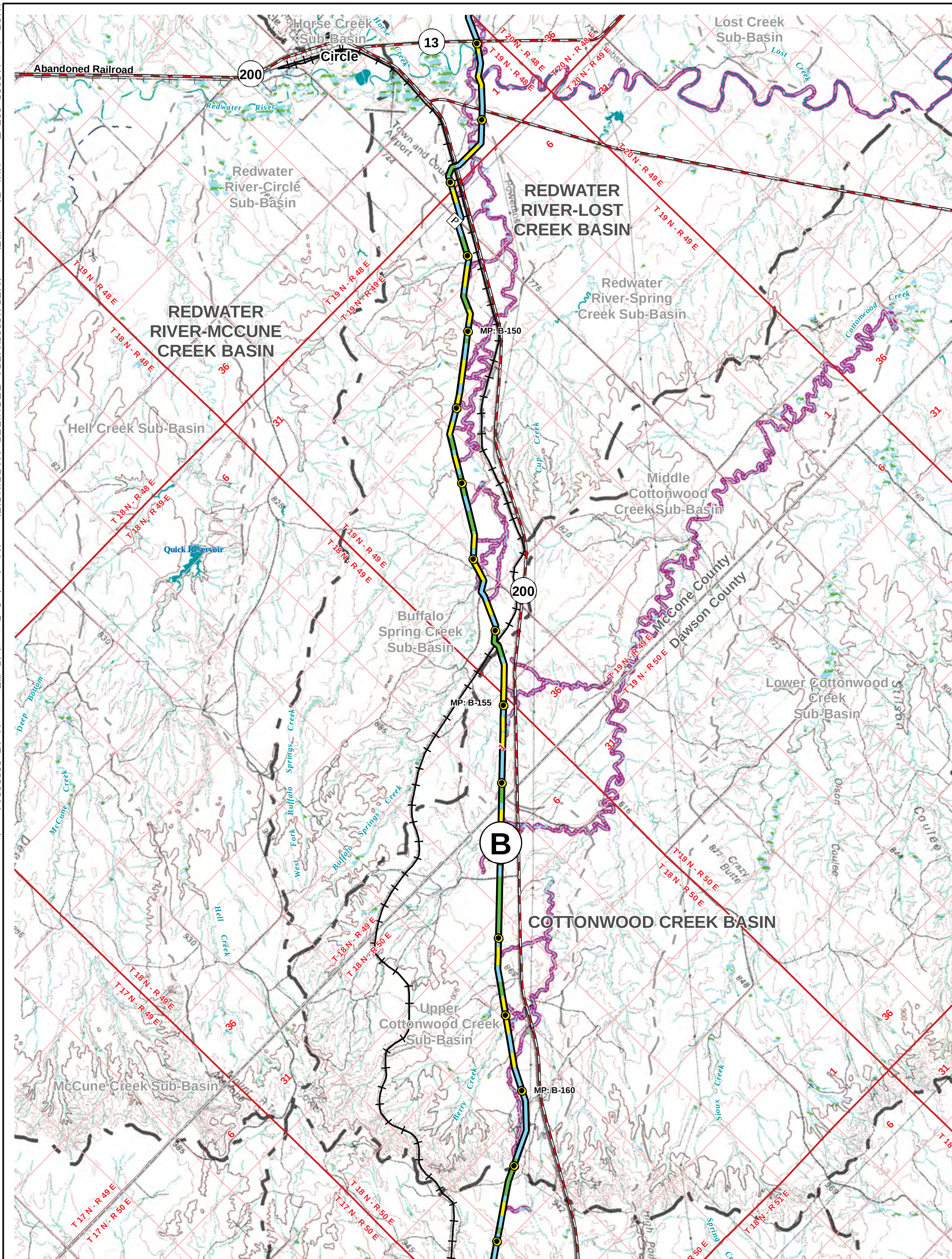

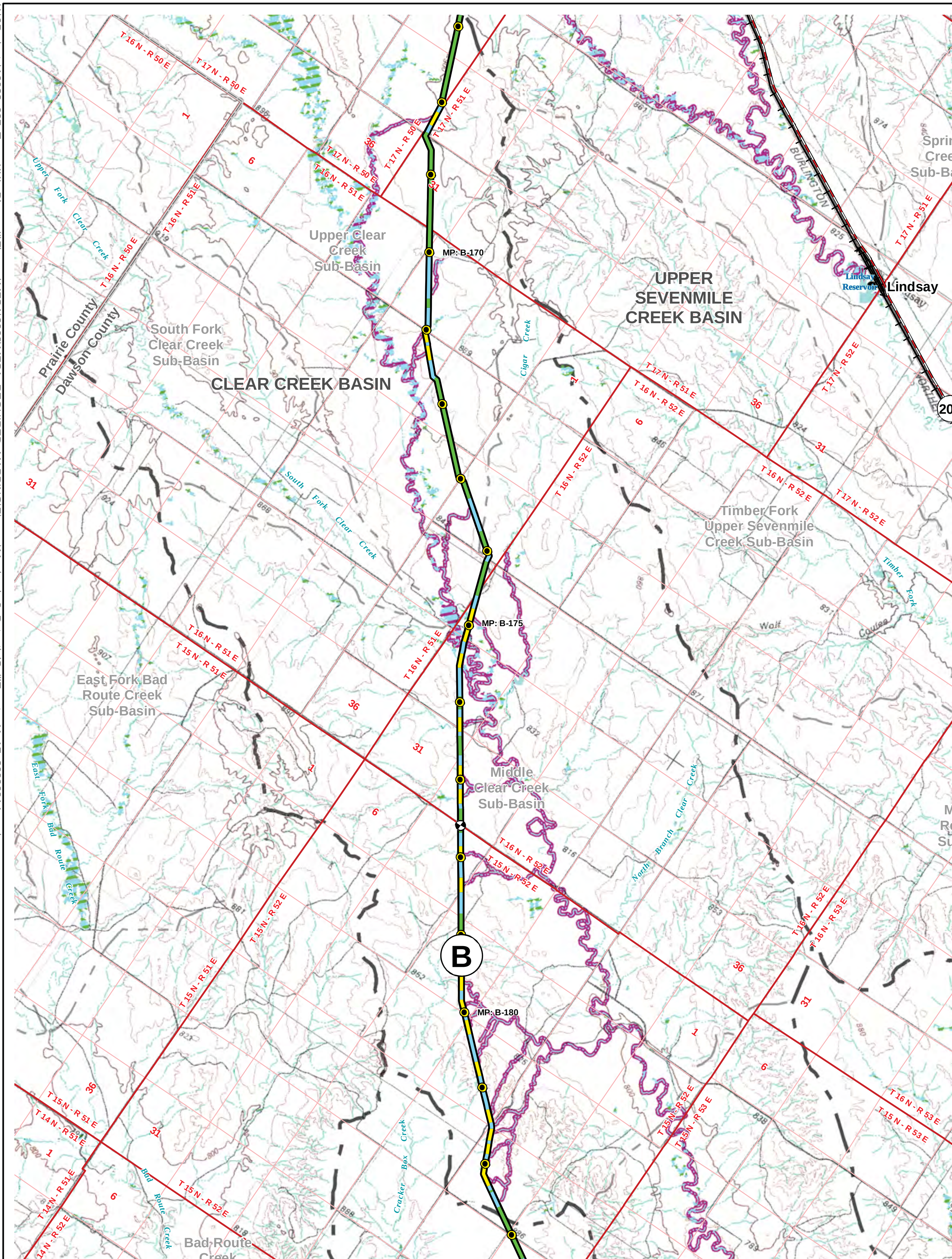

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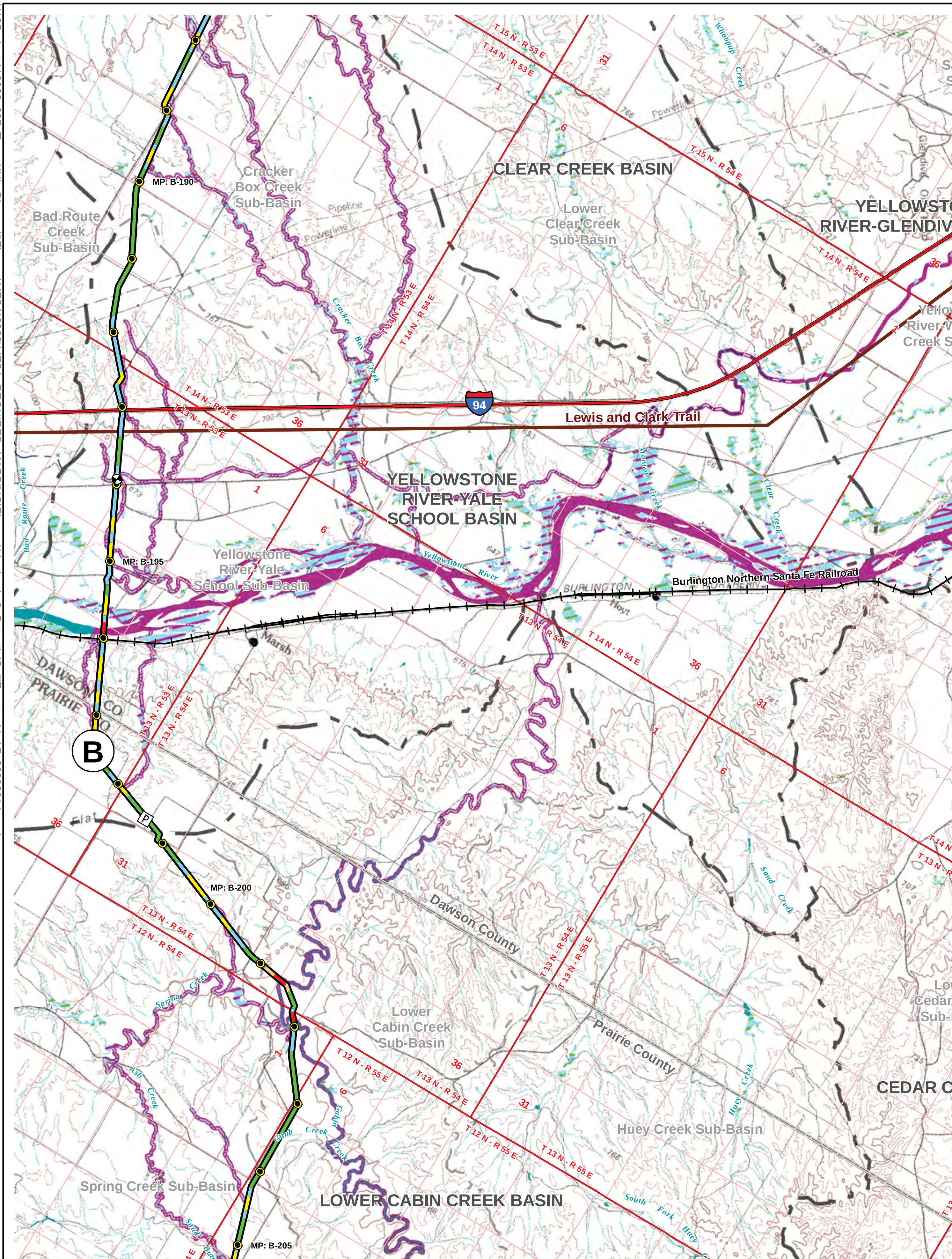

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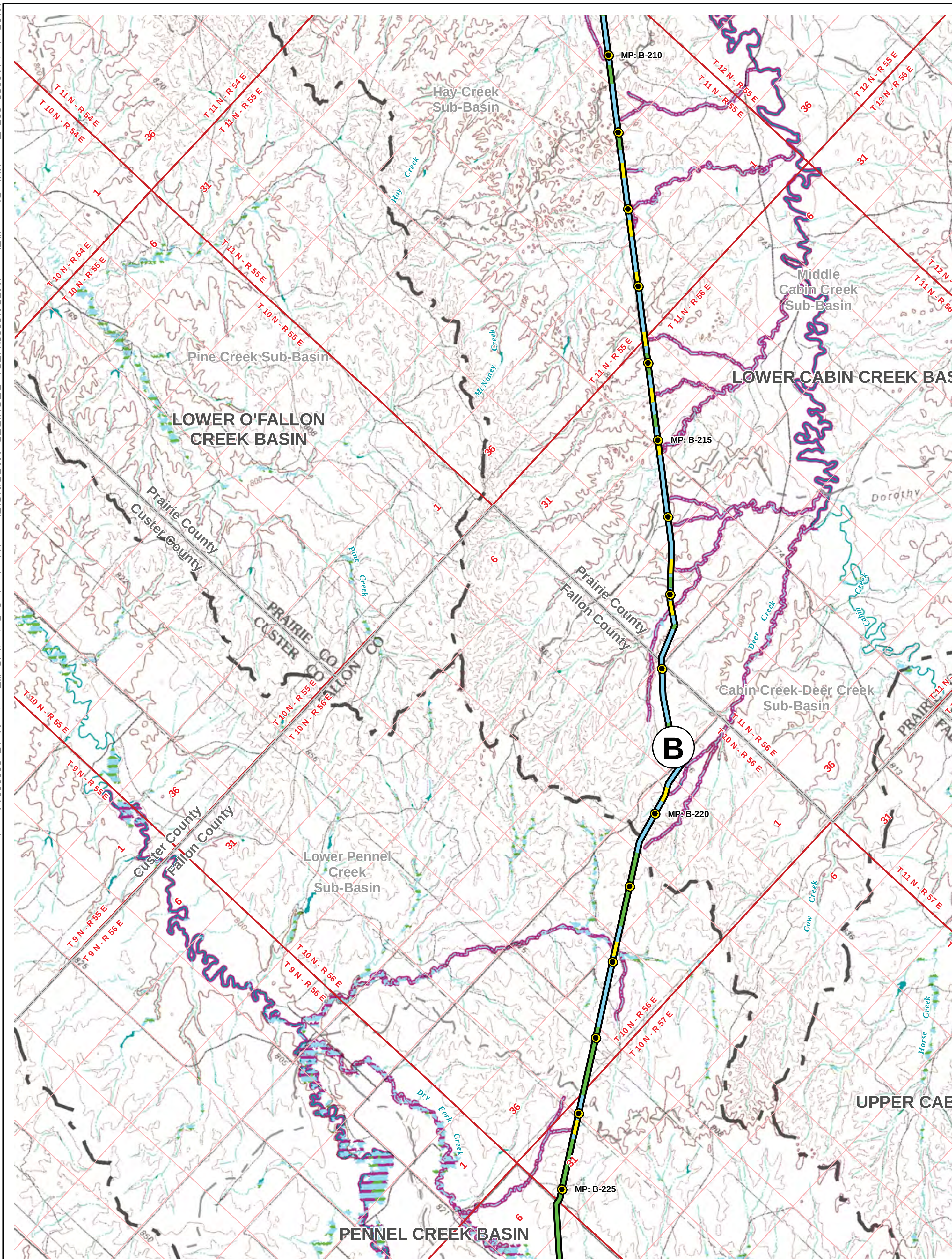

MP: B-210
MP: B-215
MP: B-220
MP: B-225
B
Hay Creek Sub-Basin
Middle Cabin Creek Sub-Basin
LOWER CABIN CREEK BASIN
Pine Creek Sub-Basin
LOWER O'FALLON CREEK BASIN
Prairie County
Custer County
Fallon County
PRAIRIE CO
CUSTER CO
FALLON CO
Cabin Creek-Deer Creek Sub-Basin
Lower Pennel Creek Sub-Basin
PENNEL CREEK BASIN
UPPER CAB
Hay Creek
McNaney Creek
Pine Creek
Deer Creek
Cow Creek
Horse Creek
Dry Fork Creek
Dorothy
T 11 N - R 54 E
T 10 N - R 54 E
T 11 N - R 55 E
T 10 N - R 55 E
T 12 N - R 55 E
T 12 N - R 56 E
T 11 N - R 56 E
T 10 N - R 56 E
T 9 N - R 55 E
T 9 N - R 56 E
T 10 N - R 57 E
T 11 N - R 57 E

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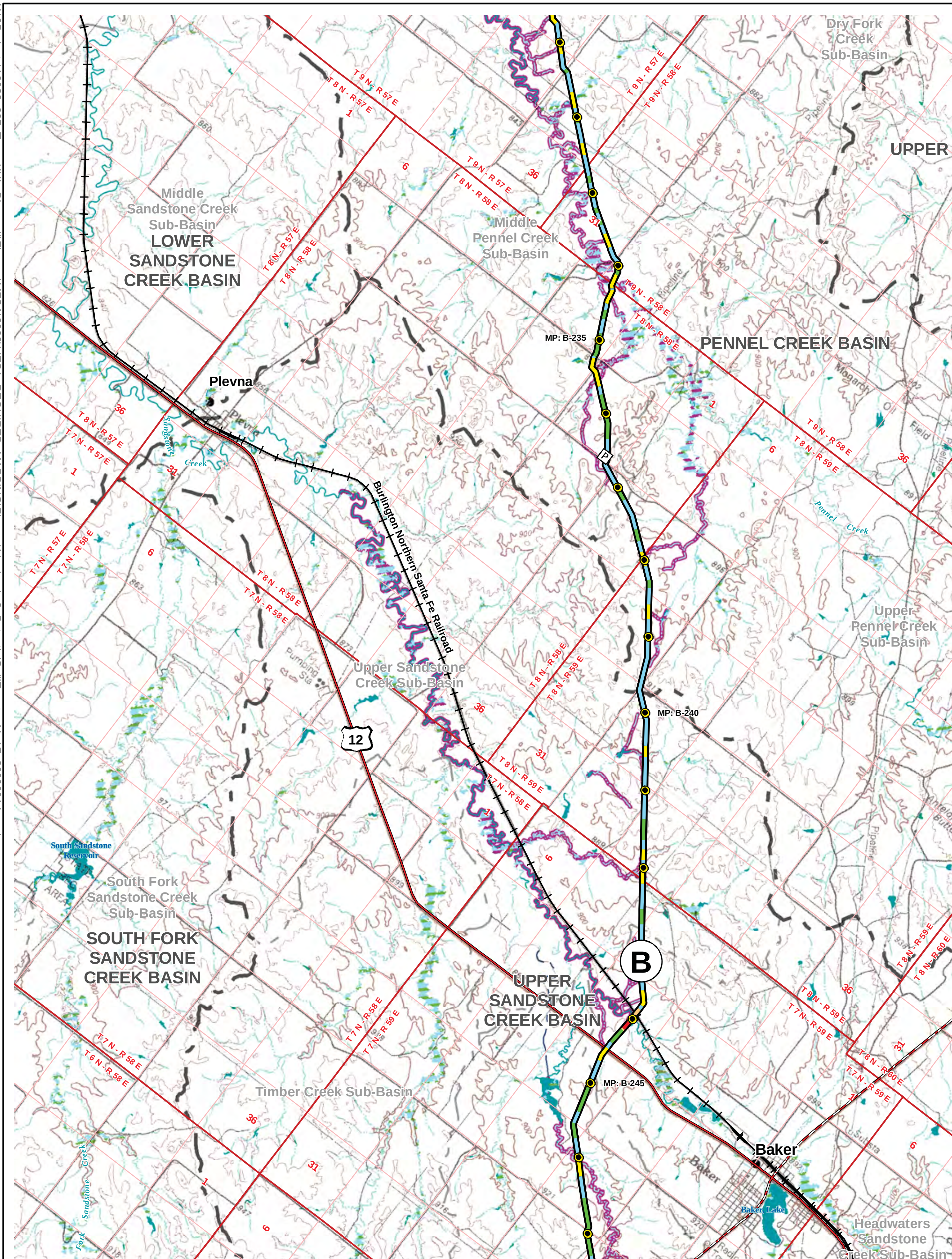

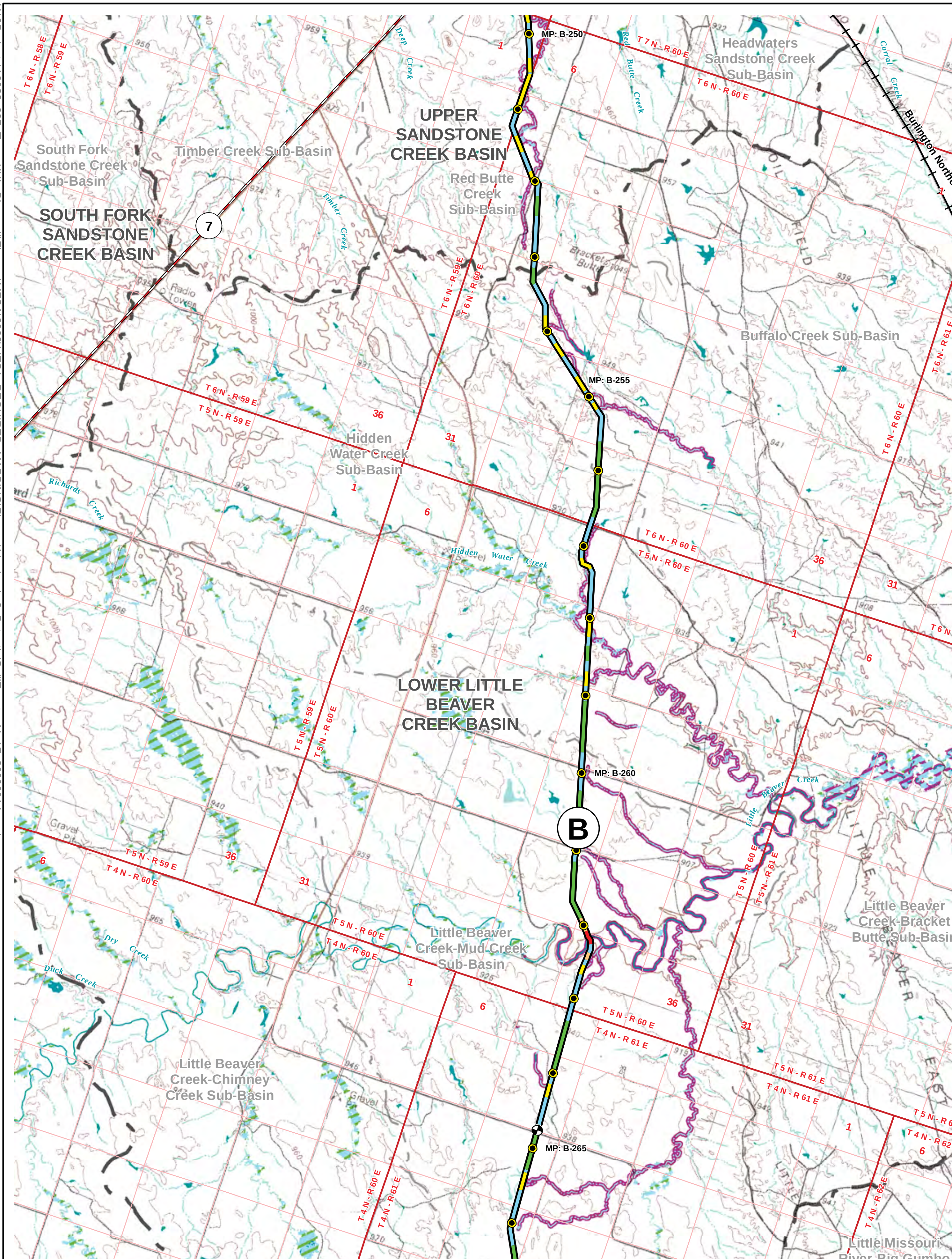

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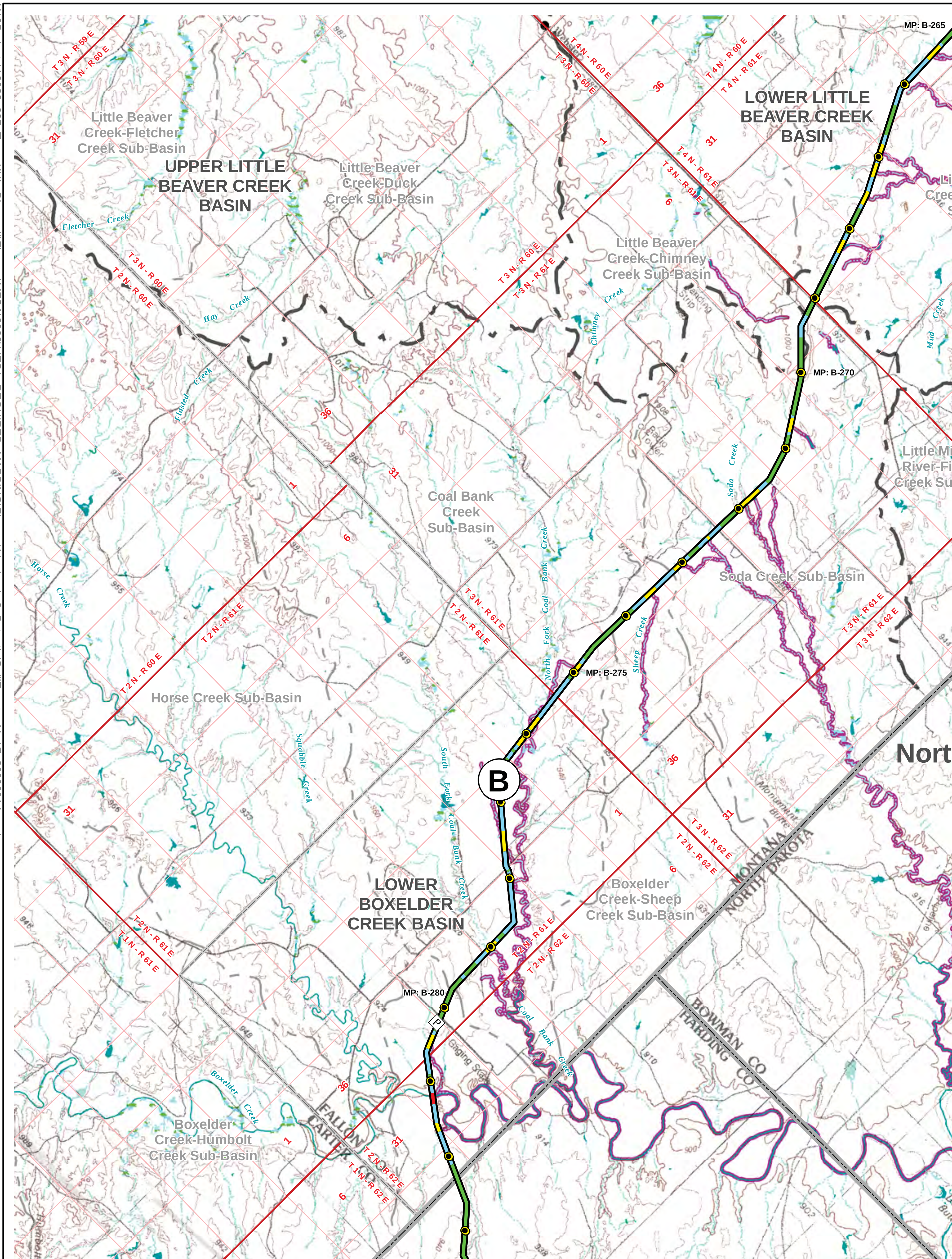
UPPER SANDSTONE CREEK BASIN
SOUTH FORK SANDSTONE CREEK BASIN
LOWER LITTLE BEAVER CREEK BASIN
South Fork Sandstone Creek Sub-Basin
Timber Creek Sub-Basin
Red Butte Creek Sub-Basin
Headwaters Sandstone Creek Sub-Basin
Buffalo Creek Sub-Basin
Hidden Water Creek Sub-Basin
Little Beaver Creek-Mud Creek Sub-Basin
Little Beaver Creek-Bracket Butte Sub-Basin
Little Beaver Creek-Chimney Creek Sub-Basin
MP: B-250
MP: B-255
MP: B-260
MP: B-265
B
7
Burlington North



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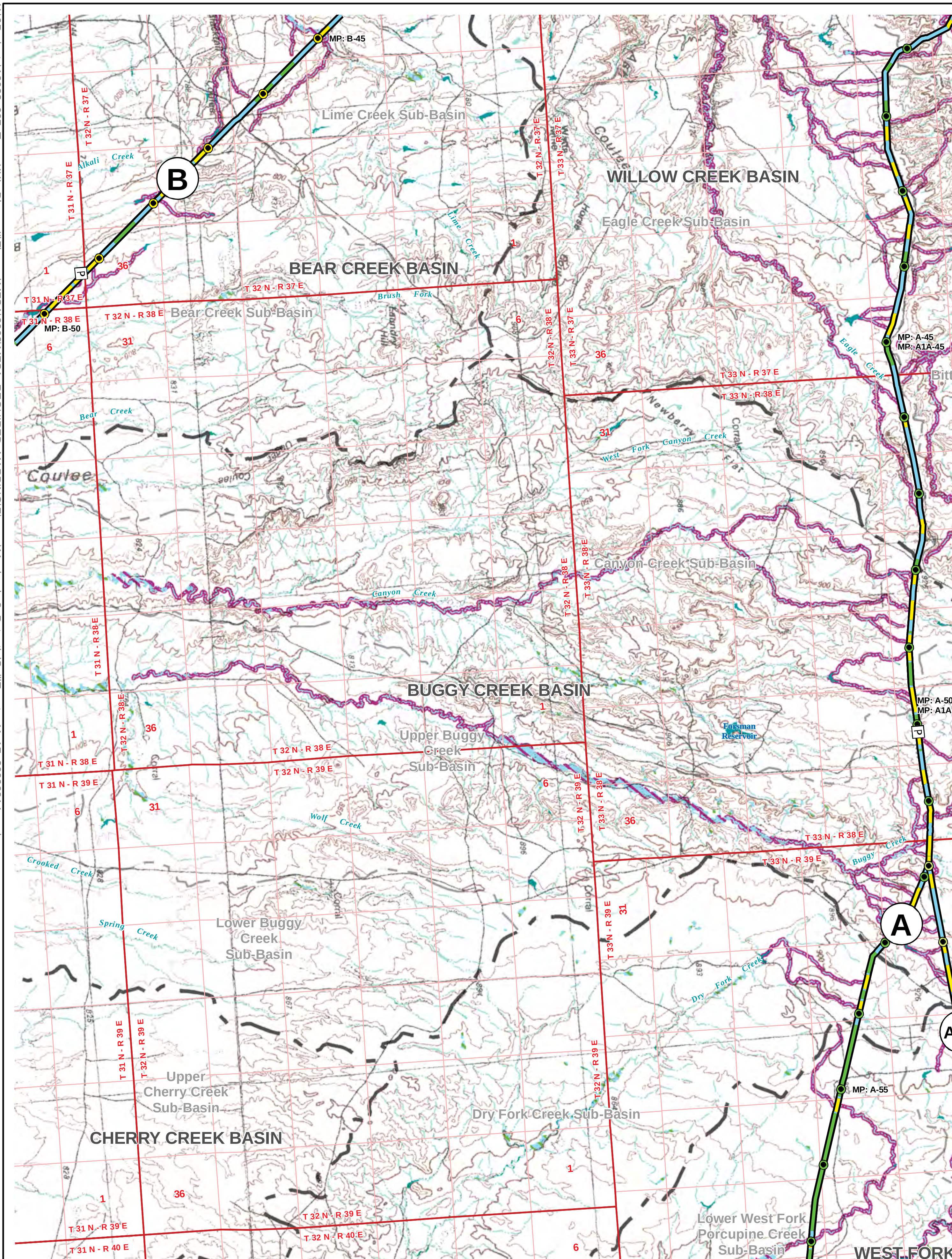

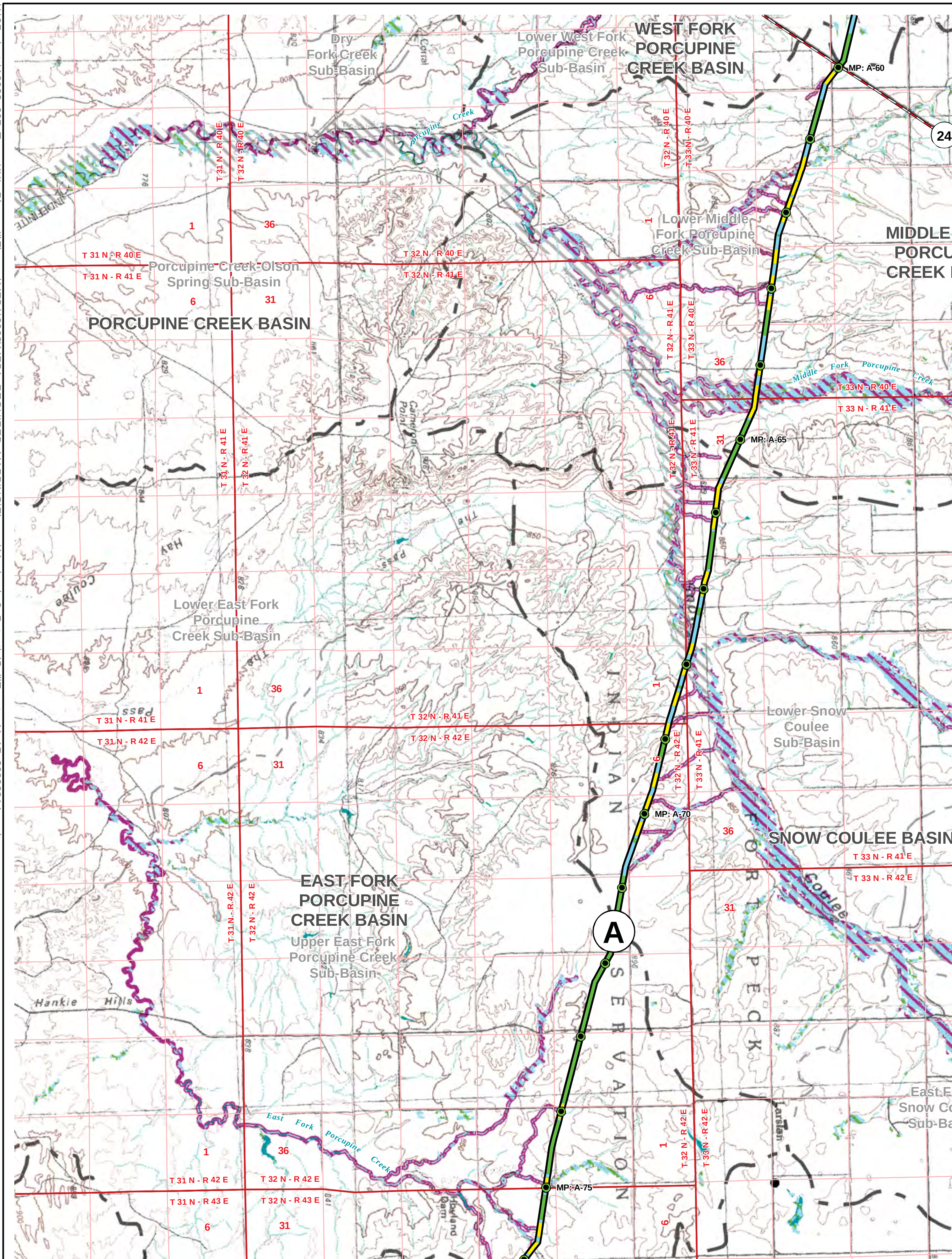

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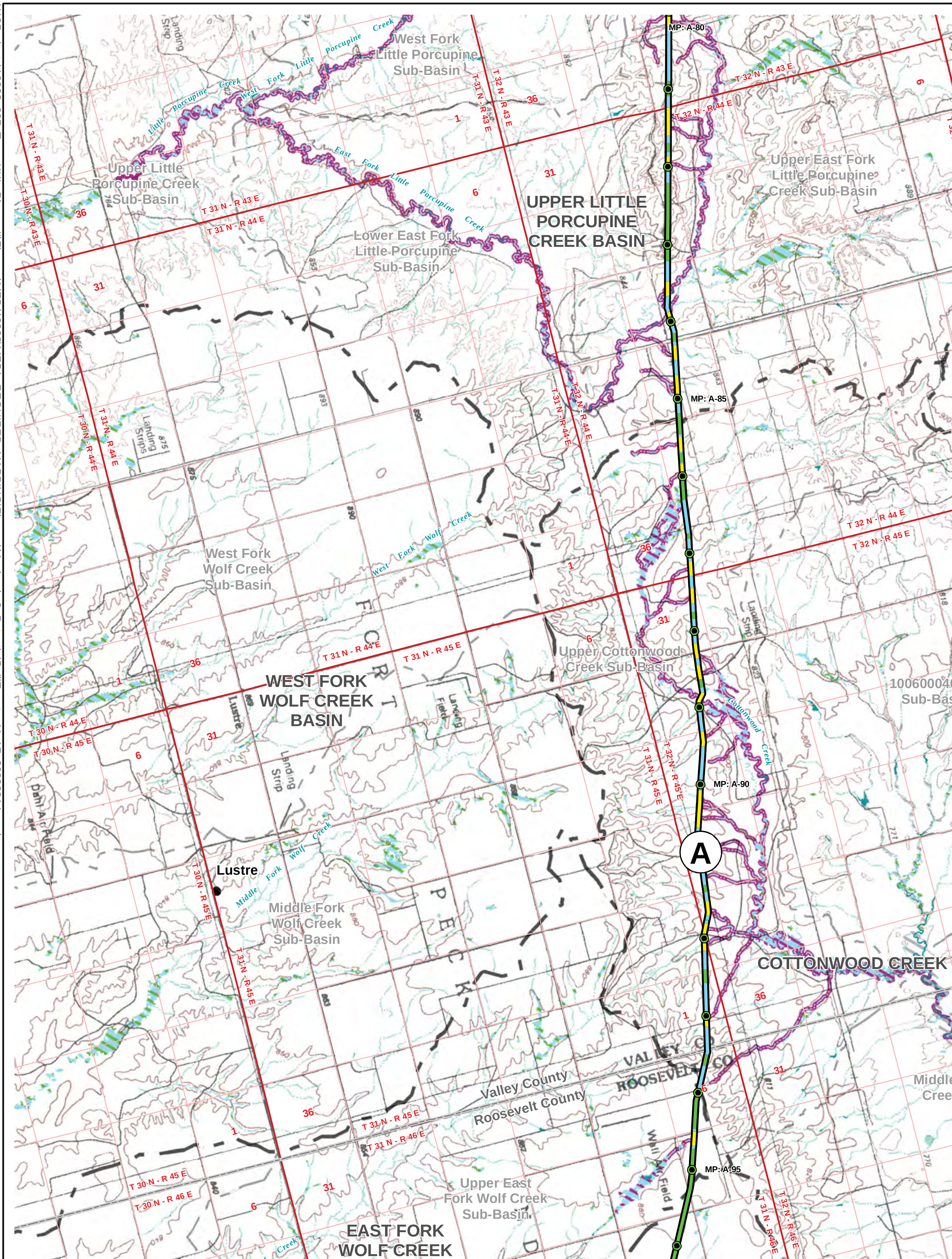

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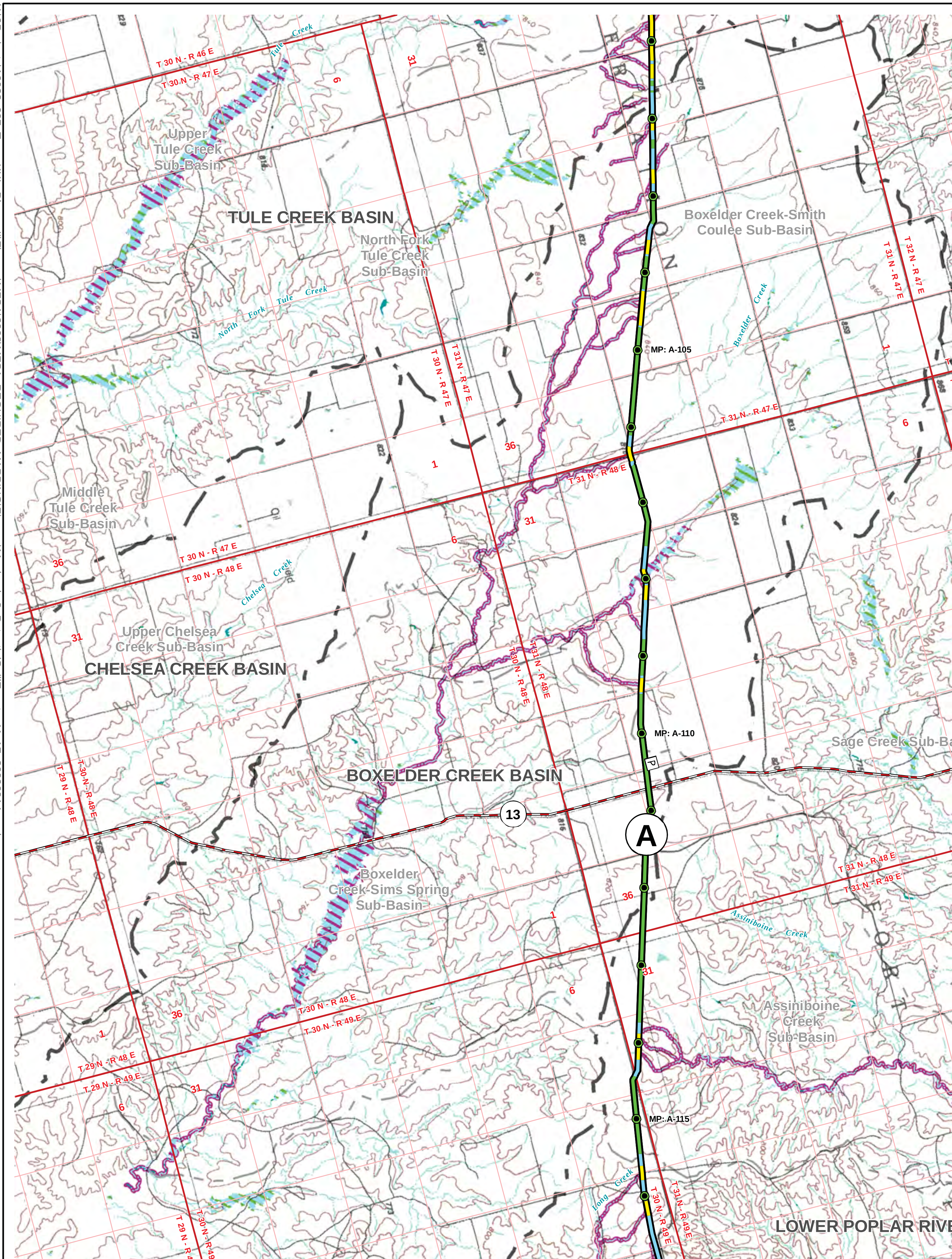

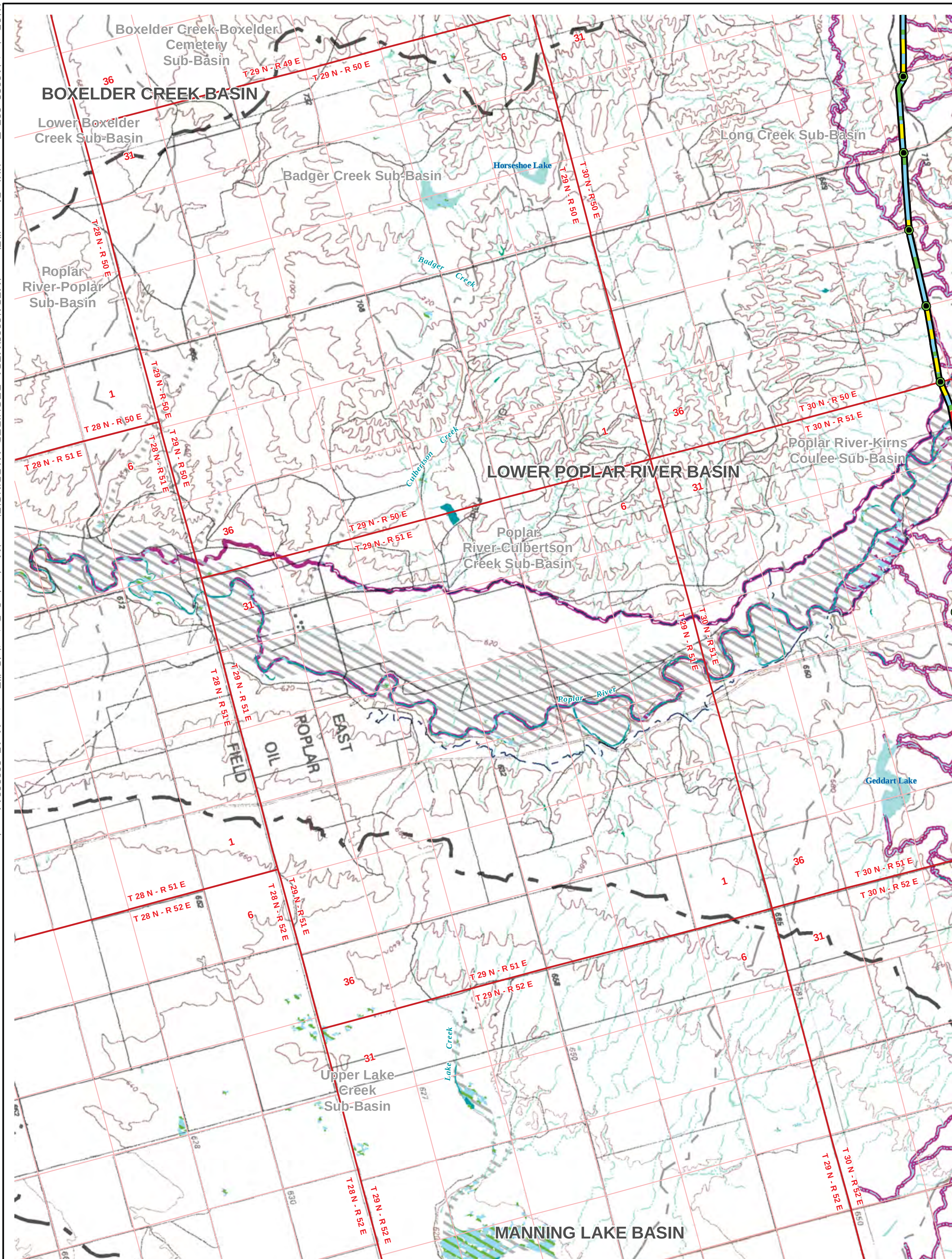

BOXELDER CREEK BASIN
Boxelder Creek-Boxelder Cemetery Sub-Basin
Lower Boxelder Creek Sub-Basin
Badger Creek Sub-Basin
Long Creek Sub-Basin
Poplar River-Poplar Sub-Basin
LOWER POPLAR RIVER BASIN
Poplar River-Kirns Coulee Sub-Basin
Poplar River-Culbertson Creek Sub-Basin
Upper Lake Creek Sub-Basin
MANNING LAKE BASIN
Horseshoe Lake
Geddart Lake
Badger Creek
Culbertson Creek
Poplar River
Lake Creek
EAST POPLAR OIL FIELD
T 29 N - R 49 E
T 29 N - R 50 E
T 28 N - R 50 E
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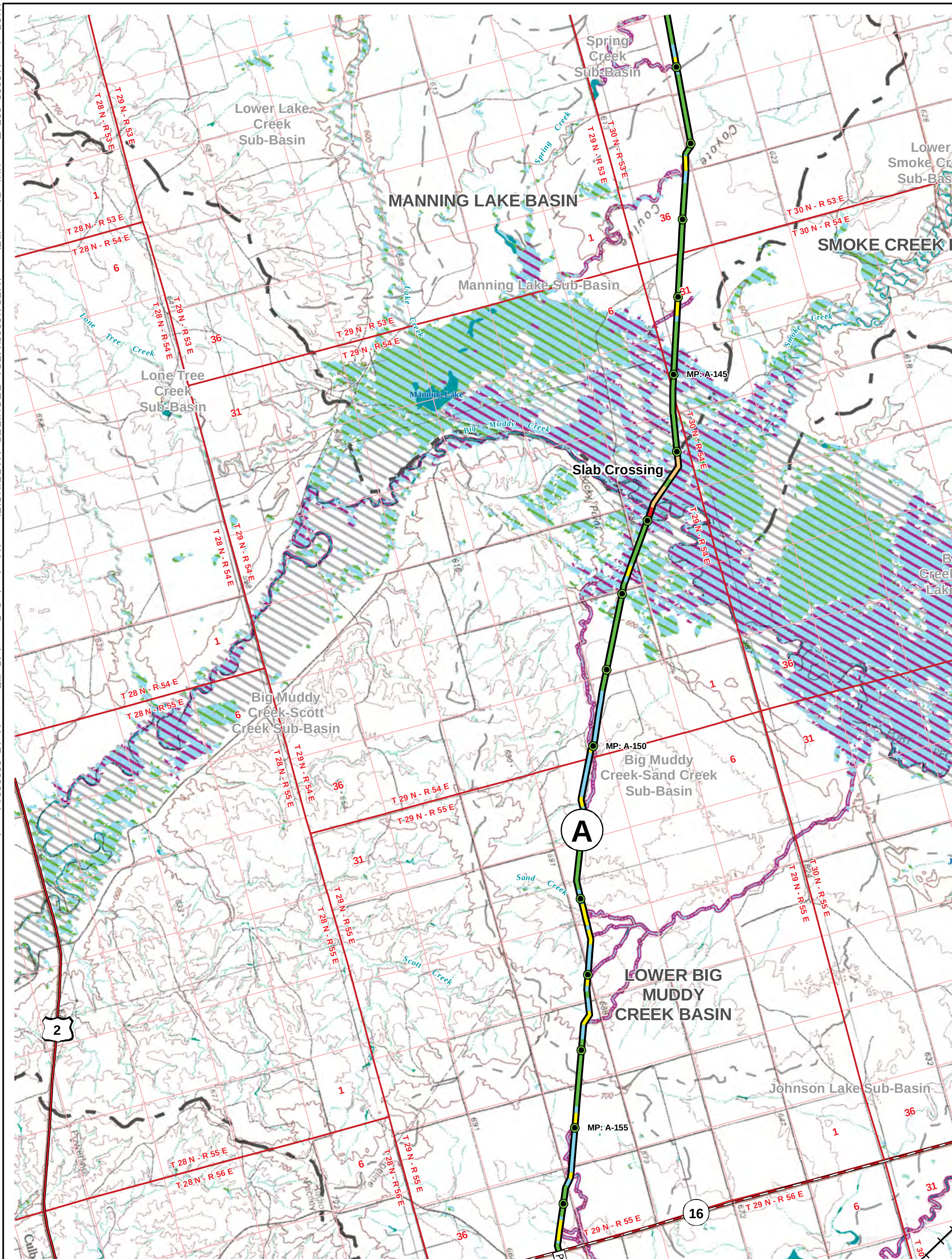
T 30 N - R 52 E



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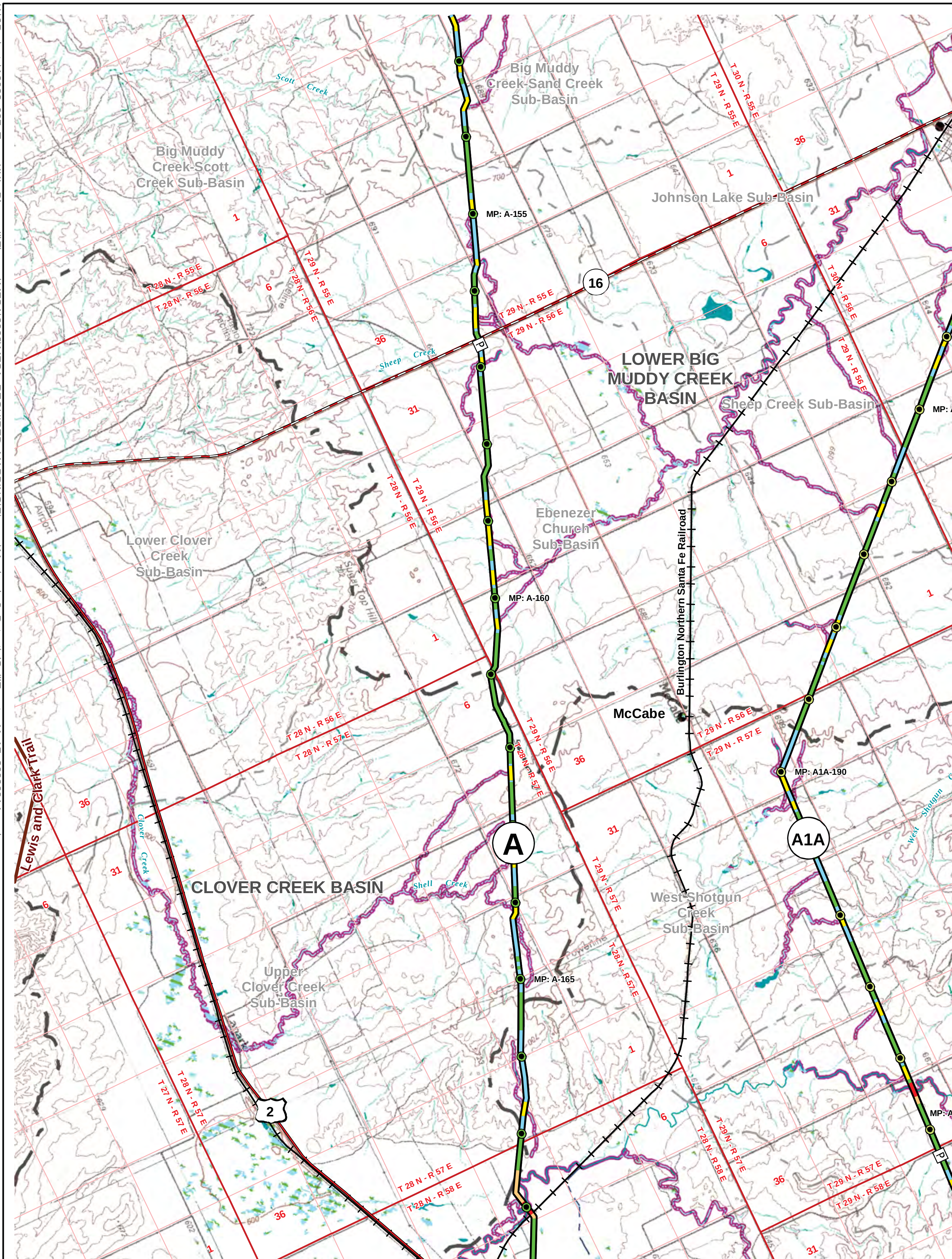

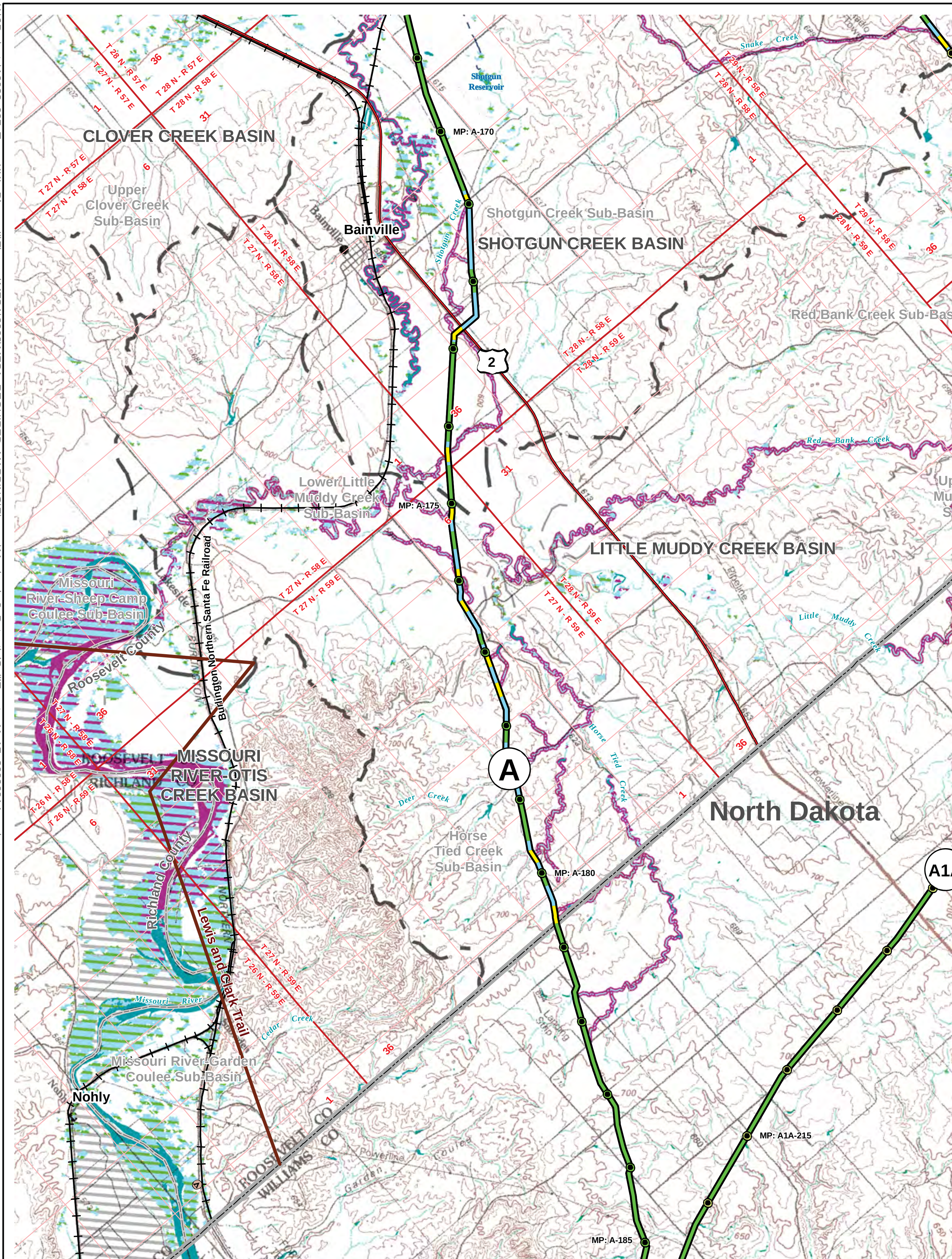

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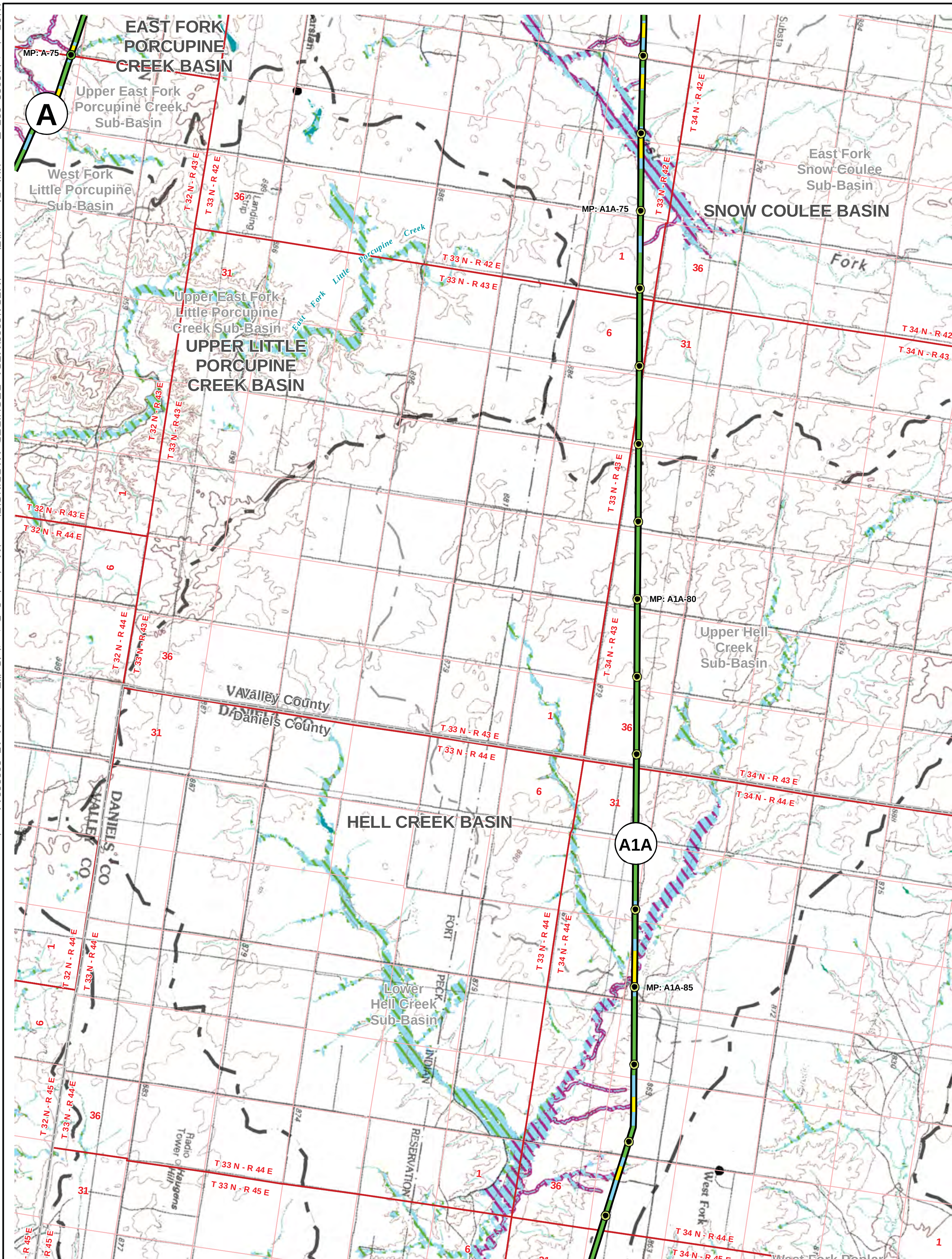

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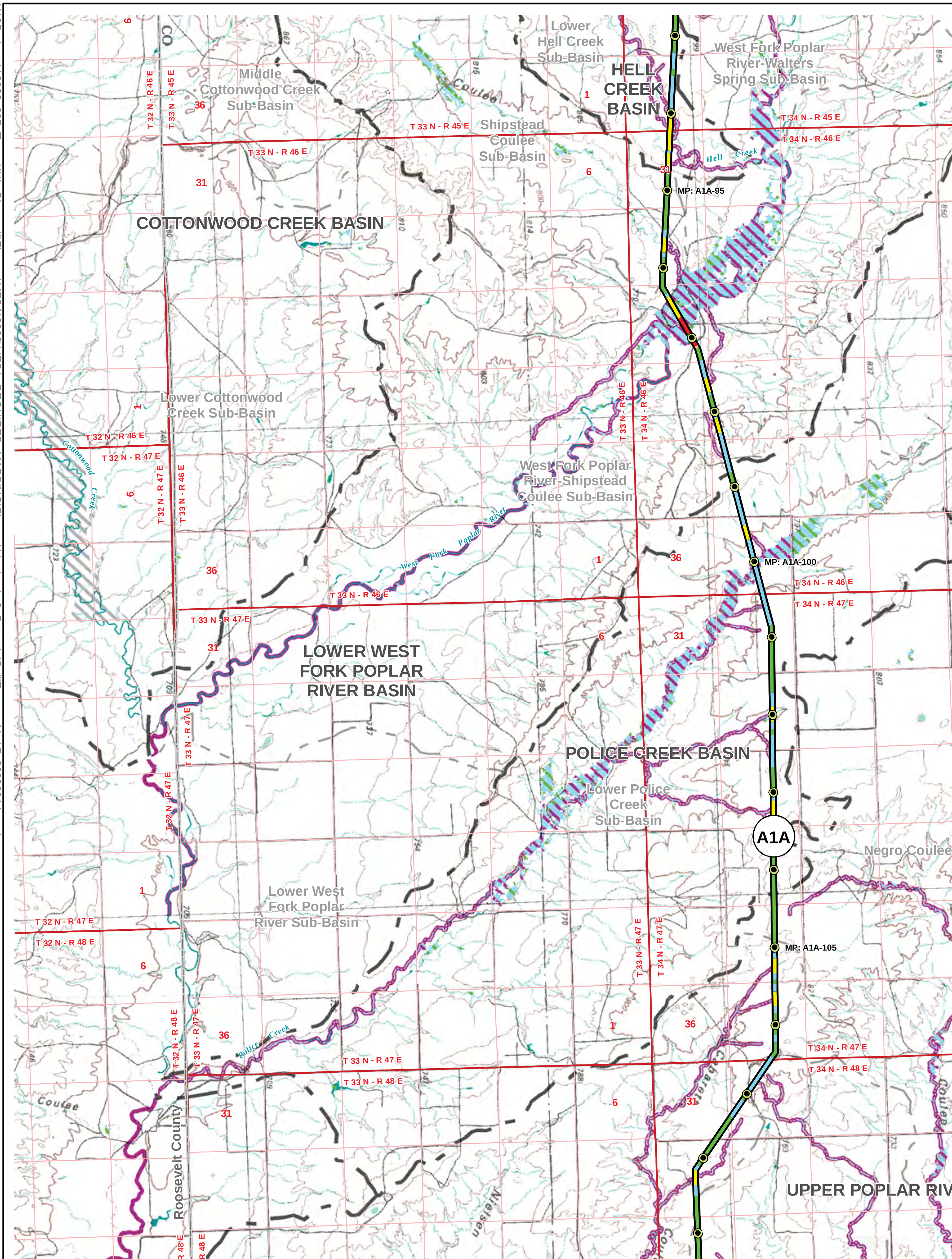

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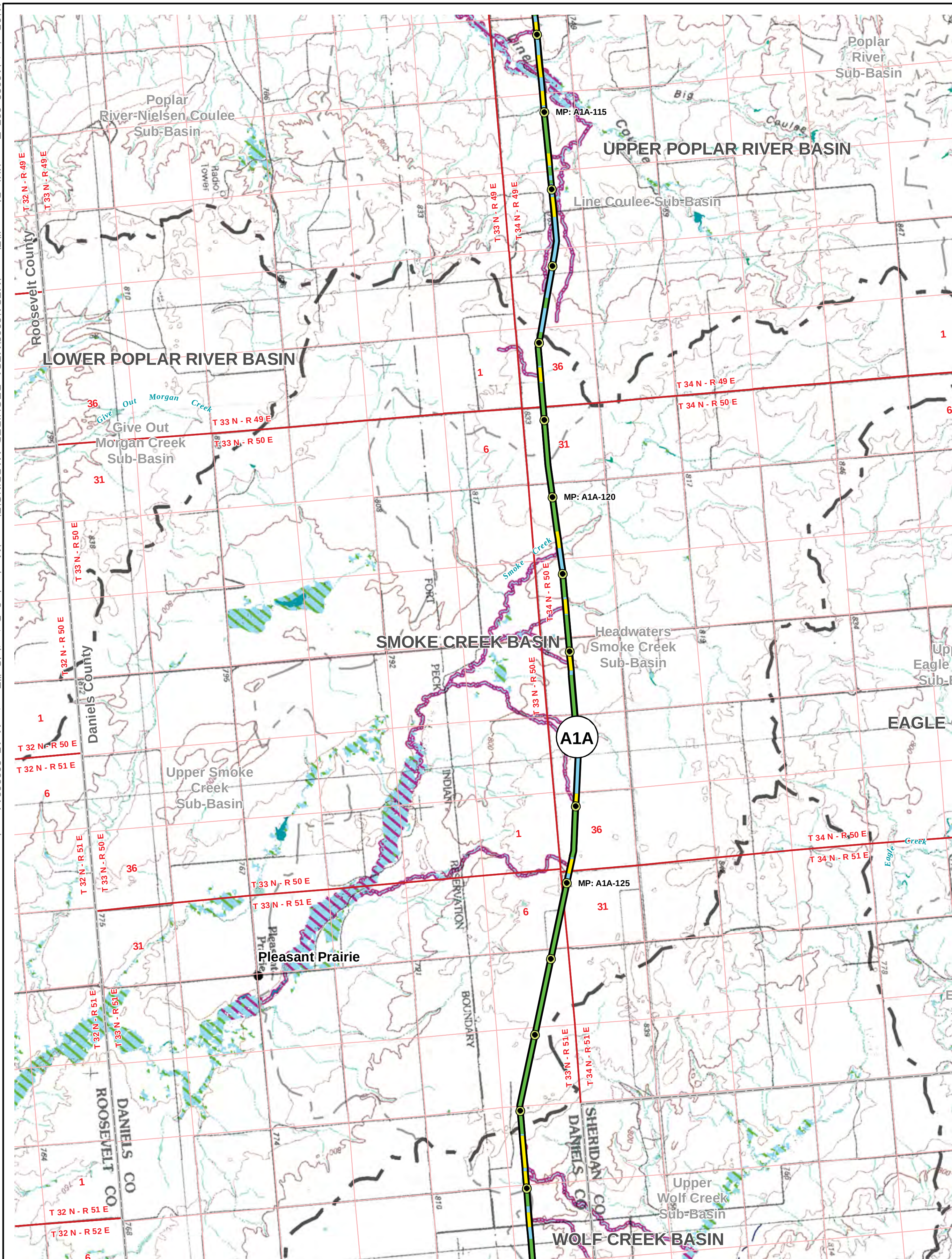

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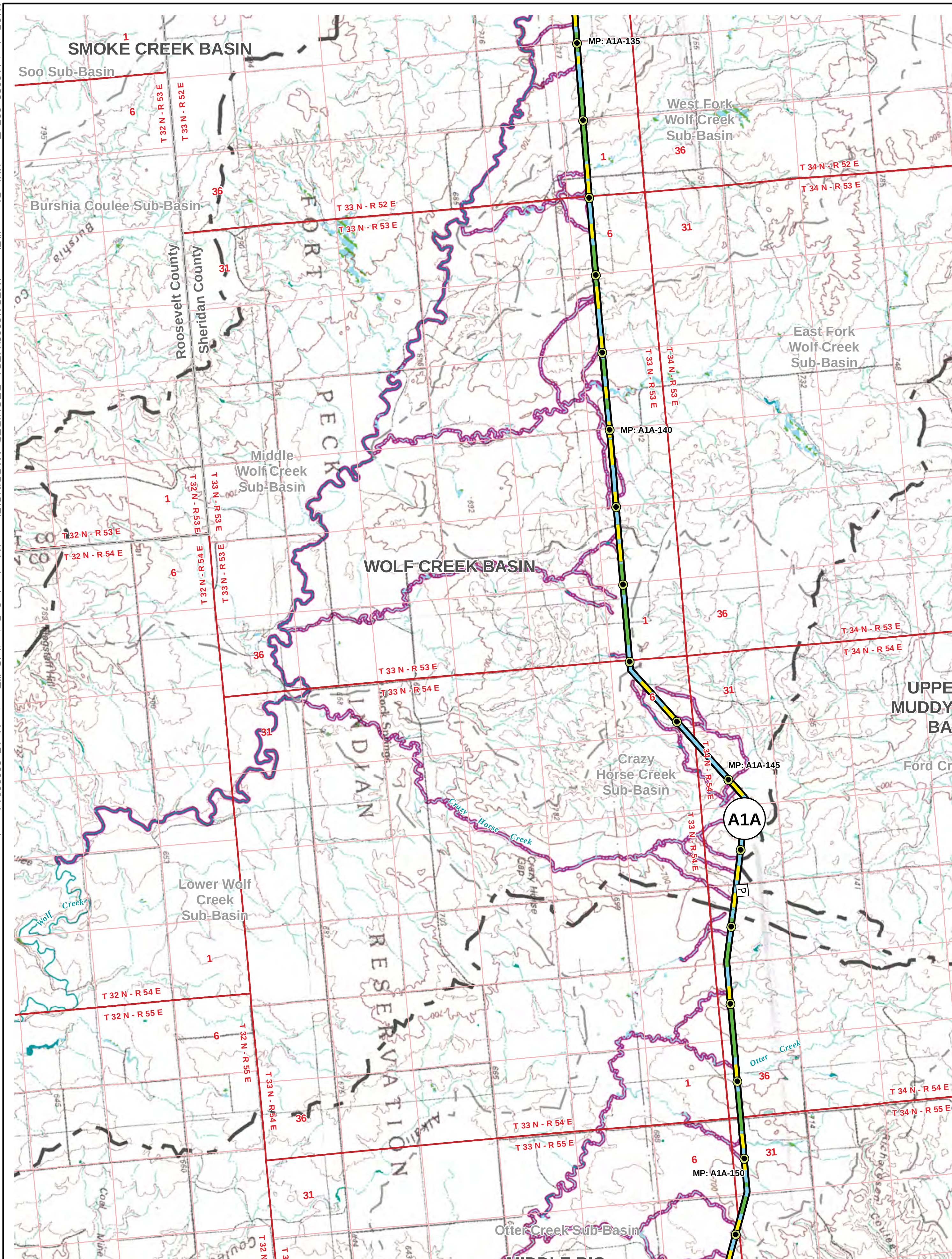

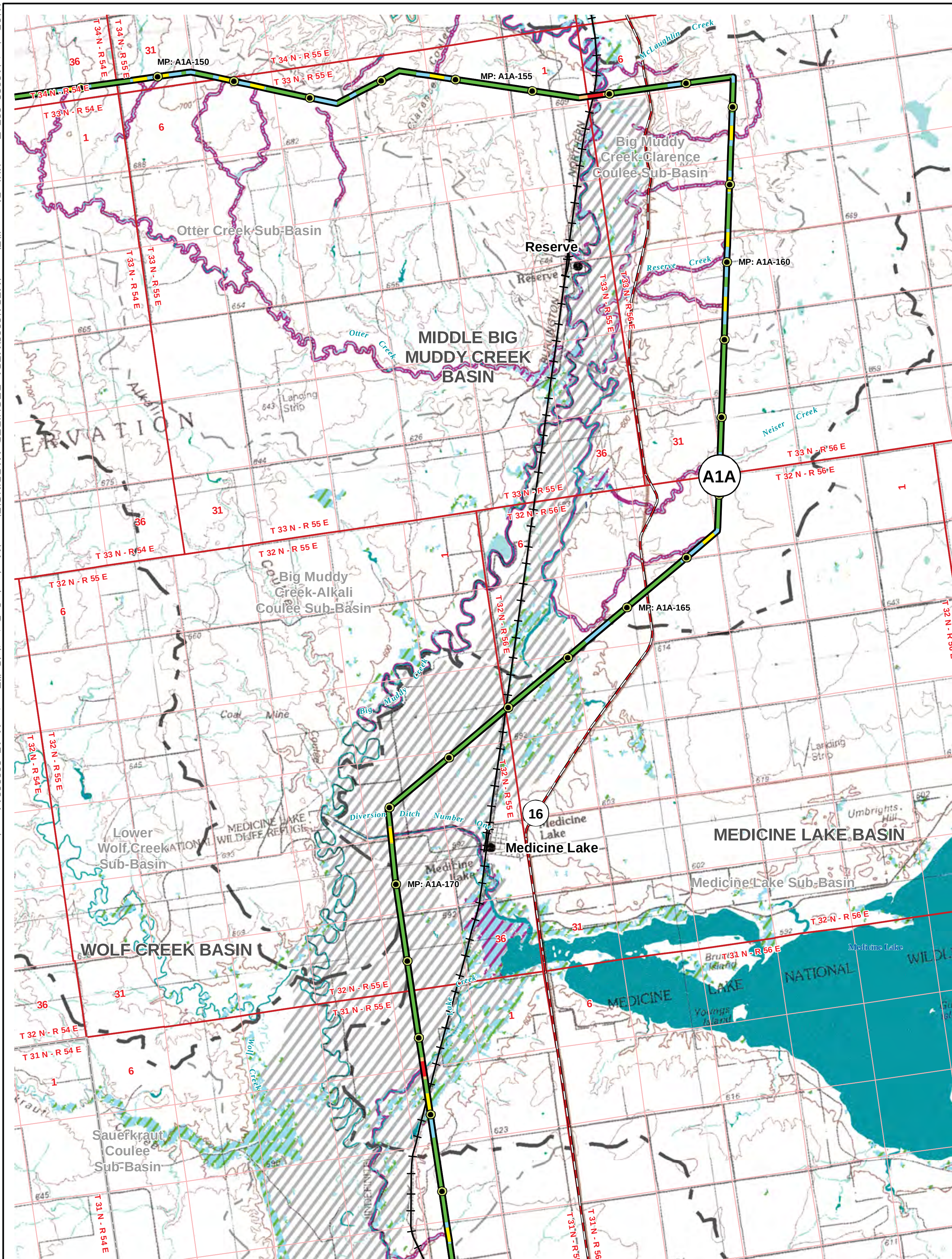

MIDDLE BIG MUDDY CREEK BASIN
MEDICINE LAKE BASIN
WOLF CREEK BASIN
Big Muddy Creek-Clarence Coulee Sub-Basin
Otter Creek Sub-Basin
Big Muddy Creek-Alkali Coulee Sub-Basin
Lower Wolf Creek Sub-Basin
Medicine Lake Sub-Basin
Sauerkraut Coulee Sub-Basin
MP: A1A-150
MP: A1A-155
MP: A1A-160
MP: A1A-165
MP: A1A-170
A1A
16
Reserve
Medicine Lake
T 34 N - R 54 E
T 34 N - R 55 E
T 33 N - R 54 E
T 33 N - R 55 E
T 33 N - R 56 E
T 32 N - R 54 E
T 32 N - R 55 E
T 32 N - R 56 E
T 31 N - R 54 E
T 31 N - R 55 E
T 31 N - R 56 E
McLaughlin Creek
Reserve Creek
Otter Creek
Neiser Creek
Big Muddy Creek
Diversion Ditch Number One
Lake Creek
Wolf Creek
Landing Strip
MEDICINE LAKE NATIONAL WILDLIFE REFUGE
Umbrights Hill
Youngs Island