**United States Department of the Interior**
**Office of Surface Mining Reclamation and Enforcement**

# Dry Fork Mine
# Amendment 2, Tract 1
# Federal Mining Plan Modification
# Environmental Assessment

## May 2017

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# 1.0 Purpose and Need

## 1.1 Introduction

The Dry Fork Mine Amendment 2, Tract 1 Federal Mining Plan Modification Environmental Assessment (the Project) has been prepared by the Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region, with assistance from cooperating agencies, including the Bureau of Land Management (BLM), Buffalo Field Office (BFO); the Wyoming Department of Environmental Quality (WDEQ) (including the Land Quality Division [LQD], the Air Quality Division [AQD], the Water Quality Division [WQD], and the Solid and Hazardous Waste Division [SHWD]); the Wyoming Industrial Siting Agency; the Wyoming Office of State Lands and Investments (OSLI); Wyoming Game and Fish Department (WGFD); Wyoming Department of Health, Public Health Division (WDH-PHD); Campbell County Commissioners; and the Campbell County Conservation District. OSMRE is the lead federal agency responsible for development of this Environmental Assessment (EA) because, under the Surface Mining Control and Reclamation Act of 1977 (SMCRA), OSMRE has the authority to make a recommendation to the U.S. Department of the Interior (DOI) Assistant Secretary, Land and Minerals Management (ASLM) regarding federal mining plan modifications (OSMRE 1999).

This EA describes the environmental impacts that are anticipated to result from the current and future mining operations at the Dry Fork Mine (DFM) from January 1, 2016, through the life of the mine within a tract of land known as Amendment 2, Tract 1 (A2Tr1) that lies within the approved WDEQ-LQD permit area. The A2Tr1 tract encompasses approximately 364.5 acres that contains an estimated 32 million tons (Mt) of recoverable coal.

This EA review has been conducted in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of federal Regulations [CFR] 1500-1508); the Department of the Interior's (DOI's) regulations for implementation of NEPA (43 CFR Part 46); the DOI's Departmental Manual Part 516; and OSMRE's Directive REG-1, Handbook on Procedures for Implementing the National Environmental Policy Act of 1969 (OSMRE 1989). Information gathered from federal, state, and local agencies; Western Fuels-Wyoming, Inc. (WFW); publicly available literature; and in-house OSMRE sources, such as the DFM Permit Application Package (PAP), was used in the preparation of this EA.

NEPA requires federal agencies to disclose to the public the potential environmental impacts of projects they authorize and to make a determination as to whether the analyzed actions would "significantly" impact the environment. The term "significantly" is defined in 40 CFR 1508.27. If OSMRE determines that the Project would have significant impacts following the analysis in this EA, then an Environmental Impact Statement (EIS) would be prepared for the Project. If OSMRE determines that the potential impacts would not be "significant," OSMRE would prepare a Finding of No Significant Impact (FONSI) to document this finding, and, accordingly, would not prepare an EIS.

## 1.2 Background

### 1.2.1 Site History

The DFM is located approximately 4.5 miles northeast of the City of Gillette in Campbell County, Wyoming, between Wyoming State Highway (SH) 59 and Garner Lake Road (**map 1-1**). According to information provided by WFW (WFW 2016a), the DFM currently includes coal from five federal coal leases, one state lease, and one private lease, as listed below. A2Tr1 overlaps portions of federal coal leases WYW-0271200 and WYW-0271201. **Map 1-2** shows the federal coal leases.

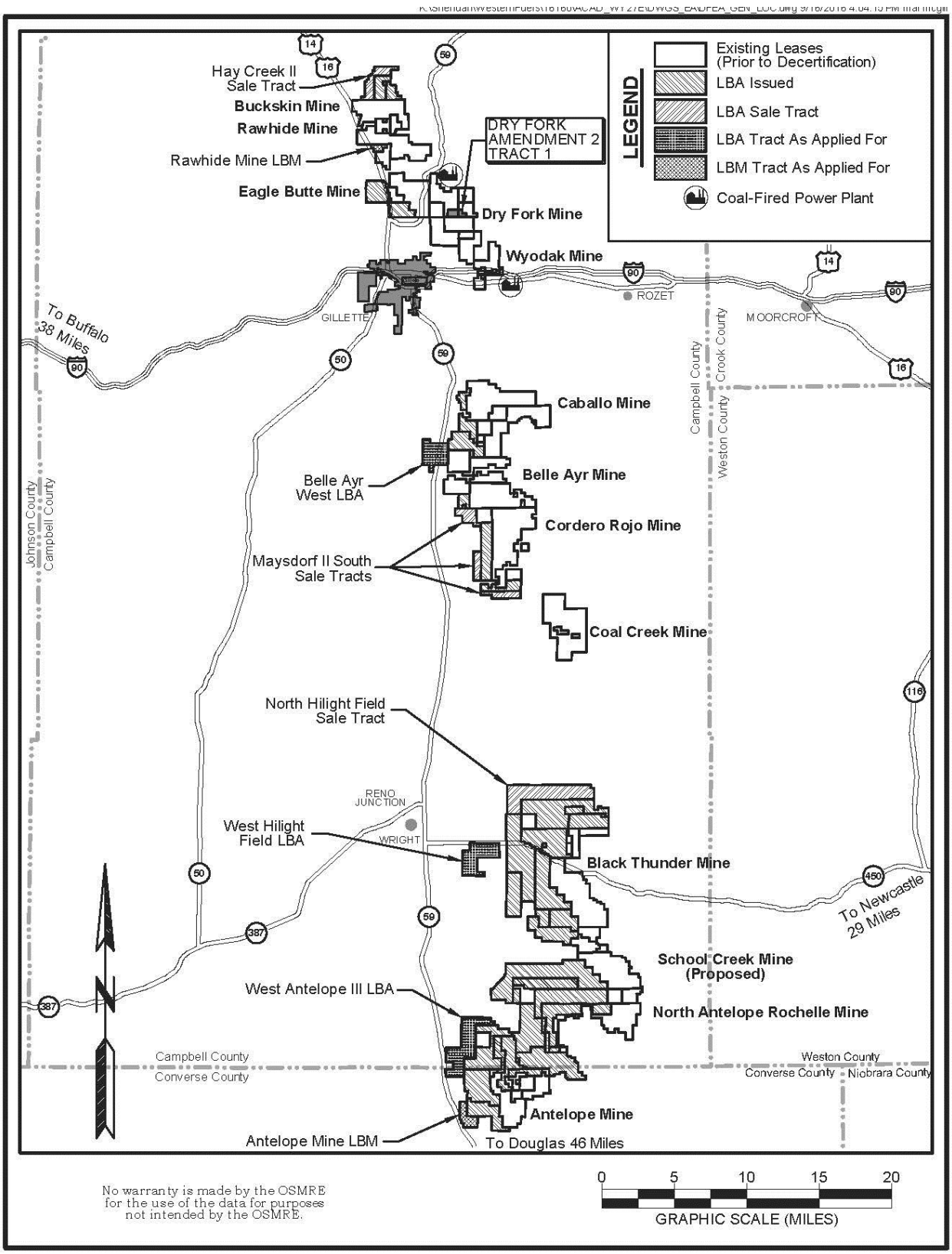
1. State Coal Lease 0-26652,
2. Federal Coal Lease WYW-5035,
3. Federal Coal Lease WYW-0271199,
4. Federal Coal Lease WYW-0271200,
5. Federal Coal Lease WYW-0271201,
6. Federal coal lease WYW-0311810,
7. Marshall et al. Private Coal Lease

State Coal Lease 0-26652 was obtained by Peabody Coal Co. on August 2, 1973. After changing hands several times, the lease was acquired by North Gillette Coal Company (NGCC) and Dry Fork Coal Company (DFCC) on April 3, 1989, and the lease was added to Permit No. PT0599. On August 24, 2000, WFW acquired sole ownership of the lease.

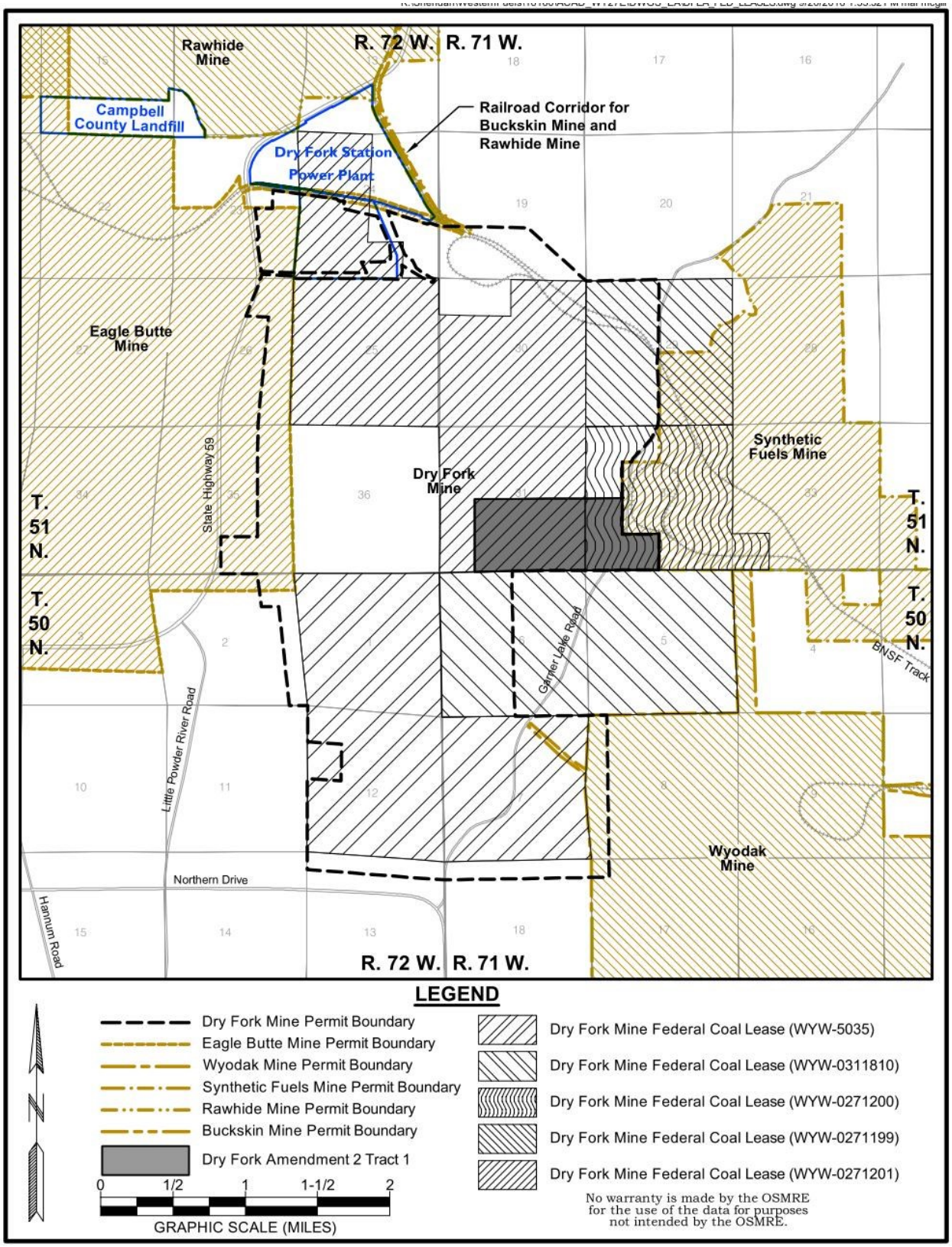
Federal coal leases WYW-0271199, WYW-0271200, and WYW-0271201 were originally acquired by Sentry Royalty Company (a division of Peabody Energy) in 1967. The leases changed hands several times, however in 1989, NGCC and WFW acquired the leases through a Wyoming limited partnership known as DFCC. WFW was the general partner of DFCC and NGCC was the limited partner.

Federal coal lease WYW-5035 was originally issued to Humble Oil & Refining Company in 1967. After several transactions, this lease became the property of the Fort Union Mine Partnership. This lease received federal mine plan approval for mining on February 28, 1985. The Fort Union Mine Partnership eventually sold lease WYW-5035 to Wyoming Coal Resources Company (WCRC). WCRC obtained a separate WDEQ-LQD permit (PT0659) for the reserves in lease WYW-5035 and produced coal from the lease from 1996 through 1998. By an agreement dated October 20, 2003, Kennecott Energy and Coal Company, on behalf of WCRC, sold the remaining reserves to Tri-State Generation and Transmission Association, Inc. (Tri-State) and Basin Electric Power Cooperative (Basin Electric). In 2004, federal coal lease WYW-5035 was added to the Dry Fork Mine Logical Mining Unit. WFW merged the Fort Union state permit (PT0659) into the Dry Fork Mine in 2011 under Amendment 1 to Permit No. PT0599.

Federal coal lease WYW-0311810 was originally issued January 1, 1970 to Kerr McGee Corporation. A portion of the lease was included in the East Gillette Mine permit area. This area received federal mine plan approval in 1988. During the late 1990's, Kerr McGee split the East Gillette Mine, selling a portion to the adjoining Wyodak Mine and lease WYW-0311810 to Dry Fork Coal Company on February 6, 1997. The previously permitted portion of lease WYW-0311810 was added to the Dry Fork Mine as part of the Amendment 2 permit revision.




**Map 1-1. General Location Map with Federal Coal Leases**




**Map 1-2. Dry Fork Mine's Federal Coal Leases**

The Marshall et al. private coal lease was originally issued on January 31, 1973 to Peabody Coal Co. The lease changed hands several times and was assigned to Philips Petroleum Company (later known as NGCC) on December 1, 1982. The mineable portion of this tract was added to Permit No. PT0599 and was mined out during the early 1990's.

The DFM is located in the middle of the Wyoming Powder River Basin (PRB) region, a coal basin that spans from northeast Wyoming to southeast Montana. The PRB produces 80 percent of the coal mined from federal government owned coal leases in the U.S. The region has also been heavily developed for oil and gas recovery, most recently for coal bed natural gas (CBNG) recovery. All of the land surrounding A2Tr1 is currently leased for coal mining. The DFM permit area has overlapping coal permit areas with three other approved mining operations (Eagle Butte, Wyodak, and Synthetic Fuels mines), and abuts mine permit areas on three sides. The A2Tr1 area adjoins a neighboring mine's coal loadout railroad loop. Several heavy industrial facilities are also near A2Tr1, including an oilfield wastewater injection business, an activated carbon refinery, and a septic waste disposal business. An industrial park is in the process of being developed within 0.75 mile of the tract.

Coal is mined at the DFM using truck and loader, multiple bench methods. The coal is transported by haul truck to the truck-dump hopper located near the mine silos. From the silos, coal is conveyed to the adjacent Dry Fork Station (DFS) power plant silos or to the railroad loadout facility, which is within the DFM railroad loop. The DFS power plant has a design capacity of 422 megawatts (MW) and construction was completed during 2011, and the power plant began accepting coal from the DFM, which currently provides all of the coal for the power plant. The DFS is estimated to need approximately 2.0 million tons per year (Mtpy) through the life of that facility (estimated at 2071). Additionally, the DFM provides coal on the spot market (market in which coal is sold for immediate delivery), and coal is shipped to customers via an on-site rail spur connected to a BNSF Railway Company Railway (BNSF) main line that can accommodate coal shipments to all portions of the U.S. Mining operations are described in detail in **chapter 2**.

WFW operates the DFM under WDEQ-LQD Permit No. PT0599, issued by WDEQ-LQD, in accordance with the approved Wyoming State Coal Regulatory Program (30 CFR Part 950). The approved permit boundary includes the entire A2Tr1 tract. WDEQ-LQD approved the most recent version of Permit No. PT0599 with the condition that the DFM may not mine coal from any federal coal lease prior to receiving approval from the ASLM. Although WDEQ-LQD permits are issued based on the life-of-mine (LOM) plans for the mining operation, under the Wyoming Environmental Quality Act of 1973 (WEQA), permits must be renewed every 5 years (Wyo. Stat. § 35-11-405, Wyoming Revised Statutes [WRS] 1973 as amended). This EA considers potential effects from mining A2Tr1 and does not reevaluate existing federal mining areas and operations, except in terms of cumulative effects.

The Resource Recovery and Protection Plan (R2P2) for the DFM is sequenced to concurrently operate two mining pits. This sequencing is necessary to ensure proper blending of the coal to meet coal contract stipulations. It is also necessary to lessen the risk of interrupted coal delivery in case an emergency (i.e., pit flooding) disrupts operations in one of the pits. The mine also has specific bench lengths and bench orientations. These specific pit lengths, orientations, and other mine design factors are done to optimize the coal haul distances and to improve coal drying at the benches. Coal drying at the benches reduces the potential for spontaneous combustion in coal stockpiles. This mine plan design has been approved by the BLM in the R2P2 and is needed to ensure maximum recovery of the coal resource. As explained in the R2P2, interruptions to

the mine plan sequence will disrupt these strategic decisions, resulting in illogical sequences, more overburden rehandle, longer haul distance, delayed reclamation, and lower coal recovery.

WFW's original purpose for acquiring the DFM in the late 1980's was to obtain a long-term coal supply for the Laramie River Station (LRS) and to sell excess coal on the open market. WFW currently has a long-term coal supply contract through 2039 with the LRS for up to 2.7 Mtpy. The LRS is a coal-fired power plant located approximately 150 miles southeast of the Project that has three coal-based units, including Unit 1(a 570 net megawatt unit operating since 1980), Unit 2 (a 570 net megawatt unit operating since 1981), and Unit 3 (a 570 net megawatt unit operating since 1982) (Basin Electric Power Cooperative 2016). LRS typically receives the majority of its coal from mines other than the DFM. According to U.S. Energy Information Administration (USEIA) reporting data, from years 2011 through 2015, between 18 percent and 35 percent of the total coal burned at the LRS originated at the DFM (**table 1-1**).

**Table 1-1. Summary of Coal Shipment Reports at the DFM, 2011 through 2015**

| Year | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Mt of Coal Recovered | 5.77 | 6.01 | 5.43 | 5.37 | 6.37 |
| Percent Shipped In State | 79.2% | 90.5% | 86.1% | 96.5% | 98.0% |
| *Percent of In State Shipped to DFS* | *17.5%* | *33.8%* | *36.6%* | *39.9%* | *33.0%* |
| Percent Shipped Out of State | 20.8% | 9.5% | 13.9% | 3.5% | 2.0% |

Source: WFW 2016a

Producing at a 6.0 Mtpy coal mining rate is the current optimal mining rate for the DFM, and coal sales are expected to continue at that rate unless market conditions change. Typically, most of the sales are to power plants in the region. As seen on **Table 1-1**, the DFM shipped between 79 percent and 98 percent of its coal to power plants located in Wyoming during the period between 2011 and 2015. Since the DFS became fully operational in 2014, over 96 percent of DFM coal has been consumed in Wyoming. This trend of primarily selling coal to in-state power plants is expected to continue.

### 1.2.2 Project Background

DFM Permit No. PT0599 was most recently amended on August 19, 2013 to include Amendment 2 Tracts 1 and 2 areas. The amendment tracts were approved by the WDEQ-LQD with the following conditions:

1. The DFM may not mine coal from any federal coal lease prior to receiving approval from the Secretary of the DOI.
2. The DFM shall report any unanticipated discovery of cultural or paleontological resources to the WDEQ-LQD within 5 days. The DFM shall protect the site from further disturbance and consult with the WDEQ-LQD District III Field Office to insure that the resource is properly evaluated. Identified sites shall be protected from any disturbance until they have been evaluated and salvaged, if necessary.
3. Within 90 days of the permit term renewal approval, DFM shall contact the U.S. Fish and Wildlife (USFWS) for guidance on conducting surveys for mountain plovers, a proposed threatened species. If a survey is carried out and identifies suitable habitat for mountain plovers, Dry fork must submit a mitigation plan and

document approved by the USFWS. The plan must be formatted as a Non-Significant Revision for inclusion in the permit.

4. Within 90 days of each LQD approval revision for Permit No. PT0428 (Eagle Butte Mine) and Permit No. PT0232 (Wyodak Mine) which affects the "Dual Permitted Areas" between Permit Nos. PT0599 and PT0428, and Permit Nos. PT0599 and PT0232, DFM shall submit a revision to Permit No. PT0599. This revision application shall update and revise all text and maps associated with the "Dual Permitted Area" in order to bring Permit No. PT0599 into accord with the revised Permit No. PT0428 and Permit No. PT0232. The WDEQ-LQD District III Office shall notify DFM of the need to submit any such revisions.

Standard Conditions of WDEQ-LQD State Decision Document (SDD):

1. All operations shall be conducted in accordance with the approved mining and reclamation plan and any conditions of the permit or license;
2. The rights of entry shall be provided as described by the Act and any regulations promulgated pursuant thereto;
3. The operations shall be conducted in a manner which prevents violation of any other applicable State or federal law, and
4. All possible steps shall be taken to minimize any adverse impact to the environmental or public health and safety resulting in noncompliance with this approved mining and reclamation plan and other terms and conditions of any permit or license, including monitoring to define the nature of the noncompliance and warning of any potentially dangerous condition.
5. All reclamation fee shall be paid as required by Title IV, P.L. 95087, for coal produced under the permit for sale, transfer or use.

As seen on **map 1-2**, the A2Tr1 Tract is within the current DFM permit boundary. Until a decision regarding the federal mining plan modification request for the A2Tr1 tract is made, the DFM is continuing to mine federal coal from the portions of federal coal leases WYW-0271199, WYW-0271200 and WYW-0271201, WYW-5035 and WYW-0311810 approved in prior ASLM federal mining plan revisions, in accordance with conditions to WDEQ-LQD Permit No. PT0599.

### 1.2.3 Statutory and Regulatory Background

For new mining plans, OSMRE prepares a mining plan decision document (MPDD) in support of its recommendation to the ASLM (30 CFR Chapter VII, Subchapter D). For existing approved mining plans that are proposed to be modified, as is the case with this project, OSMRE prepares a MPDD for a mining plan modification request (30 CFR 746.13). The ASLM reviews the MPDD and decides whether or not to approve the mining plan modification, and, if approved, what, if any, conditions may be needed. Pursuant to 30 CFR 746.13, OSMRE's recommendation to the ASLM is based, at a minimum, upon

1. the PAP,
2. information prepared in compliance with NEPA, including this EA,
3. documentation illustrating compliance with the applicable requirements of federal laws, regulations and Executive Orders (EOs) other than NEPA,
4. comments and recommendations or concurrence from other federal agencies and the public,

5. findings and recommendations of the BLM with respect to the R2P2, federal lease requirements, and the Mineral Leasing Act of 1920 (MLA),
6. findings and recommendations of the WDEQ with respect to the mine permit application and the Wyoming State program, and
7. the findings and recommendations of the OSMRE with respect to the additional requirements of 30 CFR Chapter VII, Subchapter D.

In compliance with other federal laws, regulations and EOs, OSMRE also conducts consultation with other agencies before it makes its recommendation to the ASLM. This consultation includes the USFWS Section 7 consultation for threatened and endangered species potentially affected by the proposed mining plan under the Endangered Species Act of 1973 (ESA), and the Wyoming State Historic Preservation Office (SHPO) under the National Historic Preservation Act of 1966 (NHPA) Section 106 consultation for the affected area.

## 1.3 Purpose and Need

The purpose of the Proposed Action is established by the MLA and the SMCRA, which requires the evaluation of WFW's proposed mining plan modification for the DFM before conducting surface mining and reclamation operations to develop Federal coal lands included in Leases WYW-0271200 and WYW-0271201. OSMRE is the agency responsible for making a recommendation to the ASLM to approve, disapprove, or approve with conditions the proposed mining plan modification. The ASLM will decide whether the mining plan modification is approved, disapproved, or approved with conditions.

### 1.3.1 Purpose

The purpose of this action is to evaluate the environmental effects of coal mining on the proposed portions of federal coal leases WYW-0271200 and WYW-0271201 within the A2Tr1 area, which will assist OSMRE in developing a recommendation to the ASLM whether to approve, disapprove, or approve with conditions the federal mining plan modification.

### 1.3.2 Need

The need for this action is to provide WFW the opportunity to mine the federal coal obtained under federal coal leases WYW-0271200 and WYW-0271201 (issued by BLM) to access and mine these federal coal reserves located in the A2Tr1 area at the DFM. ASLM approval of the federal mining plan modification is necessary to mine the reserves.

## 1.4 Relationship to Statutes, Regulations, and Other Agency Plans

### 1.4.1 Statutes and Regulations

The following key laws, as amended, relate to the primary authorities, responsibilities, and requirements for developing federal coal resources:

1. MLA,
2. NEPA,
3. Mining and Minerals Policy Act of 1970 (MMPA),
4. Federal Coal Leasing Act Amendment, 1976 (FCLAA),
5. Federal Land Policy Management Act of 1976 (FLPMA),
6. SMCRA,
7. Multiple-Use Sustained Yield Act of 1960,

8. Endangered Species Act of 1973 (ESA),
9. Clean Air Act, as amended (CAA),
10. Clean Water Act (CWA),
11. Safe Drinking Water Act, as amended (SDWA),
12. National Historic Preservation Act, as amended (NHPA),
13. American Indian Religious Freedom Act of 1978 (AIRFA),
14. Paleontological Resources Preservation Act of 2009 (PRPA), and
15. Migratory Bird Treaty Act of 1918, as amended (MBTA).

In addition, this EA follows guidance in DOI 516 Department Manual (DOI 2004), which, as outlined in 43 CFR Part 46 (U.S. Government Publishing Office [GPO] 2011), is the DOI manual guiding the implementation of the NEPA process. An MPDD will be prepared and submitted to the ASLM for the reconsidered federal mining plan modification.

The MLA and FCLAA provide the legal foundation for the leasing and development of federal coal resources. BLM is the federal agency delegated the authority to offer federal coal resources for leasing and to issue leases. The MMPA declares that it is the continuing policy of the federal government to foster and encourage the orderly and economic development of domestic mineral resources. In that context, BLM complies with FLPMA to plan for multiple uses of public lands and determine those lands suitable and available for coal leasing and development. Through preparation of land use plans and/or in response to coal industry proposals to lease federal coal, BLM complies with NEPA to disclose to the public the potential impacts from coal leasing and development, and also complies with the NHPA, CAA, CWA, ESA, and other applicable environmental laws to ensure appropriate protection of other resources. BLM then makes the federal coal that is determined suitable for coal development available for leasing. BLM also is responsible for ensuring that the public receives fair market value for the leasing of federal coal. Once a lease is issued, BLM ensures that the maximum economic recovery of coal is achieved during the mining of those federal leases and ensures that waste of federal coal resources is minimized through review and approval of a mine's R2P2 as required under the MLA. BLM implements its responsibilities for leasing and oversight of coal exploration and development under its regulations at Public Lands, Subtitle B, Chapter II, BLM, DOI, Subchapter C – Minerals Management (43 CFR Parts 3400-3480).

SMCRA provides the legal framework for the federal government to regulate coal mining by balancing the need for continued domestic coal production with protection of the environment and ensuring the mined land is returned to beneficial use when mining is finished. OSMRE was created in 1977 under SMCRA to carry out and oversee those federal responsibilities. OSMRE implements its MLA and SMCRA responsibilities under regulations at Mineral Resources, Chapter VII – OSMRE, DOI (30 CFR Parts 700-End).

As provided for under SMCRA, OSMRE works with coal producing states and tribes to develop their own regulatory programs to permit coal mining. Once a regulatory program is approved for a state or tribe, OSMRE steps into an oversight role. OSMRE approved the State of Wyoming's coal regulatory program on November 26, 1980 (30 CFR 950.10). As a result, the WDEQ-LQD manages its own program under the Wyoming Environmental Quality Act (Sections 35-11-101 through 35-11-1104, Wyoming Statutes, 1977, as amended). LQD has the authority and responsibility to make decisions to approve surface coal mining permits and regulate coal mining in Wyoming under Regulations of the Environmental Quality Council (EQC) and the

Administrator of the WDEQ-LQD with oversight from OSMRE. The Cooperative Agreement between OSMRE and LQD allows the LQD to regulate surface coal mining on federal lands or leases while OSMRE continues to carry out its obligations under the MLA, NEPA and other public laws (30 CFR 950.30) which includes the recommendations related to mining plans and mining plan modifications.

The PRPA requires the secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The PRPA includes specific provisions addressing management of these resources by the BLM, the National Park Service (NPS), the Bureau of Reclamation (BOR), the USFWS, and the U.S. Forest Service (USFS).

### 1.4.2 Other Agency Plans

The Project is within the BFO, which manages 780,291 acres of public lands and 4,731,140 acres of mineral estate within Campbell, Johnson and Sheridan counties in north-central Wyoming, including BLM-managed mineral estate in the project area. As required by FLPMA, BLM periodically prepares and revises land use plans to determine those uses that are suitable and compatible on specific portions of public lands, and under what conditions those uses would be authorized to mitigate potential impacts on other resource values and protect human health and safety.

No existing BLM management plans (Resource Management Plans [RMP] or Management Framework Plans [MFP]) were available when DFM federal coal leases WYW-0271200, WYW-0271201, WYW-5035, and WYW-0311810 were issued. MFPs were BLM's land-use management plans utilized to administer public lands in Wyoming prior to 1985. These management plans were replaced in 1985 by the RMP concept for managing public lands. To the extent possible, the DFM federal coal leases were evaluated as part of the 1974 BLM Final Environmental Impact Statement Eastern Powder River Coal Basin of Wyoming (BLM 1974), the 1981 Powder River Final Environmental Impact Statement Coal (BLM 1981), the 1984 Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region (BLM 1984), and the September 2015 Record of Decision (ROD) and approved Resource Management Plan (RMP) and associated land use plans for the Rocky Mountain Region Greater Sage-Grouse Conservation Strategy (BLM 2015a, and 2015b, respectively).

Since the DFM leases were issued by the BLM prior to the existence of an RMP or Management Framework Plan (MFP) for the BFO, the leases were issued based on valid existing rights (VER). The VER lease process conveyed certain rights of development to the leaseholder without stipulations, unless there was consent of both the lessee and lessor. Conditions of Approval (COAs) and/or Best Management Practices (BMPs) required by the BLM in accordance with the newer RMPs would need to be consistent with the VER granted in existing leases. In this context, BLM made subsequent and periodic decisions regarding readjustment of the lease terms for each lease as required under the MLA and FCLAA. For each readjustment decision, BLM determined whether the lease terms were in conformance with the land use plan in effect at the time. In several cases the BLM, with the concurrence of WFW (or its predecessor), added stipulations to the lease adjustments to align the leases with the RMP in place at the time.

On January 10, 2011, the BLM Casper Field Office (CFO) approved the R2P2 for the DFM, which included mining all the reserves in A2Tr1. In a letter dated June 29, 2012, the WDEQ-LQD

provided information to the BLM CFO as part of the 2011 Amendment 2 approval process. In a reply dated July 20, 2012, the BLM CFO approved the pending application to mine Amendment 2.

## 1.5 Authorizing Actions

A state permit approved by the WDEQ-LQD and a federal mining plan or mining plan modification approved by the ASLM are needed for a coal mine operator to conduct mining operations on lands containing leased federal coal in Wyoming. On August 19, 2013, WDEQ-LQD issued a SDD approving with conditions mining in the project area, as described in **section 1.2.3**. The WDEQ-LQD approval included the requirement that the ASLM must approve the mining plan modification before mining of federally leased coal can begin.

In accordance with 30 CFR 746.13, OSMRE will prepare and submit an MPDD to the ASLM recommending approval, approval with conditions, or disapproval of the federal mining plan modification. The MPDD will include this EA, which includes consultation with federal and state agencies, Native American tribes, local governments, and the public; the consideration of alternatives and the potential effect of the Project on the environment and the public; the determination of whether the potential effects of the Project and alternatives considered are significant; and the determination that the proposed action complies with other applicable federal laws and executive orders.

## 1.6 Outreach and Issues

A scoping process was conducted during which public comments were solicited. OSMRE published legal notices of intent (NOIs) in the Gillette News Record on March 9 and March 23, 2016 (**appendix A**). The notices described the Project in summary form and informed the public that scoping comments would be accepted until April 8, 2016. Outreach letters were mailed on March 8, 2016 to Native American tribes, federal and state agencies, city and county governments, elected officials, adjacent landowners, and other interested parties. On March 9, 2016, OSMRE made a project website available that provided project information and comment opportunities. The public scoping comment letters are included in **appendix B** and the summarized issues included

1. the effects on the economic impacts of the mining operation on the state and local economies including jobs and revenues generated from mining,
2. the effects on wildlife, including impacts on threatened and endangered species, assessing the MBTA, and guidelines to reduce impacts on birds,
3. the effects on and protection of wetlands,
4. the need to continue to provide coal resources to the area power plants to generate affordable and reliable electricity, and
5. the need to continue appropriate WDEQ-LQD reclamation standards and to continue to provide annual wildlife monitoring reports.

OSMRE's A2Tr1 project website continues to be updated periodically as additional information on the Project becomes available.

Comments received during and after the comment period were evaluated for relevance in preparing this EA. **Table 1-2** summarizes the comment topics by resource category.

**Table 1-2. Public Outreach Comments Categorized by Key Resource Category**

| Comment Category | Number of Topics Discussed | % of Total Comments |
|---|---|---|
| Wetlands | 1 | 3% |
| Reclamation | 1 | 3% |
| Threatened and Endangered Species | 1 | 3% |
| Support Coal-fired Power Generation | 2 | 7% |
| Wildlife | 3 | 10% |
| General Support without Specific Topic | 6 | 21% |
| Economic Impacts to Local/State | 15 | 52% |
| Total | **29** | **100%** |

The majority of the comments received (21 of 23) during the public outreach period were general support letters received from a variety of individuals, and letters requesting this EA heavily weigh the economic impacts of mining to the state and local communities. The WGFD requested this EA ensure that the mine continues the wildlife monitoring protocol and annual LQD reporting, as well as continue to adhere to the WDEQ-LQD approved reclamation standards. The USFWS provided a reference to threatened, endangered, and candidate (T&E) species needing review, and a reminder to review the Project relative to responsibilities under the MBTA, wetlands, and avian protection procedures.

The comments made in support of DFM asked that the economic impacts of the mine to the local and state community be discussed. Economic impacts were discussed in nearly every comment of support for DFM. One commenter asked that this EA address the positives of jobs and revenues generated by mining, the need to provide coal for area power plants, and the good record of the mine. Additional comments were submitted supporting the Project without specific focus on any one subject. All substantive comments received have been considered and included as appropriate in the preparation of this document.

# 2.0 Proposed Action and Alternatives

This chapter provides background information on the existing operations at the DFM, and describes the Proposed Action and the No Action Alternative. Alternatives that were considered, but eliminated from detailed analysis are also discussed. A more complete description of DFM's existing mining and reclamation methods can be found in the PAP. WFW submitted the PAP to WDEQ-LQD on January 13, 2012, which was approved on August 19, 2013. The latest permit renewal for Permit No. PT0599 was issued effective May 12, 2014. The PAP and state permit renewal are available at the DFM Office at 3629 N. Garner Lake Road, Gillette, Wyoming, 82716; WDEQ-LQD at 200 West 17th Street, Suite 10, Cheyenne, Wyoming, 82002; and the OSMRE Western Region Office located at 1999 Broadway, Suite 3320, Denver, Colorado, 80202.

## 2.1 DFM WDEQ-LQD Permit

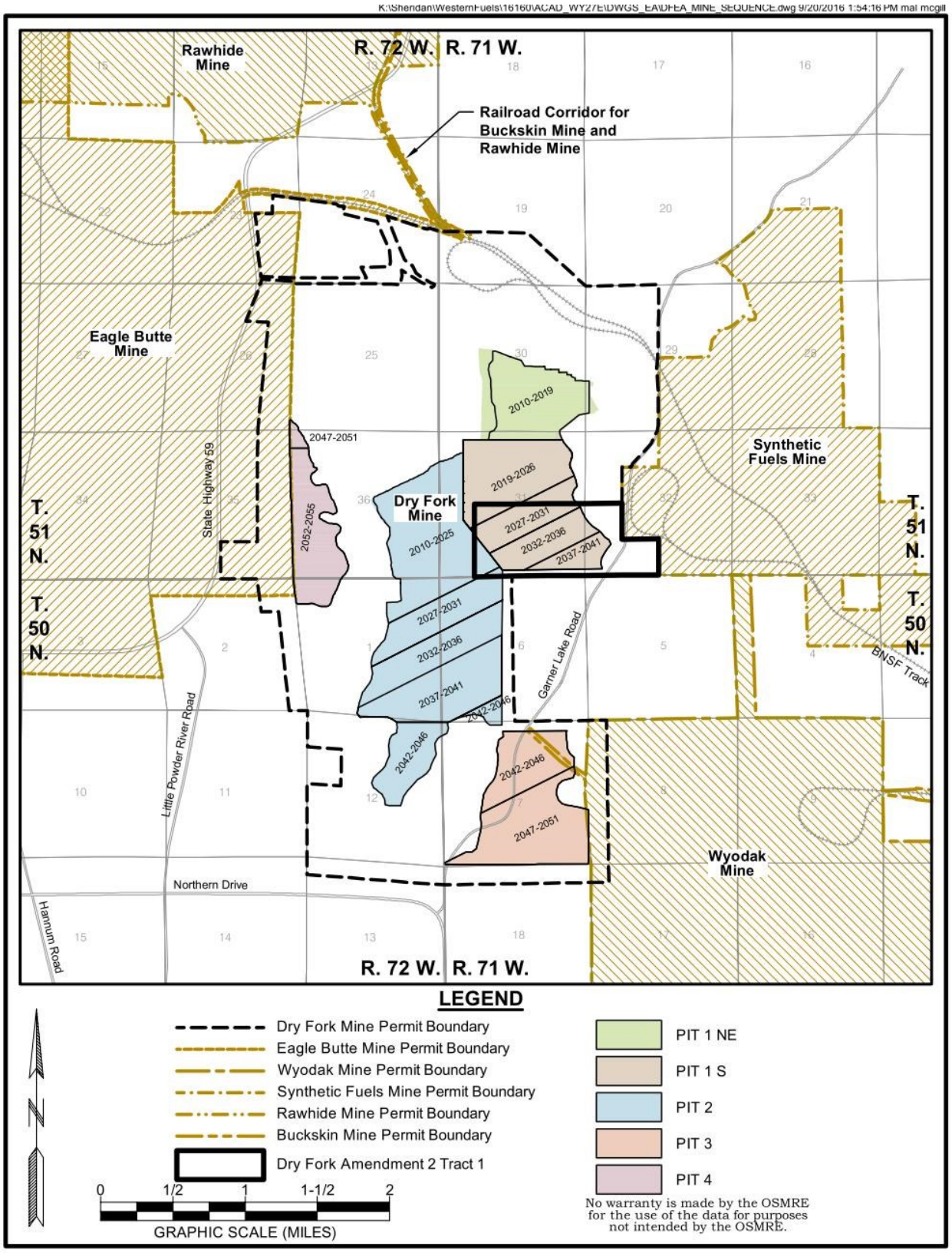
WFW operates the DFM in accordance with WDEQ-LQD issued Permit No. PT0599 (**map 2-1**). As currently permitted, the DFM permit area includes a total of approximately 6,477.48 acres, of which approximately 4,364.8 are currently permitted for mining disturbance. The currently approved DFM permit boundary includes the entire A2Tr1 tract. While WDEQ-LQD approved the Amendment 2 permit revision, a condition was included that the DFM may not mine coal from any federal coal lease within the permit boundary prior to receiving approval from the Secretary of the DOI. WFW owns or controls the surface estate and coal resources within the DFM permit boundary. The surface ownership includes 5,613.42 acres of private surface, 39.43 acres of federal surface, and 824.63 acres of state surface (WDEQ-LQD 2014a). The coal ownership includes 195.3 acres of private coal, 5,541.5 acres of federal coal, and 740.7 acres of state owned coal. All mineable coal within the permit boundary is currently leased by WFW. Surface and mineral estate within the A2Tr1 tract is discussed in detail in **section 3-10**.

Environmental studies for the DFM began during 1978. WDEQ-LQD originally approved Permit No. PT0599 on April 13, 1989, and mining operations began in 1989. **Section 1.2** discusses the various additions of other permitted lease areas to the DFM. Permit renewals approved under WDEQ-LQD regulations are for a 5-year permit term and the permit must be renewed every 5 years, updating the application with new information and planned changes in the mining or reclamation activities. Permit No. PT0599 for the DFM has been approved for renewal six times since 1989. The current approved permit term (T6) for operations at the DFM is from April 13, 2014 to April 12, 2019.

Changes to the state mining plan occurring during the 5-year permit term must be approved by WDEQ-LQD through a revision. Each time a permit revision is approved by WDEQ-LQD, the appropriate changes are made to the PAP so that the PAP remains current with the mining and reclamation plans.

## 2.2 Project Area

The project area for this EA is identified as the A2Tr1 tract and is located within portions of federal coal leases WYW-0271200 and WYW-0271201 that lie within the central/eastern portion of the DFM permit boundary (**map 1-2**). As determined from BLM Master Title Plats, the project area is approximately 364.48 acres (BLM 2010).




**Map 2-1. Dry Fork Mine's Mining Sequence at 6.0 Mtpy**

This EA includes OSMRE's assessment of the environmental impacts of WFW's request to modify the DFM federal mining plan to include the federal coal in the A2Tr1 tract. The analysis considers the full extent of disturbance contemplated over the LOM. **Chapter 1.0** provides a detailed discussion regarding the status of current coal leases associated with the DFM permit area, including the status of leases within the project area.

Prior to ownership by WFW, the project area was homesteaded and was leased at various times for oil and gas recovery and associated pipelines and power lines. There is one active oil well on the property. There are several small livestock ponds and some fields were dryland farmed and inter-seeded with cropland species. As presented on **map 2-1**, the Garner Lake Road (County Road 38N) bisects A2Tr1. The lower 33.7 acres of the tract were previously disturbed by mining under the Fort Union permit prior to ownership of lease WYW-5035 by WFW. The area was disturbed for a coal haul road used by WCRC to haul coal related to WYW-5035, to what is now known as the Synthetic Fuels Mine loadout facility. The 33.7 acres disturbed by WCRC have been reclaimed. The reclaimed area and active oil well pad are indicated on **map 2-2**.

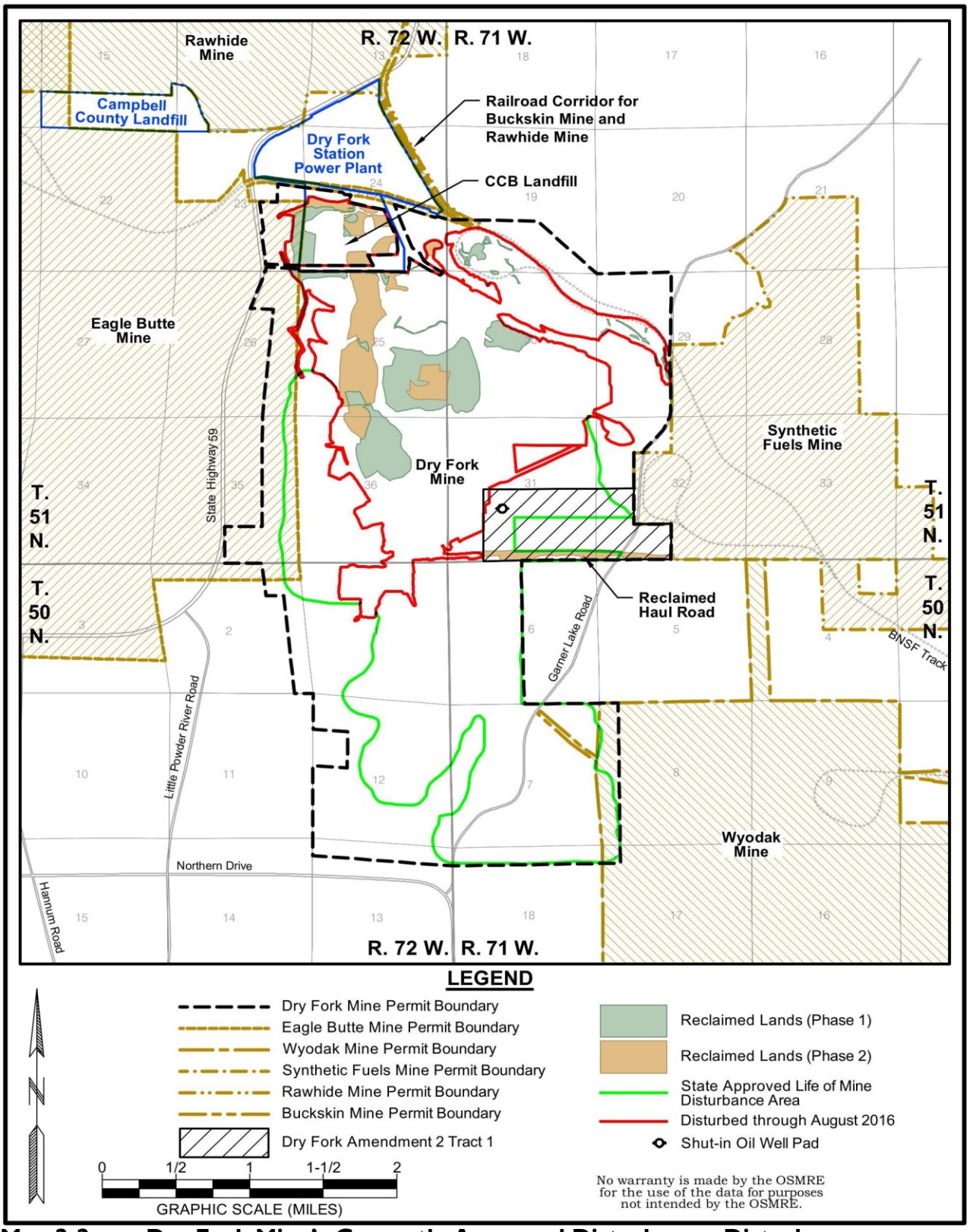
## 2.3 Description of Existing Mining and Reclamation Operations

The DFM is an open-pit, sub-bituminous coal mine, located approximately 5 miles (8 km) north of the City of Gillette, in Campbell County, Wyoming, and the mine is accessed via the Garner Lake Road (**map 1-2**). Development of the DFM began in the late 1960's with exploration drilling and continued with acquisition of state and federal coal leases, water rights, and permits to operate. Construction of mine facilities began in 1989 and mining operations began in 1989. The first coal was shipped in 1990.

WFW currently employs approximately 82 people and estimates that the average production rate at the DFM would continue at the approximate current rate of 6 Mtpy. The DFM's current Air Quality Permit No. MD-11723 allows a maximum coal production of 15 Mtpy (WDEQ-AQD 2011). Through the end of 2015, an estimated 104.2 Mt of federal, state and private coal has been recovered at the mine.

Operations at the DFM are conducted in accordance with applicable laws and regulations including SMCRA, the WEQA, WDEQ-LQD rules and regulations, and the WDEQ-LQD approved PAP. The PAP, including approved revisions, provides the most complete descriptions of mining, environmental protection measures, and reclamation activities within the project area for the LOM and, as such, is used and referenced by this EA. Coal is mined and either conveyed to the adjacent DFS or shipped from an onsite railroad loading facility to electric utilities and industrial customers in the United States (WFW 2016a).

Coal recovery at the DFM is conducted using conventional surface mining techniques. Vegetation would be removed in new disturbance areas in conjunction with topsoil removal, followed by blasting and removal of the overburden, overburden/interburden, and coal; pit backfilling; and reclamation. Mining uses a combination of loaders, trucks, and dozers to remove overburden and recover coal using conventional multiple bench techniques. Backfilling is completed as soon as safely possible, once the coal has been removed from an active pit. After the pit has been backfilled and mining has progressed away from the mined-out pit, the backfill material is rough graded using dozers in preparation for reclamation. In most cases, rough grading of the backfill begins within 60 days of its placement into the final lift. Rough grading of the backfill is important




**Map 2-2. Dry Fork Mine's Currently Approved Disturbance, Disturbance Through August 2016, and Reclamation by Bond Release Phase**

in reducing risk of pit flooding by directing water that might pool in the backfill away from the active pit.

After rough grading, final grading is conducted to blend the backfilled areas with the surrounding topography, create a reclaimed area in accordance with WDEQ-LQD approved post-mine topography (PMT), and construct drainage patterns. After the area is graded to the approved PMT, it is tested for spoil suitability. If it is suitable, the area is then prepared for topsoil placement and seeding.

The DFM's overall reclamation objectives are to reclaim the disturbed areas to the approved post-mining land uses of cropland, livestock grazing, or wildlife habitat. Through September 12, 2016, mining at the DFM has disturbed approximately 2,103 acres, and a total of 588 acres have been reclaimed since the start of mining, using approved seed mixes suitable for livestock grazing and wildlife habitat. Revegetation of all tracts is monitored until the vegetation establishment meets the approved standards provided in the PAP.

In addition to land formerly reclaimed, an additional 291 acres have been temporarily seeded, which are used by wildlife, with some agricultural use. The temporarily seeded areas include long-term topsoil storage areas and hydrologic control structures. Including the permanently reclaimed areas and the temporarily reclaimed lands, approximately 879 acres, or about 42 percent of the total disturbed area, is used by wildlife and sustains some agricultural use.

The DFM was not a mine mouth operation prior to 2011, as all coal sales were shipped out via rail. In 2011, the DFS was opened adjacent to and outside (north of) the DFM permit boundary (**map 2-2**) and the DFM became the long-term, sole-source coal supplier for the DFS. At the current 6.0 Mtpy mining rate, approximately 33 percent of the coal produced from the DFM is conveyed to the adjoining DFS silos.

While no coal-processing waste is generated from activities at the DFM, the mine is permitted to take the coal combustion byproduct (CCB) wastes from the DFS (**map 2-2**). CCBs are utility wastes generated during the burning of coal and include fly ash, bottom ash, and scrubber sludge. An estimated 100,000 tons annually are placed at the DFM in an area located within the DFM permit boundary, but outside of the project area. CCB waste is in dry form (not a slurry), and is hauled via belly or side dump trucks from the DFS to the active disposal cell. CCB waste is laid in the cells in lifts, watered for dust control, and compacted with the water to harden the ash to a concrete form. Runoff from cells drains to a lined pond where it is stored for use for dust control in the ash landfill. CCBs from DFS are in the process of being tested for use in cement products, wallboard, or as road base.

### 2.3.1 Current Bonding and Bond Release Status

SMCRA provides that, as a prerequisite for obtaining or modifying a coal mining permit, permittees must post a reclamation bond to ensure that the regulatory authority would have sufficient funds to reclaim the site if the permittee fails to complete obligations set forth in the approved reclamation plan (OSMRE 2016). The bond is made payable to the State of Wyoming and OSMRE and covers performance of all requirements contained in regulations, the PAP, and the WDEQ-LQD reclamation plan. A bond must remain in place until reclamation is completed in accordance with the regulatory requirements and permit documents, and to the satisfaction of the regulatory authorities. The bond is based on the cost of having a third-party contractor complete the required reclamation work if for some reason WFW is unable to do so.

Reclamation liabilities at the DFM, as calculated by WDEQ-LQD as part of the annual report for Permit No. PT0599, are $26.7 million (WDEQ 2016). The DFM is self-bonded, with the bonding guaranteed by Basin Electric Power Cooperative and Tri-State Generation and Transmission Association in the amount of $29.4 million to cover all reclamation liabilities at the DFM (WDEQ-LQD 2013).

As outlined in WDEQ-LQD Guideline No. 20 (Bond Release Categories and Submittal Procedures for Coal Mines), there are four types of bond release, based on completion of certain portions of the reclamation plan (WDEQ-LQD 2014b). The four types of bond release lands disturbed by coal mining are

1. area bond release (rough backfilling has been completed),
2. Phase 1(backfilling, regrading, topsoil replacement, recontouring, and drainage control of a bond area, in accordance with the approved reclamation plan, has been completed,
3. Phase 2 (when the reclamation plan for any affected land has been completed), and
4. Phase 3 (occurs once all surface coal mining and reclamation activities have been completed in accordance with the requirements of SMCRA, the Wyoming regulations, and the PAP, and no fewer than 10 years have passed since the completion of seeding.

Bond release is successive, meaning that reclaimed land must achieve Phase 1 bond release before being eligible for Phase 2 and must achieve Phase 2 bond release before being eligible for Phase 3. Each successive phase of bond release is a subset of the previous phase.

WFW has received approval for Phase I bond releases for areas within the DFM permit boundary, and in the project area. **Map 2-2** shows the reclaimed areas by bond release phase within the project area and **table 2-1** provides acreages for each phase of bond release within the DFM.

**Table 2-1. Summary of Phased Bond Release Acreages in the Project Area**

| Phased Bond Releases Status[1] | Mine Wide | Percent of Total | Specific to the A2Tr1 | Percent of Total |
|---|---|---|---|---|
| Current[2] Total Acres Disturbed | 2,103 | -- | 33.7 | 1.6% |
| Current[2] Total Acres Reclaimed | 588 | 28% | 33.7 | 5.7% |
| Acres That Have Achieved Phase 1 Bond Release | 568 | 27% | 33.7 | 5.9% |
| Acres That Have Achieved Phase 2 Bond Release | 265 | 13% | 33.7 | 12.7% |
| Acres That Have Achieved Phase 3 Bond Release | 0 | 0% | 0 | 0% |

[1] Area Bond Release has been obtained
[2] As of September 12, 2016

### 2.3.2 DFM Support Facilities

Mining activities are supported by existing, permitted facilities located within the DFM permit boundary and include facilities buildings, coal handling facilities, and ancillary facilities (roads, ponds, power lines, etc.). Other facilities not considered as the main facilities described above include the train loadout, railroad loop, explosives storage area, scoria pits, landfarm, sediment control ponds and diversions, the access road and miscellaneous haul roads and light use roads.

## 2.4 Description of Alternatives

Descriptions of the alternatives analyzed by this EA are discussed below and a summary comparison of coal production, surface disturbance, mine life, and employees under the No

Action Alternative and Proposed Action as of December 31, 2015 is provided in **table 2-2**. The No Action Alternative would leave operations as currently stated in the currently approved federal mining plan. The Proposed Action would add additional coal associated with federal leases WYW-0271200 and WYW-0271201. These scenarios are described in greater detail, below.

**Table 2-2. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Employees for the Current WDEQ-LQD Permit No. PT0599, the No Action Alternative, and the Proposed Action as of December 31, 2015**

| Item | Current DFM Permit No. PT0599 | Current OSMRE Federal Mining Plan (No Action Alternative) | Projections Under Proposed Action |
|---|---|---|---|
| Remaining Recoverable Leased Coal[1] | 190.3 | 190.3 Mt | 222.3 Mt |
| Total Area to Be Disturbed | 4,364.8[2] | 4,058.7 acres | 4,365.1 acres[2] |
| Estimated Average Annual Production | 6 Mt | 6 Mt | 6 Mt |
| Remaining Years from Recovering All Leased Coal | 37.1 | 31.7 yrs. | 37.1 yrs. |
| Average Number of Employees | 82 | 82 | 82 |

[1] Includes federal, state, and private coal leases
[2] Table MP-9, Permit 599

### 2.4.1 Proposed Action

Under the Proposed Action, OSMRE would prepare a MPDD recommending approval of the WFW's federal mining plan modification request to include the federal coal within the A2Tr1 tract associated with federal leases WYW-0271200 and WYW-0271201 and the ASLM would approve the federal mining plan modification. The mine would use similar mining and reclamation methods as described in **section 2.3**. The operations within the proposed 364.5-acre project area are estimated to disturb a total of 306.4 acres. Of that total, 276.8 acres are considered lands unaffected by mining and 26.4 acres are re-disturbance of reclaimed land. An area of 3.2 acres was disturbed through end of year (EOY) 2015 as approved in support of the adjoining ongoing permitted mining activities and approximately 9.7 acres of the 276.8 acres of lands unaffected by mining are non-mining related disturbance associated with oil wells, farming, and oilfield roads.

Approving the Proposed Action would add 32 Mt of recoverable federal coal to the mine. **Table 2-3** shows the effects of adding Proposed Action reserves on the estimated LOM under 6-Mtpy and 15-Mtpy scenarios.

**Table 2-3. Mine Life Scenarios for the Proposed Action**

| Production Rate Scenarios | Current Anticipated LOM | Estimated Years Extended[1] | Anticipated LOM with the Proposed Action |
|---|---|---|---|
| 6.0 Mtpy | 09/2047 | 5.3 | 01/2053 |
| 15.0 Mtpy[2] | 09/2028 | 2.1 | 10/2030 |

[1] Estimated using tons of additional recoverable coal (32 Mt)
[2] The maximum production permitted under DFM's current Air Quality Permit No. MD-11723

#### *2.4.1.1 Mine Operation Components within the Project Area Associated with the Proposed Action*

**Map 2-1** shows the projected coal recovery sequence in the Proposed Action, at the 6.0 Mtpy mining rate. The Proposed Action would consist of the following mine components and facilities located within the project area. The major pit facilities indicated below are also shown on **map 2-1**:

1. Pit 1 is a currently active open pit operating in federal lease WYW-0271201 and WYW-0271199. At the 6.0 Mtpy projected mining rate, this pit would be recovering coal from the A2Tr1 area from 2023 through 2041.
2. Pit 2 is a currently active open pit operating in federal lease WYW-0271201 and state lease 0-26652. At the 6.0 Mtpy projected mining rate, this pit would be recovering coal in the A2Tr1 area during years 2020 through 2030.
3. Existing 120-volt power lines would provide power to facilities within the project area.
4. Support facilities necessary to conduct mining operations within the project area would include
   - haul roads used by haul trucks to transport coal to the DFM truck dump hopper, or move overburden and connect with in-pit roads and ramps;
   - temporary light use ancillary roads;
   - temporary in-pit ramps and roads;
   - temporary stockpile areas to store topsoil removed from disturbed areas for use in reclamation;
   - temporary berms for control of water, material placement, or traffic;
   - dewatering wells and associated waterlines;
   - temporary construction staging areas;
   - environmental monitoring stations for air and water monitoring; and
   - Sediment ponds and diversion ditches.

#### *2.4.1.2 Existing and Proposed Disturbance within the Project Area*

The Proposed Action would include mining related disturbance in the A2Tr1 tract, with topsoil salvage anticipated to occur between years 2016 and 2036 and coal removal projected to occur in the project area between years 2020 and 2041. All acreages for disturbance and reclamation used in this EA are based on the disturbance and reclamation status as of the EOY 2015. **Table 2-4** summarizes the total projected mining related surface disturbance in the A2Tr1 project area, by disturbance class. The overall disturbed areas for the Proposed Action are shown on **map 2-2**.

Coal recovery within the project area will require disturbing a total of 306.4 acres within the 364.5-acre project area. The existing WDEQ-LQD issued Permit No. PT0599 has approved a disturbance of 4,364.8 acres, which includes 306.4 acres of disturbance associated with the tract. The WDEQ-LQD approved disturbance is contingent on approval of the federal mining plan modification by the ASLM (WDEQ-LQD 2014a).

**Table 2-4. Summary of Mining Related Surface Disturbance in Project Area**

| Row | Disturbance Class[1] | Acreage |
|---|---|---|
| *A* | ***Total Project Area*** | ***364.5*** |
| B | Previously Disturbed and Reclaimed Acres as of EOY 2015 | 33.7 |
| C | Previously Disturbed and Not Reclaimed Acres as of EOY 2015 | 3.2 |
| *D* | ***Previously Disturbed within Project Area (Row B + Row C)*** | ***36.9*** |
| *E* | Proposed New Disturbance Associated with the Proposed Action | 276.8 |
| F | Proposed Redisturbance Associated with the Proposed Action | 26.4 |
| *G* | ***Total New Proposed Disturbance Associated with the Proposed Action ( Row E + Row F)*** | ***303.2*** |
| *H* | ***Total Disturbance within the Project Area (Existing Unreclaimed and Proposed) (Row C + Row G)*** | ***306.4*** |
| *I* | ***Surface Disturbance within Project Area Permitted Under Previous Approvals*** | ***152.6*** |
| *J* | ***New Surface Disturbance Associated with the Proposed Action (Row H – Row I)*** | ***153.8*** |

[1] Excludes non-mining disturbances, such as oil wells, roads, farming activities.

#### *2.4.1.3 Mining Operations Associated with the Proposed Action*

Mining operations associated with the Proposed Action would continue to be conducted in a similar manner as described for existing operations in **section 2.3**. Vegetation would be removed in new disturbance areas followed by topsoil removal, blasting of the overburden, overburden/interburden and coal removal, pit backfilling, and reclamation. **Table 2-5** provides additional information on the projected total tons of recoverable coal in Pits 1 and 2 within the project area.

**Table 2-5. Proposed Project Area Mine Plan**

| Mine Pit | Coal Recovery Area (Acres)[1] in Acres | Estimated Recoverable Federal Coal Tons[2] | Estimated Period of Mining Years |
|---|---|---|---|
| Pit 1 | 249 | 29,708,942 | 2023-2041 |
| Pit 2 | 19 | 2,254,727 | 2020-2030 |
| Total | 268 | 31,963,670 | 2020-2041 |

[1] From EOY 2015, through LOM (estimated 2054 at 6 Mtpy mining rate), from coal blocks shown on map 2-2.
[2] From "Application for Approval of a Revised Resource Recovery and Protection Plan for DFM, September 2010", approved January 5, 2011.

### 2.4.2 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved by the ASLM and WFW would continue to operate under the currently approved federal mining plan. Under this alternative, OSMRE would not recommend approval or approval with conditions of the federal mining plan modification and the ASLM would issue a decision based on the No Action Alternative. If the ASLM does not approve the federal mining plan modification to allow recovery of federal coal in the proposed project area, WFW would continue to mine according to the most recent federal mining plan.

If the No Action Alternative is selected, WFW would bypass the coal in the project area, resulting in 32 Mt of federal coal not being recovered and 117.4 acres of previously undisturbed ground not being disturbed. The No Action Alternative would require revisions to the WDEQ-LQD approved Permit No. PT0599 and the BLM approved R2P2 to modify the reclamation plan,

maximum economic recovery conditions, and coal recovery plans for areas within boundaries of the Permit No. PT0599 by excluding mining activities within the A2Tr1 tract. Economic and social impacts of the No Action Alternative are discussed in **section 4.17**.

### 2.4.3 Alternatives Considered but Eliminated from Further Study

OSMRE considered alternative scenarios to the approval or denial of the federal mining plan modification. However, since OSMRE's decision would be limited to approving, approving with conditions, or denying the mining plan modification, OSMRE concluded that there are no other reasonable action alternatives to the Proposed Action that would meet the agency's purpose and need. The following alternatives were considered but eliminated from detailed analysis. The discussions include reasons the alternatives were eliminates from detailed analysis.

#### *2.4.3.1 Underground Mining Alternative*

An alternative to require WFW to use underground mining methods to extract the coal was identified in public comments received during the outreach period for similar recent projects. It was considered by OSMRE for this project, and eliminated from detailed study because WDEQ-LQD has approved a surface mining permit for this project using surface mining techniques, and underground mining is inconsistent with the approved permit. The purpose and need for this EA is predicated upon review of a surface mining plan included as part of the WDEQ-LQD approved surface mining permit. An Underground Mining Alternative would, thus, be inconsistent with the Purpose and Need for this action.

This alternative also would be economically infeasible. The facilities and equipment needed for underground mining are different from surface mining. Because the infrastructure for underground mining is not in place at the DFM, new infrastructure for underground mining would need to be constructed. The capital expenditure to develop an underground mine would be prohibitive. In addition, all new surface facilities would need to be constructed, including, but not limited to, conveyors, coal stockpiles, and maintenance and support facilities. In addition, all new underground mining equipment would need to be purchased, such as, but not limited to, a long wall mining system, conveyor systems, drives and power stations, vehicles for transporting workers and supplies, several continuous miners, shuttle cars, large and small ventilation fans, and roof bolters.

Underground mining of the coal seams at the DFM is not a method approved by the BLM in the approved R2P2 for the mine. Proposing to mine the seams by underground mining methods would require a new R2P2 to be developed and approved by the BLM prior to permitting with WDEQ-LQD. The coal recovery would be significantly reduced, resulting in noncompliance with the goals of the BLM to maximize coal recovery in approved leases. There is very little chance the BLM would approve this option.

Underground mining of the coal seams at the DFM is additionally not a method authorized by the mine's Mine Safety and Health Administration (MSHA) required ground control plan. Proposing to mine the seams by underground mining methods would require a new ground control plan to be developed and approved by MSHA prior to permitting with WDEQ-LQD. This would take years of study prior to submittal of the permit. Given the shallow overlying sedimentary geologic strata, it is unlikely an acceptable and adequately safe underground mining plan could be permitted with MSHA.

Mining the large (60 feet – 100 feet thick) coal seams in the Wyoming Powder River Basin using conventional underground mining techniques is not conducted, therefore detailed cost or

feasibility analysis is not readily available. This alternative was not brought forward for analysis because underground mining would not respond to the purpose and need for this action, is not in conformance with the maximum economic recovery requirements of the federal coal leases and the R2P2, and would result in a prohibitive economic burden on the mine. Given these factors, bringing this alternative forward for further review would not be reasonable.

#### *2.4.3.2 Low or No Pollutant Emitting Equipment*

Public comments received during the outreach period for similar recent projects suggested considering an alternative that required reduced air emissions at the mine by changing or modifying mining related equipment to equipment which would produce lower air emissions. As described in **section 3.4.7**, the DFM is a relatively small contributor of the emissions related to engine combustion (primarily carbon dioxide [$CO_2$] and oxides of nitrogen [$NO_X$]) in the region.

The cost to make the switch to equipment powered by a different fuel (such as natural gas or solar powered equipment) for recovery of 32 Mt of federal coal would be cost prohibitive for the minimal benefit to the regional air quality. In addition, the use of natural gas powered engines in mining equipment is relatively new and some types of equipment would not be available for replacement with natural gas powered engines. The use of solar power to run large equipment has not been tested and is not considered technologically feasible at this time. Similarly, retrofitting existing equipment with additional emissions control devices would be expensive with limited effect on regional air emissions.

OSMRE has not brought forward this alternative for full analysis because requiring natural gas and solar powered engine technology and retrofitting existing equipment is not economically or technologically feasible for all equipment at the DFM; and would likely have substantially similar effects to an alternative that is analyzed. Given these factors, bringing this alternative forward for further review would not be reasonable.

#### *2.4.3.3 Air Quality Mitigation Alternatives*

Some public comments received during the outreach period for similar recent projects suggested that OSMRE consider alternatives that mitigate air quality impacts, specifically by imposing more stringent emission limits at power plants fueled by the DFM and by requiring oil and gas operators in the region to reduce their emissions. These proposals are not alternatives to the mining plan being considered. The effects of coal combustion are analyzed in the Proposed Action as well as in the No Action Alternative because they are considered to be indirect effects. CEQ regulations at 40 CFR 1508 (b) define "indirect effects" as those which are caused by the proposed action and are later in time or farther removed in distance, but are still reasonably foreseeable. These indirect effects would occur as a result of burning the coal that is mined. The analysis concluded impacts to air resources under the Proposed Action would be minor and there would not be significant impacts to air resources under the Proposed Action and no mitigation was recommended. Any mitigation measure proposed by OSMRE imposing more stringent emission limits on non-coal operators is beyond OSMRE's authority and its implementation would be highly remote and speculative. Given these factors, bringing this alternative forward for further review would not be reasonable.

### 2.4.4 Project Environmental Protection and Mitigation Features

The surface mining permitting process under WDEQ-LQD coal regulatory program requires applicants to obtain approvals from various agencies, including the WGFD, SHPO, and the

USFWS. The applicant is then required to incorporate agency required design features into their mining proposals that are intended to protect, or minimize impacts to, environmental resources. Each PAP submitted to WDEQ-LQD for review and approval contains resource-specific plans, design features, and associated performance standards. The resource-specific plans describe the design features for reducing or eliminating the potential impacts to various resources or how those resources would be restored to approved post-mining conditions after mining is complete. WDEQ-LQD approval commits the applicant to implementing the design features contained in the PAP. It is important to note that the design features of the original permit also apply to a newly revised permit, unless WDEQ-LQD approves changes.

The following is a summary of the environmental commitments for environmental protection and mitigation, by resource, included in the PAP. More detailed descriptions of these environmental commitments are included in the PAP, which is available at the DFM Office at 3629 N. Garner Lake Road, Gillette, Wyoming, 82716; the WDEQ District 3 office at 200 West 17th Street, Suite 10, Cheyenne, Wyoming, 82002; and the OSMRE Western Region Office located at 1999 Broadway, Suite 3320, Denver, Colorado, 80202.

#### *2.4.4.1 Topography*

- Reclaim the area to the WDEQ-LQD approved post-mining topography.
- Grade backfilled mining areas to establish a stable post-mine topography that blends into the undisturbed areas outside the mining limits.

#### *2.4.4.2 Air Quality*

- Water roads and apply chemical dust suppressants as necessary to control fugitive dust emissions.
- Control dust from coal stockpiles by compaction and applying water.
- Operate in compliance with the WDEQ-AQD Permit No. MD-11723.
- Revegetate long-term topsoil stockpiles.

#### *2.4.4.3 Water Resources*

- Route all runoff from disturbed areas through one or more sediment ponds or approved alternative sediment control measures (ASCMs).
- Construct new sedimentation structures and diversion ditches prior to topsoil removal to control runoff, avoid erosion and an increased contribution of sediment load to runoff, and protect surface water and groundwater quality.
- Give new-hire training to employees regarding sediment control requirements and construction techniques.
- Maintain temporary sediment ponds and ASCMs until vegetative establishment is complete and acceptable runoff water quality is achieved.
- Monitor performance of diversion ditches and sediment control structures and maintain or upgrade as needed.
- Control and monitor the quantity and quality of any discharges from the permit area in compliance with the Wyoming Pollutant Discharge Elimination System (WYPDES) Permit Number WY-0032964 issued by the WDEQ-WQD under the National Pollutant Discharge Elimination System (NPDES) program.

- Revegetate permanent drainage ditches unless an alternative is approved by WDEQ-LQD and install other erosion control measures where necessary based on the approved design.
- Seed disturbance related to sediment pond construction, including embankments and surrounding areas, after the pond construction is completed.
- Design sediment ponds to contain the water and settleable sediment load from a 10-year, 24-hour storm event.
- Construct ASCMs in small drainage basins, where sediment ponds are inappropriate, to provide secondary sediment controls for precipitation and snowmelt events in disturbed areas of the mine site. ASCMs are typically dozer sumps and ditches to the dozer sumps or a series of straw wattles (permeable barriers used to detain surface runoff long enough to reduce flow velocity).
- Size haul road culverts to maintain proper drainage during high snowmelt or other exceptional runoff events.

#### *2.4.4.4 Vegetation*

- Revegetate to achieve the approved post-mining land uses.
- Reclaim the post-mine disturbed land with shrubs in accordance with approved permit commitments.
- Eliminate livestock grazing during vegetation establishment.
- Once vegetation is established, manage livestock usage to protect the established
- vegetative cover.
- Evaluate revegetation success in accordance with the standards approved by the WDEQ-LQD.

#### *2.4.4.5 Terrestrial Wildlife*

- Re-establish appropriate and suitable forage, shrubs and trees on reclaimed areas in accordance with approved permit commitments to provide wildlife habitat.
- Construct permanent stock and wildlife watering ponds.
- Leave undisturbed islands throughout the disturbed area to provide habitat for wildlife.
- Provide training to employees on WGFD topics for protecting wildlife, and inform them of wildlife prone locations.
- Post and set the maximum speed of 45 mph on the mine access road to limit collisions with wildlife.
- Manage livestock grazing to ensure that adequate forage is left for wildlife use and that the range is not over used.
- Control pesticide and herbicide use to protect livestock and wildlife.
- Provide rock piles and varying topographic design in the reclamation to provide habitat diversity for wildlife habitat.
- Limit soil salvage activities near active Greater sage-grouse leks during the breeding and rearing season, mid-March through mid-July.
- Install fencing in accordance with PAP requirements for wildlife protection.

#### *2.4.4.6 Fish/Aquatic Life*

- Restrict access to the Moyer Spring riparian habitat area with fencing and signs.
- Continuously monitor flows in Moyer Creek, and submit monthly reports to WDEQ-LQD documenting adequate flows and maximum temperatures.
- Setback mining from the recharge area to Moyer Creek.
- Monitor the wells around the creek monthly.
- Augment flows to Moyer Spring from approved alternative sources, if low flow triggers are reached.
- Allow WGFD personnel to periodically access Moyer Creek to conduct various assessments.
- Ensure all discharges into Moyer Spring Creek are in compliance with WYPDES limitations.
- If augmentation occurs, comply with water treatment requirements in the PAP.

#### *2.4.4.7 Threatened and Endangered Species*

- Construct power lines to *Suggested Practices for Raptor Protection on Power lines - The State of the Art in 2006*.
- Conduct annual wildlife surveys of raptors and migratory birds of high federal interest (MBHFI), and prepare/submit annual reports.
- If a nest develops within ¼ mile (or line of sight) of the active mining area, consult with USFWS before continuing activities near the nest. Implement site specific protections and mitigation measures as required.
- Prepare raptor mitigation plans as required by USFWS. Comply with the requirements in the plans, such as installing raptor platforms.
- Conduct surveys and develop mitigation plans for newly listed T&E species that are present in the mine area as they are newly listed.

#### *2.4.4.8 Cultural Resources*

- Perform pre-disturbance field surveys.
- If an unidentified cultural or historical resource is discovered within or adjacent to the project area, halt activities that may damage the resource and report the findings to the responsible regulatory agency.
- Complete required mitigation for cultural and historic resources.

#### *2.4.4.9 Visual Resources*

- Reclaim disturbed areas to the approved post-mining topography.

#### *2.4.4.10 Soils*

- Live-handle topsoil where possible to apply the benefits of topsoil that has not been stored in topsoil piles for an extended period of time.
- Locate topsoil stockpiles to avoid erosion from wind and water and additional compaction or contamination.
- Regrade topsoil stockpiles with outside slopes no steeper than 3H:1V and protect topsoil stockpiles by revegetating as soon as conditions allow.
- Clearly label topsoil stockpiles.

- Reserve adequate topsoil for reclamation of wetlands, bottomlands and croplands.
- Periodically recalculate the mine-wide soil balance and adjust the replacement depth as necessary.
- Sample the regraded spoil in accordance with the PAP before applying topsoil to ensure it is not toxic to vegetation.
- Control weeds on topsoil stockpiles by monitoring and treating with an herbicide as needed.
- If soil compaction occurs after topsoil replacement, rip the soil to minimize compaction, promote stability and assist in revegetation.
- Leave reapplied topsoil in a rough condition to help control wind and water erosion prior to seeding.
- Monitor topsoil removal and maintain replacement balances to ensure adequate topsoil is available for reclamation.

*2.4.4.11 Post-mining Land Use*

- Reclaim affected areas to land uses as high as or higher than those in effect prior to mining.
- Establish vegetation to support livestock grazing.
- Establish adequate forage and cover to support year-round wildlife usage.
- Establish permanent stock and wildlife watering ponds.
- Establish the post-mining hydrologic conditions in accordance with the approved hydrologic reclamation plan.

# 3.0 Affected Environment

The CEQ regulations state that NEPA documents "must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1(b)). While many issues may arise during scoping, not all of the issues raised warrant analysis in an EA. Issues are analyzed if an analysis of the issue is necessary to make a reasoned choice between alternatives, or if the issue is associated with significant direct, indirect, or cumulative impact, or where analysis is necessary to determine the significance of the impacts. **Table 3-1** lists the resources considered for this EA and the determination as to whether the resource required additional analysis. For the purposes of discussion, the general analysis area includes an area that contains the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines (referred to as the northern group of mines) (**map 1-1**). Resource specific analyses may utilize an analysis area specific to the resource, which is described if different from the general analysis area.

**Table 3-1. Resources and Determination of Need for Further Analysis**

| Resource | Determination[1] | Rationale for Determination |
|---|---|---|
| General Setting | PI | See discussion below |
| Topography | PI | See discussion below |
| Geology, Minerals, and Paleontology | PI | See discussion below |
| Air Quality/Climate Change | PI | See discussion below |
| Water Resources | PI | See discussion below |
| Alluvial Valley Floors | NP | No Alluvial Valley Floors are located within the Project Area |
| Wetlands/Aquatic Features | PI | See discussion below |
| Soils | PI | See discussion below |
| Vegetation | PI | See discussion below |
| Wildlife | PI | See discussion below |
| Land Use and Recreation | PI | See discussion below |
| Cultural and Historic Resources | PI | See discussion below |
| Visual Resources | PI | See discussion below |
| Noise | PI | See discussion below |
| Transportation | PI | See discussion below |
| Hazardous and Solid Waste | PI | See discussion below |
| Socioeconomics | PI | See discussion below. |
| Prime Farmlands | NP | No Prime Farmlands are located within the Project Area |
| Floodplains | NP | No Federal Emergency Management Agency-designated floodplains are located within the Project Area |

[1] NP = not present in the Project Area. PI = present with the potential for impact. Only PI designated resources are analyzed in this EA.

## 3.1 General Setting

The DFM is located approximately 4.5 miles north of Gillette, in Campbell County, Wyoming (**map 1-1**). The general analysis area includes a group of mines referred to as the northern-group of mines, including Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak, in the part of the Northern Great Plains that includes most of northeastern Wyoming. This region is also within the Northwestern Great Plains Ecoregion of Wyoming (Chapman et al. 2004).

**Map 2-1** depicts the limits of the A2Tr1 tract and the currently approved DFM WDEQ-LQD PT0599 permit boundary. The existing disturbance as of September 12, 2016, and the future disturbance from September 12, 2016, through the LOM within the mine are shown on **map 2-2**. The A2Tr1 tract is the focus of the Affected Environment for this EA. However, in order to provide context for a specific resource, resource discussions may include a larger area.

The climate associated with the A2Tr1 tract is semi-arid and characterized by cold winters, warm summers, and a large variation in annual and seasonal precipitation and temperature. Wind, precipitation, and temperature patterns in the A2Tr1 tract are affected by the mountain ranges to the west, especially by the nearby Bighorn Mountains.

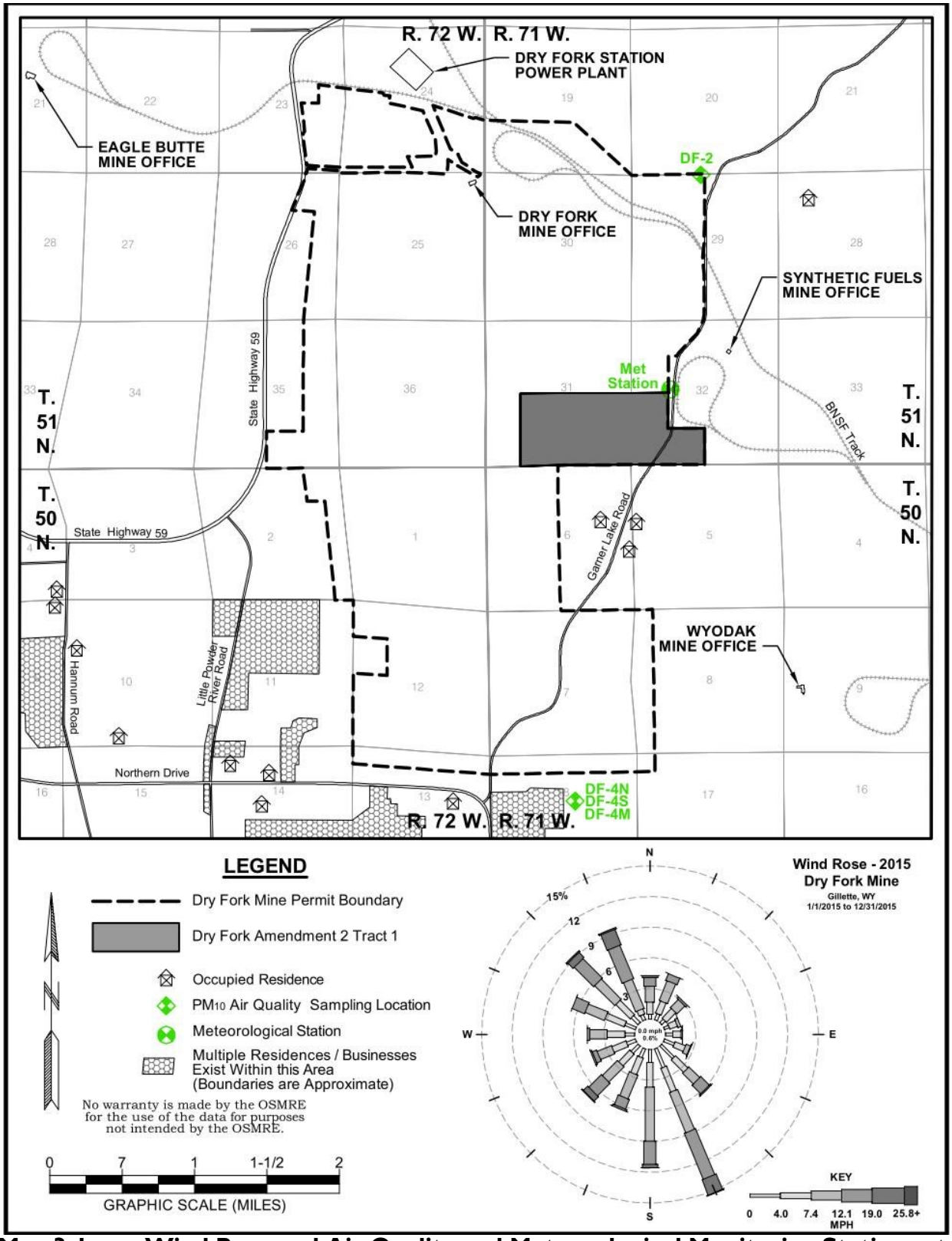
Annual precipitation for the period 1902-2012 (period of record) at the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) Gillette 9 ESE station (483855) located about 7 miles southeast of the DFM was 15.72 inches (Western Regional Climate Center [WRCC] 2012). Precipitation ranged from a low of about 8.1 inches in 1936 to a high of about 26.4 inches in 1982 (WRCC 2012). Approximately 45 percent of the annual precipitation falls in the 3-month period April through June. Average annual snowfall at the Gillette 9 ESE station is approximately 55.7 inches, with March (10.0) and December (8.5) recording the highest monthly average snowfall. Approximately 29 percent of the annual precipitation falls as snow in the 6-month period October through March (WRCC 2012). The remainder generally occurs as summer thunderstorms, which are commonly accompanied by high winds and hail. Most flooding in the area likely occurs in response to high-intensity thunderstorms of comparatively short duration.

The seasonal and daily variations between maximum and minimum temperatures are often extreme. Daily variations of 30° to 50° F are common as a result of characteristic radiative effects. Temperatures at Gillette 9 ESE station range from -40° to 110° F. Temperatures in the proposed lease modification tract will probably lie between these extremes. The frost-free period for this area lasts between 101 and 120 days (Curtis and Grimes 2004).

**Map 3-1** illustrates the wind direction and percent of total for the directions. The figure shows prevailing wind directions coming from the south-southeast (15.3 percent of the time) and the north-northwest (11.6 percent of the time) quadrants. Meteorological data collected in 2015 at the DFM indicate an average wind velocity of 9.4 miles per hour; however, a maximum wind velocity of 40.6 miles per hour was recorded (WFW 2016a).

## 3.2 Topography and Physiography

The following discussions on topography and physiography were taken from Appendix D5 (Geology, Topography, and Overburden Assessment) of the DFM's WDEQ-LQD Permit No. PT0599 (WFW 2011).




**Map 3-1. Wind Rose and Air Quality and Meteorological Monitoring Stations at the DFM**

The DFM is physiographically part of the unglaciated Missouri Plateau section of the Great Plains Province (Fenneman 1931). This part of the Great Plains Province is characterized by broad plateaus which are dissected by incised stream valleys. In the western portion, the plateaus merge with the PRB and other broad regional downfolds. These basins are separated by major mountainous uplifts.

The landscape of the PRB consists of broad plains, low hills, and tablelands. Incised stream valleys create most of the topographic relief. Generally, the topography changes from open hills with 500 to 1000 feet of relief in the northern part of the basin to plains and tablelands with 300 to 500 feet of relief in the southern part (Keefer 1974). The PRB is bounded by the Platte River drainage basin to the south, the Yellowstone River in Montana to the north, the Big Horn Mountains to the west, and the Black Hills to the east.

## 3.3 Geology, Minerals, and Paleontology

### 3.3.1 General Geology

The strata in the DFM permit area generally show northwest to north-northwest strikes and gentle westward dips. The synclinal axis trends north to northwest near the western edge of the PRB, adjacent to the Casper Arch and the Big Horn Mountains. Gentle folds occur on the eastern and northern flanks, while faults and locally overturned beds are characteristic of the much steeper western and southern flanks. The northern and eastern areas of the basin have gentle dips that seldom exceed a few degrees. Regional dips in the Gillette area are from 0.5 degrees in the surface sediments to 3 degrees in the deeper sediments toward the southwest. No major faults have been mapped in the Gillette area (Hodson et al. 1973).

The general analysis area (northern group of mines) contains the following stratigraphic units or layers (in descending order from the surface): Quaternary (most recent) deposits, the Eocene Wasatch Formation, and the Paleocene Fort Union Formation. The Paleocene Fort Union Formation contains the coal seams that would be mined under the Proposed Action. **Figure 3-1** shows the stratigraphic relationships of the geologic units in the general analysis area. These stratigraphic units are discussed below. **Figures 3-2** and **3-3**, which have been modified from DFM's WDEQ-LQD Permit PT0599, Appendix D5, Addendum D, Exhibits 1 through 6, depict geologic cross sections of the Project Area, including the Anderson and Canyon coal seams.

**Surficial Geology** – Surficial geology within the Project Area is shown on **map 3-2**. Quaternary deposits in the general analysis area consist of alluvium, sheetwash, colluvium, and lacustrine deposits. Quaternary deposits represent a minor component of the surficial geology within the DFM area. Exposed and weathered Wasatch Formation residuum comprises the majority of the surficial geology within the Project Area. The Wasatch Formation residuum flanks a ridge of exposed Wasatch bedrock that occupies the central portion of the general analysis area.

**Wasatch Formation** - The Eocene Wasatch Formation comprises the majority of the overburden, which consists mainly of interfingering lenses of claystone, siltstone, and sandstone. The overburden contains clinker (variously called Wyoming porcelanite or scoria), coal stringers and carbonaceous shales.

| Geologic Unit | | Hydrologic Characteristics |
|---|---|---|
| **RECENT ALLUVIUM** HOLOCENE | | Typically, fine grained and poorly sorted sands interbedded with silts and clays in ephemeral drainages. Occasional very thin, clean interbedded sand lenses. More laterally extensive, thicker, and coarse-grained along the larger stream courses. Excessive dissolved solids generally make this aquifer unsuitable for domestic and agricultural use and marginal for livestock (Class III) WDEQ water quality use standards. Low infiltration capacity in ephemeral draws unless covered by sandy eolian blanket. |
| **CLINKER** HOLOCENE TO PLEISTOCENE | | Baked and fused bedrock resulting from burning coal seams where the seam outcrops were ignited by lightning, wildfires, or spontaneous combustion. The reddish clinker (locally called scoria, etc.) formed by melting and partial fusing of overburden above the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated. |
| **WASATCH FORMATION** EOCENE | | Lenticular fine sandstones interbedded in predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sandstones result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch Formation generally does not meet Wyoming Class I (domestic use) standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality that does meet the Class I standard. |
| **FORT UNION FORMATION** PALEOCENE | **TONGUE RIVER MEMBER** | The coal beds serve as regional groundwater aquifers and exhibit highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Wyoming Class I or Class II (irrigation use) standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use. |
| | **LEBO MEMBER** | The Lebo member, also referred to as the "Lebo Confining Layer" or "Lebo Shale", has a mean thickness of 711 feet (ft) in the PRB, although ranges between 400 and 1,000 ft in the Gillette area. The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gallons per minute (gpm). |
| | **TULLOCK MEMBER** | The Tullock member has a mean thickness of 785 ft in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but vary locally and may be as much as 40 gpm. Records from the Wyoming State Engineers Office (WSEO) indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using 13 wells completed in this zone to meet part of its municipal water requirements |
| **UPPER CRETACEOUS** | **LANCE FORMATION/HELL CREEK FORMATION** | Silty, calcareous sandstones and interbedded sandy shales, claystones, and coals. Provides yields generally less than 20 gpm. Higher yields can occur where sand thicknesses are greatest. Water quality is typically fair to good. Also referred to as the "Upper Lance Confining Layer." |
| | **FOX HILLS SANDSTONE** | Marine sandstones and sandy shales. Has a mean thickness of 818 ft and a mean sand content over 50 percent in the PRB. Yields up to 200 gpm are common; however, yields can be significantly less. Water quality is good, with total dissolved solids (TDS) concentrations commonly less than 1,000 milligrams per liter (mg/L). The City of Gillette is currently using three wells completed in this aquifer to meet part of its municipal water requirements. |
| | **PIERRE SHALE** | This unit is comprised predominantly of dark marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution. |

Sources: Stratigraphy from Stratigraphic Nomenclature Committee, Wyoming Geological Association, 1969. Hydrogeology from Lewis and Hotchkiss, 1981.

**Figure 3-1. Stratigraphic Relationship and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary and Recent Geologic Units of the Powder River Basin, Wyoming**

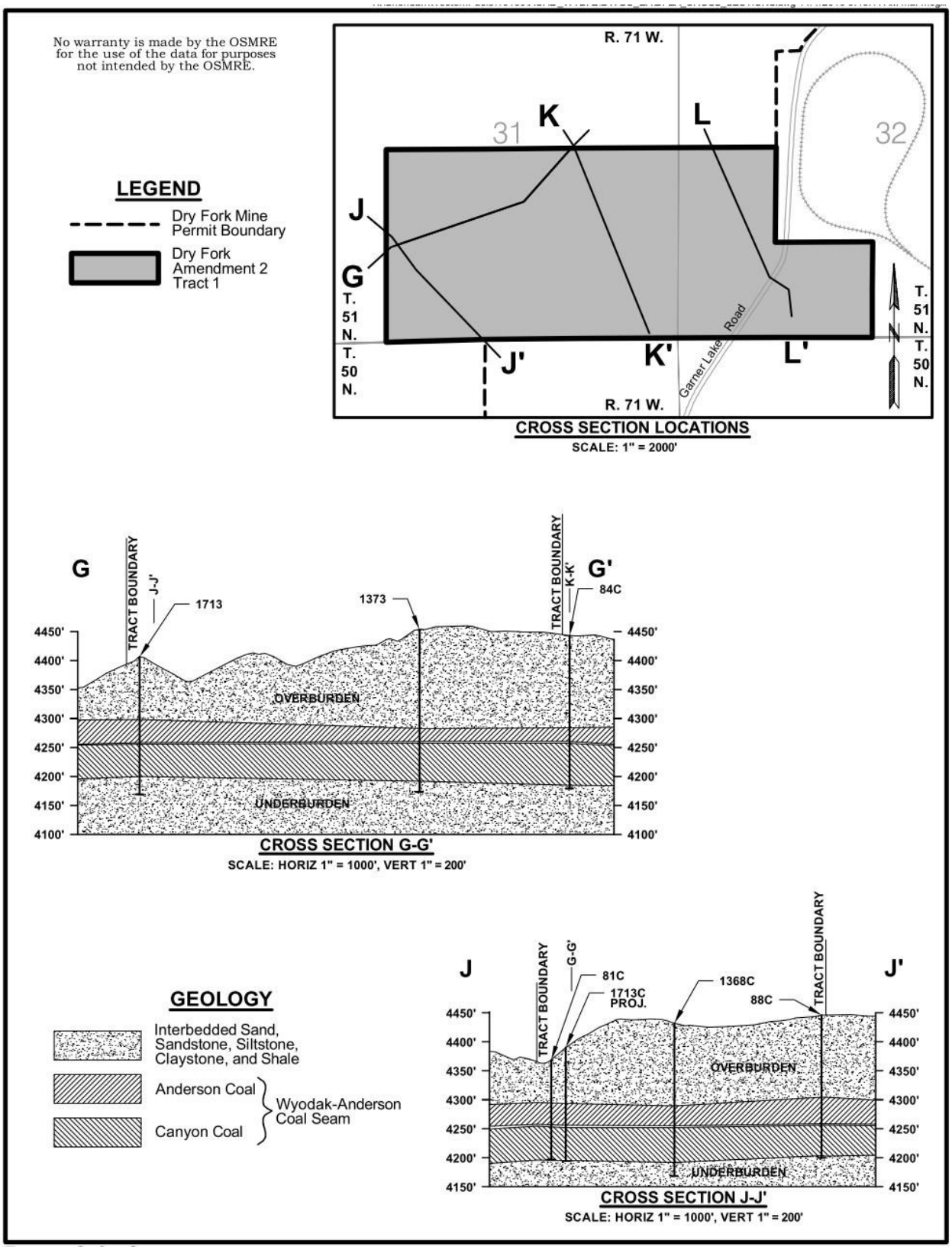



**Figure 3-2. Geologic Cross Sections for the A2Tr1 Tract**

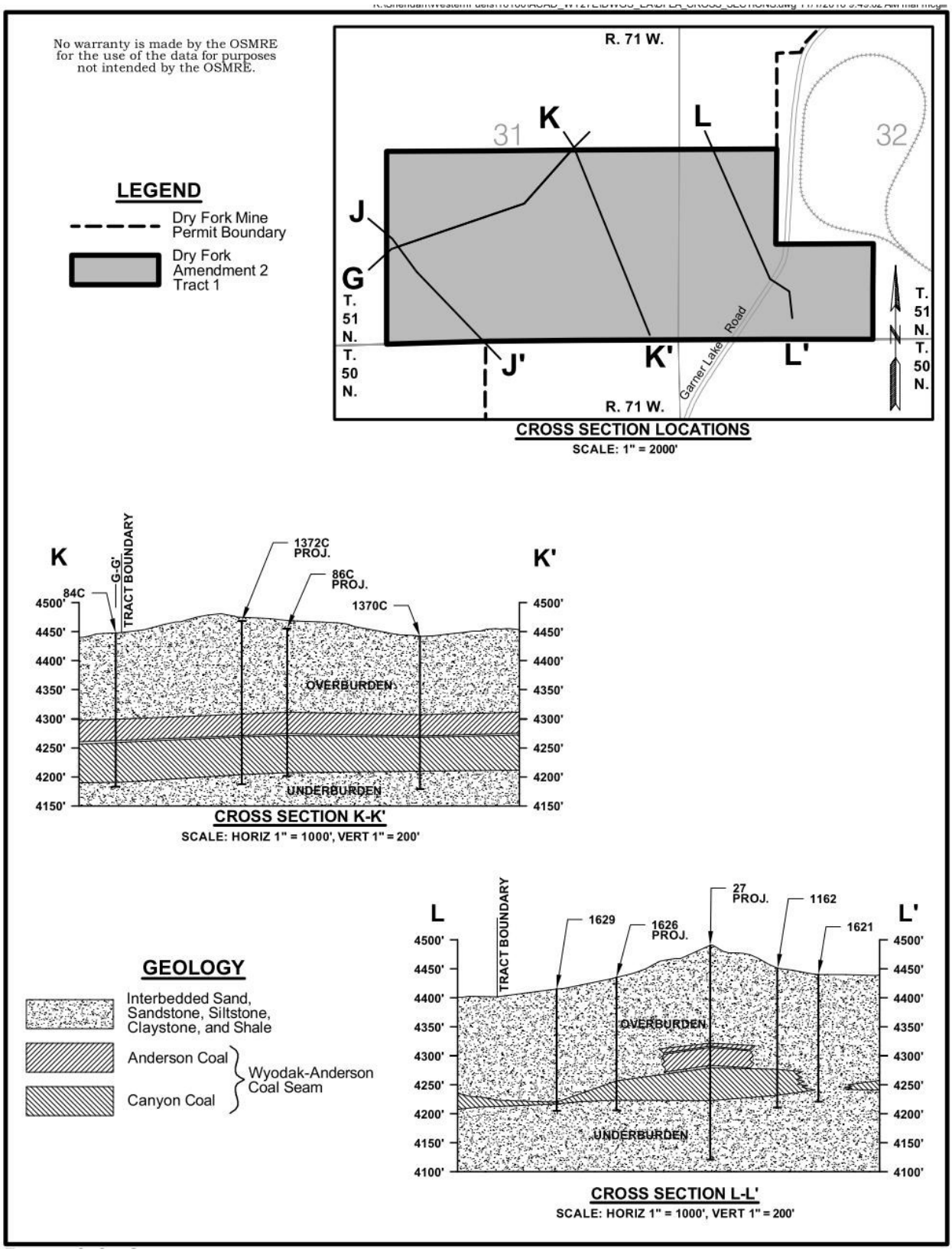
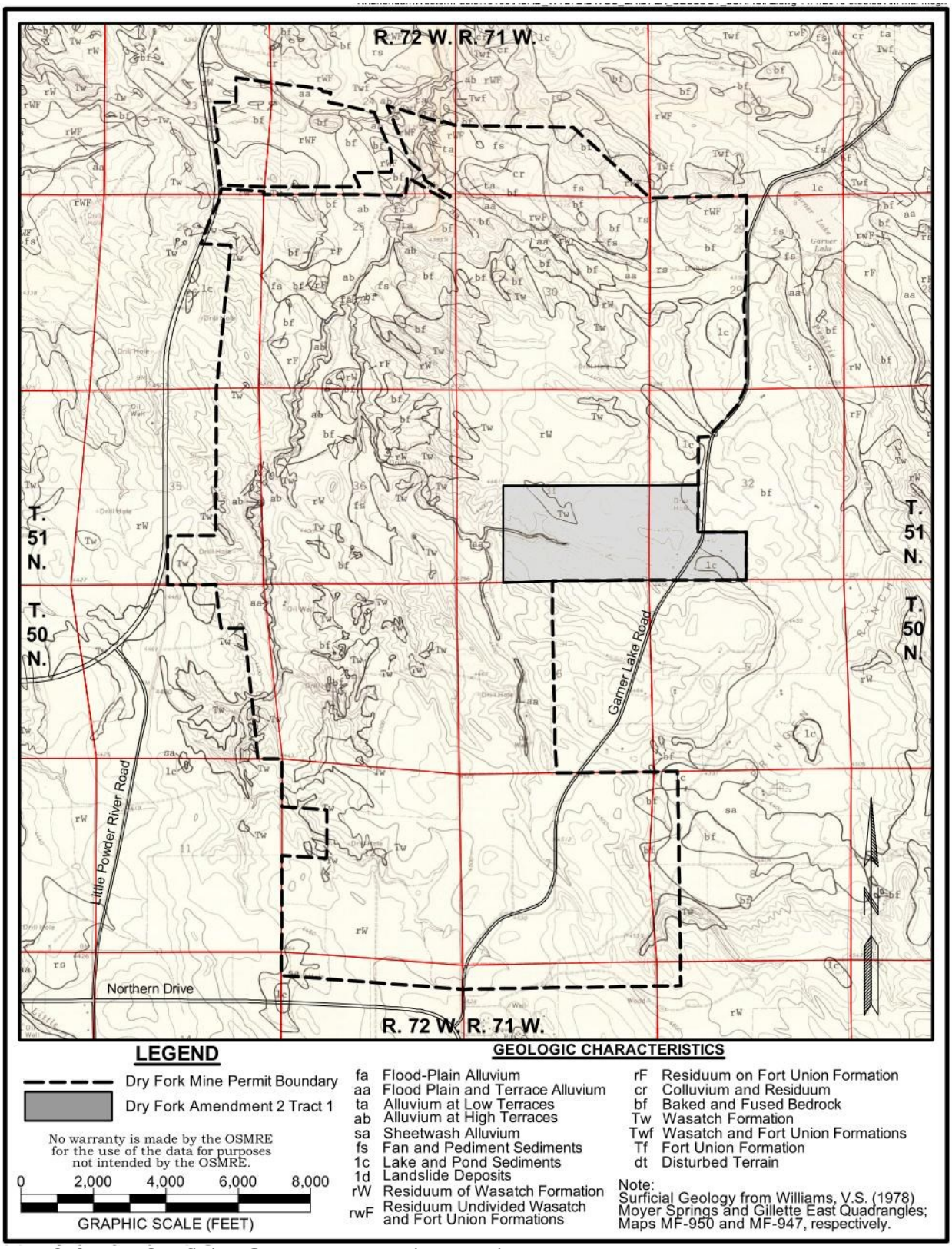



**Figure 3-3. Geologic Cross Sections for the A2Tr1 Tract**




**Map 3-2. Surficial Geology Associated with the DFM**

**Fort Union Formation** - The Paleocene Fort Union Formation consists primarily of siltstones, mudstones, claystones, shales, lenticular sands/sandstones, and coal seams. The Fort Union Formation is divided into three members, in descending order, the Tongue River (which contains the mineable coal seams), the Lebo, and the Tullock (Flores et al. 1999). The coal to be mined in this area is within the Wyodak-Anderson coal seam, which is the uppermost unit of the Tongue River Member of the Paleocene Fort Union Formation. In the mine permit area, a claystone and carbonaceous coal lens separate the Wyodak-Anderson seam into the upper Anderson coal seam and the lower Canyon coal seam. For this EA, the coal to be mined will be referred to as the Wyodak-Anderson seam. The coal is consistently underlain by shale, claystone, or occasionally siltstone throughout the Dry Fork mine. The Wyodak coal seam is nearly flat-lying with minor variations and dip reversals, which very likely reflect the depositional environment (structural highs and lows) and/or differential compaction, rather than major tectonic deformation.

Underlying the Fort Union Formation are the Cretaceous age Lance Formation, Fox Hills Sandstone, and Pierre Shale. Occasionally, mine water supply wells are constructed in the Lance-Fox Hills aquifer; otherwise, no mine related disturbance extends below the Fox Hills Sandstone.

### 3.3.2 Mineral Resources

The Anderson and Canyon coal seams are the primary shallow mineral resources within the Project Area. Coal from the Anderson and Canyon coal seams are ranked as sub-bituminous coals (35 percent to 45 percent carbon and 8,300 to 11,500 Btu/lb. (U.S. Department of Energy [USDOE] 2016 and Environmental Protection Agency [EPA] 1993). The Anderson and Canyon coals are generally low in sulfur and ash when compared to other mines in the Powder River Basin (**table 3-2**).

**Table 3-2. Average Physical Characteristics of the Mineable Portions of the Wyodak-Anderson Coal Seam in the Area**

| Parameter | Anderson[1] | Canyon[1] | Powder River Basin Range[2] |
|---|---|---|---|
| Btu's per pound | 8,144 | 8,112 | 8,000-9,500 |
| Sulfur | 0.34 percent | 0.23 percent | 0.2-0.7 percent |
| Ash | 4.1 percent | 4.37 percent | 4.2-9.0 percent |
| Range of Thickness | 15-24 Feet | 56-65 Feet | -- |

[1] WFW Unpublished Data
[2] John T. Boyd Company (2011)

The Wyodak-Anderson coal seam, which has been tapped for CBNG development, is the same seam that is being mined at the DFM. Wyoming Oil and Gas Conservation Commission (WOGCC) records indicate that as of October 2016, 341 CBNG wells have been completed in the analysis area (N½ T. 50 N., R. 71 W.; N½ T. 50 N., R. 72 W.; S½ T. 51 N., R. 71 W.; and S½ T. 51 N., R. 72 W.). Approximately 41 percent (139 wells) are producing or are capable of producing gas, with the remaining wells listed as shut in or abandoned. WOGCC records indicate that no CBNG wells have been completed within the A2Tr1 tract. As described in **section 3.10**, four conventional oil and gas wells were completed within the tract but only one is still capable of producing oil. Additionally, no bentonite or uranium reserves have been identified in the general analysis area. Wyoming porcelanite (known locally as scoria or clinker) breaks are present along the east border of the A2Tr1 tract, but these breaks are outside of the proposed coal recovery area.

### 3.3.3 Paleontology

The BLM's Potential Fossil Yield Classification (PFYC) system ranks geologic formations based on their potential to yield significant paleontological resources. The five main classes in the system are:

1. **Class 1** - Very Low. Geologic units that are not likely to contain recognizable fossils. Management concern for paleontological resources in Class 1 units is usually negligible or not applicable;
2. **Class 2** - Low. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant non-vertebrate fossils. Management concern for paleontological resources is generally low;
3. **Class 3** - Moderate or Unknown. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. Management concern for paleontological resources is moderate; or cannot be determined from existing data;
4. **Class 4** – High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases. Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action;
5. **Class 5** - Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse effects or natural degradation. Management concern for paleontological resources in Class 5 areas is high to very high.

The following discussion regarding paleontological resources within the A2Tr1 tract was taken from Appendix D3 (Prehistoric (Archeological) and Paleontological Resources), Amendment 2 Area of DFM's WDEQ-LQD Permit No. PT0599 document (WFW 2011).

A literature search indicated that the A2Tr1 tract lies on a single geological unit, the Paleocene-Eocene Wasatch Formation, which is known to yield significant paleontological resources in nearby areas. This formation has been rated by the BLM as a PFYC Class 5 unit, very high potential. In addition, mining operations impact the Tongue River Member of the Paleocene Fort Union Formation (PFYC 3) that underlies the Wasatch Formation. Vertebrate fossils from the Tongue River Member in the Powder River Basin are much less common than in the Wasatch Formation, but they are known from further north in central Montana. In addition, vertebrate bones were reported from the Fort Union Formation in the nearby Wyodak mine in Campbell County, WY, but the identification of these fossils and their location is currently unknown.

A locality search showed that no known vertebrate fossil localities are recorded from within either the original mine permit area or the A2Tr1 tract. Cultural resource surveys done in the early 1980's for the original mine permit area recorded several localities with large fossil tree trunks. No vertebrate fossils were discovered during these surveys, but because these surveys

were done before fossil resources were protected under federal law, paleontologists were not present.

## 3.4 Air Quality

Ambient air quality and air pollution emissions are regulated under federal and state laws and regulations. The WDEQ-AQD is responsible for managing air quality through the Wyoming Air Quality Standards and Regulations (WAQSR) and the Wyoming State Implementation Plan (SIP). The WDEQ-AQD has also been delegated authority by the EPA to implement federal programs of CAA. The analysis area for air quality discussion is primarily associated with the general analysis area (northern group of mines) but also includes portions of northeastern Wyoming and southeastern Montana (**map 3-3**).

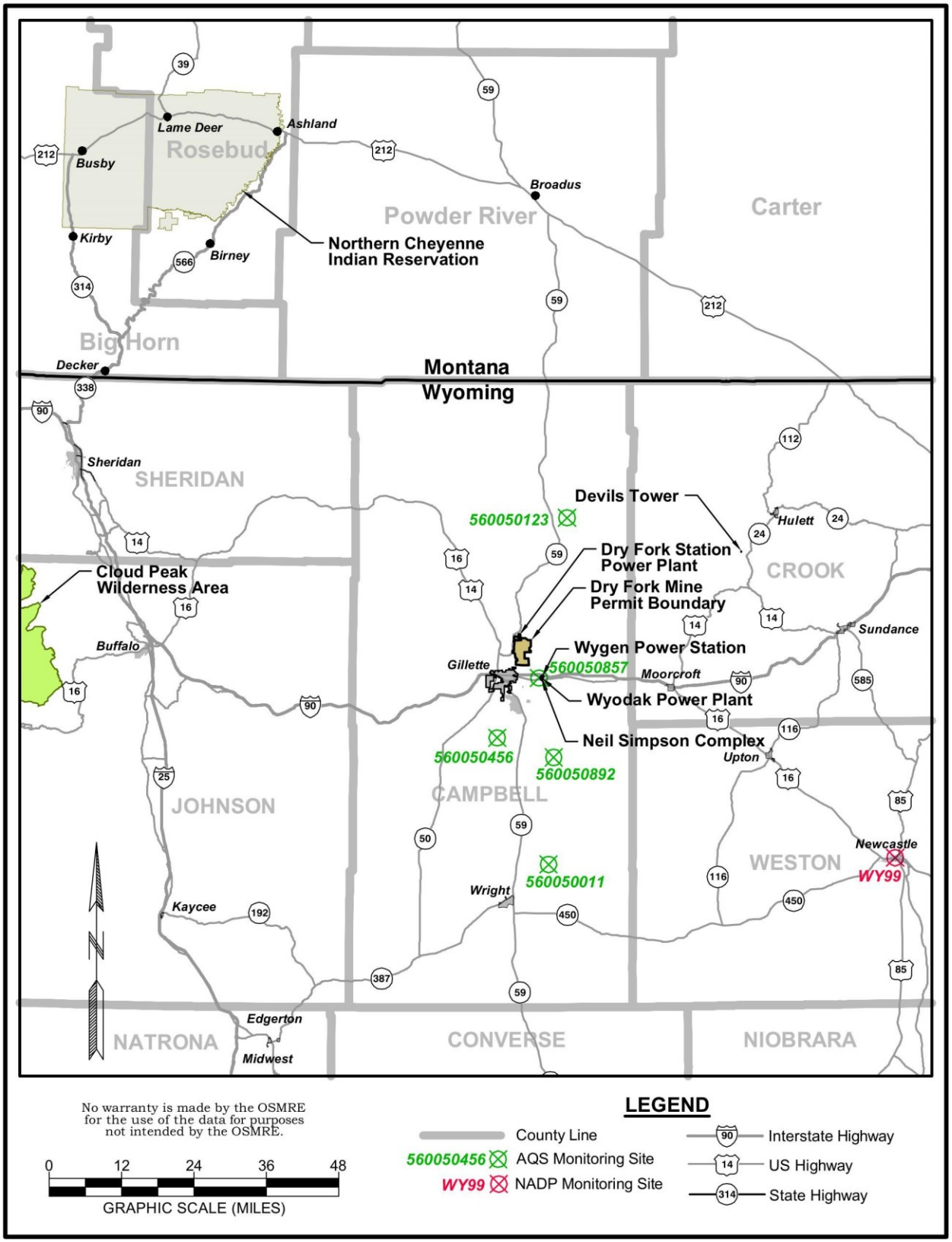
Air Quality regulations applicable to surface coal mining may include the National Ambient Air Quality Standards (NAAQS), Wyoming Ambient Air Quality Standards (WAAQS), and Prevention of Significant Deterioration (PSD). Additional air quality regulations applicable to surface coal mining include the New Source Performance Standards (NSPS), Hazardous Air Pollutants (HAPs), Mercury and Air Toxics Standards (MATS), and the Federal Operating Permit Program (Title V).

The analysis presented herein serves to summarize attainment/nonattainment areas discussions; update discussions with recent air quality monitoring findings; revise air quality modeling results; and update discussions on carbon monoxide (CO), sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), ozone ($O_3$), fine particulate matter ($PM_{2.5}$), lead (Pb), hydrogen sulfide ($H_2S$), and HAPs (specifically mercury [Hg]). Dispersion modeling conducted in 2011 (Carter Lake Consulting 2011) demonstrated that modifications to the DFM's current permit would be compliant with short-term and long-term WAAQS for particulate matter ($PM_{10}$ and $PM_{2.5}$), where $PM_{10}$ is coarse particulate with mean aerodynamic diameters less than 10 microns and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less. Furthermore, dispersion modeling performed for $NO_2$, which included regional $NO_X$ emissions sources, demonstrated that the operation of the Dry Fork Mine would comply with the annual Wyoming ambient air quality standard for $NO_2$. The results of this modeling are presented in **section 4.4**.

According to EPA (IPCC 2014), there is scientific evidence that increased atmospheric concentrations of greenhouse gases (GHG) and land use changes are contributing to increases in average global temperatures. GHG are not currently regulated pollutants (not subject to NAAQS or WAAQS regulations). GHG discussions are included in **section 3.4.7.4** and in **section 4. 4.4**.

### 3.4.1 National Ambient Air Quality Standards

The CAA requires the EPA to establish NAAQS to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as "criteria" pollutants, which "… cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources." The six, present-day criteria pollutants are Pb, $NO_2$, $SO_2$, CO, $O_3$ and $PM_{10}$ and $PM_{2.5}$.




**Map 3-3. Regional Air Quality Monitoring Sites**

The CAA and its amendments allow states to promulgate additional ambient air standards that are at least as stringent, or more stringent, than the NAAQS. The NAAQS and WAAQS, established by the WDEQ-AQD, are listed in **table 3-3**. WAAQS values also include $H_2S$.

**Table 3-3. Federal and Wyoming Ambient Air Quality Standards**

| Emissions | Averaging Period | Wyoming Standard (WAAQS) | Federal Standard (NAAQS) |
|---|---|---|---|
| Carbon Monoxide (CO) | 1-hour<br>8-hour | 35 ppm[a]<br>9 ppm[a] | 35 ppm[a]<br>9 ppm[a] |
| Sulfur Dioxide ($SO_2$)[1] | 1-Hour<br>3-hour | 75 ppb[d]<br>0.50 ppm[a] | 75 ppb[d]<br>0.50 ppm[a] |
| Nitrogen Dioxide ($NO_2$)[2] | 1-Hour<br>annual | 100 ppb[a]<br>53 ppb[b] | 100 ppb[i]<br>53 ppb[f] |
| Ozone ($O_3$)[3] | 8-hour | 0.070 ppm[e] | 0.070 ppm[e] |
| $PM_{10}$ | 24-hour<br>annual | 150 μg/m$^3$[a]<br>50 μg/m$^3$[f] | 150 μg/m$^3$[c]<br>-- |
| $PM_{2.5}$ | 24-hour<br>annual | 35 μg/m$^3$[g]<br>12 μg/m$^3$[f] | 35 μg/m$^3$[i]<br>12 μg/m$^3$[h] |
| Lead (Pb)[4] | 90-Day | 0.15 μg/m$^3$[h] | 0.15 μg/m$^3$[b] |
| Hydrogen Sulfide ($H_2S$) | 1-Hour | 70/40 μg/m$^3$[j] | -- |

[a] Not to exceeded more than once per calendar year
[b] Not to be exceeded rolling 3-month average
[c] Not to exceed more than once per calendar year on averaged over 3 years
[d] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
[e] Annual 4th-highest daily maximum 8-hour concentration, averaged over 3 years
[f] Annual mean
[g] 98th percentile of 24-hour daily average concentration
[h] Annual mean, averaged over 3 years
[i] 98th percentile 1-hour average, averaged over 3 years
[j] ½-hour average not to be exceeded more than 2 times per year/½-hour average not to be exceeded more than 2 times in any five consecutive days

-- Values not included in NAAQS or WAAQS and were not calculated.

[1] The previous $SO_2$ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous $SO_2$ standards or is not meeting the requirements of a SIP call under the previous $SO_2$ standards (40 CFR 50.4(3)), A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

[2] The level of the annual $NO_2$ standard is 0.053 ppm. It is shown here in terms of parts per billion (ppb) for the purposes of clearer comparison to the 1-hour standard level.

[3] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) $O_3$ standards additionally remain in effect in some areas. Revocation of the previous (2008) $O_3$ standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[4] In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m$^3$ as a calendar quarter average) also remain in effect.

Source: EPA (2016a) and WDEQ-AQD (2016)

### 3.4.2 Attainment/Nonattainment Area Designations

Pursuant to the CAA, EPA developed a method for classifying existing air quality in distinct geographic regions, known as air basins, air quality control regions, and/or metropolitan statistical areas. For each federal criteria pollutant, each air basin (or portion of a basin or statistical area) is classified as in "attainment" if the area has complied with the adopted NAAQS for that pollutant, as "nonattainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant, or as "unclassifiable" if the area cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Through the State Implementation Plan (SIP) process, which is approved by EPA, states use the EPA method to designate areas within their borders as being in "attainment", "nonattainment", or "unclassifiable" with the NAAQS. The A2Tr1 tract is in an area that is designated an attainment area for all pollutants (EPA 2016b). However, the city of Sheridan, Wyoming, located about 79 miles northwest of the project area, is currently a nonattainment area for $PM_{10}$ (**map 3-3**). It should be noted that WDEQ/AQD has requested that the Wyoming Air Quality Advisory Board consider a request to review the State of Wyoming's *Request for Redesignation and Limited Maintenance Plan for the Attainment in the Particulate Matter ($PM_{10}$) Moderate Nonattainment Area in Sheridan* (WDEQ-AQD 2016). The request is based on the fact that WDEQ-AQD has submitted over 25 years of monitoring data demonstrating that the Sheridan nonattainment area has attained the $PM_{10}$ NAAQS for over 25 years. Upon review and completion of a finalized draft, the request will be submitted to EPA. The final determination has not been made at this time.

### 3.4.3 Prevention of Significant Deterioration

Under provisions of the CAA, the EPA has established prevention of significant deterioration (PSD) rules, intended to prevent deterioration of air quality in attainment and unclassified areas. Increases in ambient concentrations of $NO_2$, $SO_2$, and $PM_{10}$ are limited to modest increments above the existing or "baseline" air quality in most attainment/unclassified areas of the country (Class II areas discussed below), and to very small incremental increases in pristine attainment areas (Class I areas discussed below).

For the purposes of PSD, the EPA has categorized each attainment area in the U.S. into one of three area classifications. PSD Class I is the most restrictive air quality category, and was created by Congress to prevent further deterioration of air quality in national and international parks, national memorial parks, and national wilderness areas of a given size threshold which were in existence prior to 1977, when the CAA was enacted, or those additional areas which have since been designated Class I by federal regulation (40 CFR 52.21). Such parks and wilderness areas are considered "mandatory" Class I areas, because they cannot be redesignated. Attainment areas defined as Class I at the request of a state or tribe (e.g., Northern Cheyenne Reservation, northwest of the A2Tr1 tract) are considered "designated" Class I areas; this category is intended to protect air quality in areas of particular interest to the requesting entity. Because designated Class I areas are given that status by request rather than by assignment from the EPA, they can be redesignated at the option of the requesting state or tribe. All remaining areas outside of mandatory or designated Class I boundaries were classified as Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow further degradation, have been designated. The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources. **Table 3-4** shows approximate distances and directions from the general analysis area to 30 PSD Class I and sensitive Class II areas in the vicinity of the PRB.

The closest mandatory Class I areas to the general analysis area are Wind Cave National Park and Badlands National Park in South Dakota, located about 115 miles southeast and 165 miles east-southeast of the site, respectively. The closest designated Class I area is the Northern Cheyenne Indian Reservation (in Montana), located about 74 miles from the general analysis area. The closest "sensitive" Class II areas are the Devils Tower National Monument and the Cloud Peak Wilderness Area, which are approximately 42 and 81 miles from the general analysis area, respectively. PSD regulations limit the maximum allowable increase (increment) in ambient $PM_{10}$ in a Class I airshed resulting from major stationary sources or major modifications to 4 micrograms per liter ($\mu g/m^3$) (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities listed in the PSD rules

which emit, or have the potential to emit, 100 tons per year or more of $PM_{10}$ or other criteria air pollutants, or any other facility which emits, or has the potential to emit, 250 tons per year or more of $PM_{10}$ or other criteria air pollutants, are considered major stationary sources and must demonstrate compliance with those incremental standards during the new source permitting process. Fugitive emissions are not counted against the PSD major source applicability threshold unless the source is so designated by federal rule (40 CFR 52.21). As a result, the surface coal mines in the PRB have not been subject to permitting under the PSD regulations because the mine emissions have never triggered the PSD applicability levels. The proposed action constitutes a minor permit modification to an existing minor source; therefore, PSD permitting is not an issue.

**Table 3-4. Distances and Directions from the General Analysis Area to Sensitive Air Quality Areas**

| | Distance (miles) | Direction to Receptor |
|---|---|---|
| **MANDATORY FEDERAL PSD CLASS I AREA** | | |
| Badlands National Park[a] | 165 | ESE |
| Bridger Wilderness Area | 225 | WSW |
| Fitzpatrick Wilderness Area | 215 | WSW |
| Gates of the Mountain Wilderness Area | 343 | NW |
| Grand Teton National Park | 265 | WSW |
| North Absaroka Wilderness Area | 210 | WNW |
| Red Rocks Lake Wilderness Area | 307 | W |
| Scapegoat Wilderness Area | 393 | NW |
| Teton Wilderness Area | 237 | WSW |
| Theodore Roosevelt National Park (North Unit) | 242 | NNE |
| Theodore Roosevelt National Park (South Unit) | 196 | NNE |
| U.L. Bend Wilderness Area | 287 | NW |
| Washakie Wilderness Area | 215 | WSW |
| Wind Cave National Park | 123 | SE |
| Yellowstone National Park | 236 | W |
| **TRIBAL FEDERAL PSD CLASS I** | | |
| Fort Peck Indian Reservation | 252 | N |
| Northern Cheyenne Indian Reservation | 74 | NNW |
| **FEDERAL PSD SENSITIVE CLASS II** | | |
| Absaroka-Beartooth Wilderness Area | 219 | WNW |
| Agate Fossil Beds National Monument | 168 | SSE |
| Bighorn Canyon National Recreation Area | 137 | WNW |
| Black Elk Wilderness Area | 113 | ESE |
| Cloud Peak Wilderness Area | 81 | W |
| Crow Indian Reservation | 120 | NW |
| Devils Towner National Monument | 42 | ENE |
| Fort Belknap Indian Reservation | 316 | NNW |
| Fort Laramie National Historic Site | 164 | SSE |
| Jewel Cave National Monument | 117 | ESE |
| Mount Rushmore National Memorial | 112 | ESE |
| Popo Agie Wilderness Area | 208 | SW |
| Soldier Creek Wilderness Area | 197 | SE |

[a] The U.S. Congress designated the wilderness area portion of Badlands National Park as a mandatory federal PSD class I area. The remainder of Badlands National Park is a PSD class II area.

### 3.4.4 Best Available Control Technology

All sources being permitted in Wyoming must meet state-specific Best Available Control Technology (BACT) requirements, regardless of whether the source is subject to state/federal PSD review. During new source review, a BACT analysis is developed for the proposed project

for each emission unit and pollutant. BACT analyses must evaluate all technically feasible control options on the basis of environmental, economic, and energy considerations. BACT for mining operations in the PRB is subject to categorical control requirements defined in the WAQSR, and other mitigation measures as determined by the WDEQ-AQD on a case-by-case basis.

### 3.4.5 New Source Performance Standards (NSPS)

The NSPS are a federal program of "end-of-stack" technology-based controls/approaches adopted by reference in the WAQSR. These standards, which apply to specific types of new, modified or reconstructed stationary sources, require the sources to achieve some base level of emissions control. Certain activities at coal preparation plants are subject to an NSPS. Specifically, the applicable requirements can be found at 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Plants), and in the WAQSR. However, these standards are typically less stringent than state-level BACT limits.

### 3.4.6 Federal Operating Permit Program

The Clean Air Act Amendments require the establishment of a facility-wide permitting program for larger sources of pollution. This program, known as the Federal Operating Permit Program, or Title V, requires that major sources of air pollutants obtain a federal operating permit. Under this program, a "major source" is a facility that has the potential to emit more than 100 tons per year of any regulated pollutant, 10 tons per year (TPY) of any single hazardous air pollutant, or 25 tons per year or more of any combination of hazardous air pollutants, from applicable sources. The federal operating permit is a compilation of all applicable air quality requirements for a facility and requires an ongoing demonstration of compliance through testing, monitoring, reporting and recordkeeping requirements. Under the Proposed Action, the DFM's relevant potential to emit (PTE) $PM_{10}$ from point sources would be 26.6 tons per year, which is below the 100 tons per year threshold (Carter Lake Consulting 2011). Fugitive emissions at coal mines do not contribute to the Title V applicability determination.

An inventory of all point sources, controls, and emissions for MD-11723 showed that the PTE is below the PSD 250 tpy major source threshold limit specified in Chapter 6, Section 4 of the WAQSR and below the 100 tpy major source threshold for Title V permitting specified in Chapter 6, Section 4 of the WAQSR. The DFM is also not subject to Title V regarding HAPs because its PTE is less than 25 tpy for HAPs and less than 10 tpy for any single HAP. According to MD-11723, a PSD increment consumption analysis is not necessary and WFW is not required to obtain a Title V Operating Permit (WDEQ-AQD 2011).

### 3.4.7 Existing DFM Air Quality Summary

#### *3.4.7.1 Background*

Air quality information specific to the DFM is included in WFW's WDEQ-AQD MD-11723 air quality permit (WDEQ-AQD 2011). Typical climate conditions for the Gillette 9 ESE station (483855) located about 7 miles southeast of the DFM are included in **section 3.1**.

#### *3.4.7.2 Air Quality-Monitoring Values*

WFW has monitored particulate matter levels around the DFM throughout the life of the operation. Ambient air monitoring data has been collected by the mining community in the Powder River Basin for over twenty years. Initially, concentrations were measured as total suspended particles (TSP), but in 1989, $PM_{10}$ monitors were being installed at various sites throughout the basin. All monitoring was being conducted on a one-in-six (1/6) day schedule. However, in the early part of 2001, $PM_{10}$ readings in excess of 150 $\mu g/m^3$ were being recorded in the southern area of the basin. In a letter from the Division dated October 26, 2001, the

mines in the PRB were notified that the waiver the Division had issued in 1997 allowing monitoring on a (1/6) day schedule had been revoked. As of January 2002, all the $PM_{10}$ monitoring sites in the PRB were required to conduct monitoring on a one-in-three (1/3) day schedule. This mandate did not apply to $PM_{10}$ monitors currently operating on an everyday (1/1) schedule, $PM_{10}$ monitors already on a 1/3-day schedule, or to any existing TSP monitors on a 1/6-day schedule. Additionally, a mine that had been monitoring TSP would be allowed to follow a 1/6-sampling schedule until such time a 24-hour TSP concentration in excess of 150 µg/m$^3$ was recorded or an annual average TSP concentration in excess of 50 µg/m$^3$ was recorded.

The DFM operates four high volume $PM_{10}$ samplers (DF-2, DF-4S, DF-4N, and DF-4M) (**map 3-1**). Samplers DF-4N and DF-4S are collocated and with sampler DF-4M, operate on a 1/3-day schedule. Sampler DF-2 operates on a 1/6- day schedule. Sampler DF-2 replaced the TSP sampler DF-1, which was shut down at the beginning of the 4$^{th}$ quarter of 2008.

**Table 3-5** lists the current estimated annual mean, annual high, and high-second high $PM_{10}$ micrograms per cubic meter (µg/m$^3$) at the DFM. The average annual mean $PM_{10}$ values for the 2011-2015-time period ranged between 5.6 and 14.7 µg/m$^3$. These concentrations ranged from about 11 to 29 percent of the annual standard of WAAQS annual standard of 50 µg/m$^3$. During the same time period, the 24-hour high $PM_{10}$ values ranged between 15 and 61 µg/m$^3$. Thus, these maximum concentrations have ranged from approximately 10 to 40 percent of NAAQS and WAAQS 24-hour standard of 150 µg/m$^3$. Fluctuations in monitoring values have occurred but all values are below the WAAQS annual standard of 50 µg/m$^3$ and the 24-hour standard of 150 µg/m$^3$.

**Table 3-5. Historical $PM_{10}$ Ambient Data (µg/m$^3$) and Production, 2011-2015 ($PM_{10}$ WAAQS: 50 µg/m$^3$ Annual, 150 µg/m$^3$ 24-Hour)**

| Year | Site #[1] | Annual Arithmetic Mean (µg/m$^3$) | Highest 24-Hour Reading (µg/m$^3$) | 2$^{nd}$ Highest 24-Hour Reading (µg/m$^3$) | Mt Coal Produced | MBCY[3] Overburden |
|---|---|---|---|---|---|---|
| 2011 | DF-2 | 12.2 | 45 | 36 | 5.77 | 8.19 |
| | DF-3[2] | 9.5 | 31 | 31 | | |
| 2012 | DF-2 | 14.3 | 52 | 49 | | |
| | DF-3[2] | 5.6 | 15 | 14 | 6.01 | 9.33 |
| | DF-4N & 4M | 13.0 | 43 | 40 | | |
| | DF-4S | 13.5 | 39 | 38 | | |
| 2013 | DF-2 | 14.7 | 57 | 39 | | |
| | DF-4N & 4M | 8.2 | 23 | 21 | 5.43 | 8.98 |
| | DF-4S | 7.3 | 20 | 17 | | |
| 2014 | DF-2 | 12 | 28 | 22 | | |
| | DF-4N & 4M | 7.8 | 30 | 23 | 5.38 | 8.74 |
| | DF-4S | 6.9 | 16 | 15 | | |
| 2015 | DF-2 | 13.7 | 61 | 41 | | |
| | DF-4N & 4M | 9.6 | 54 | 31 | 6.34 | 8.06 |
| | DF-4S | 9.2 | 53 | 29 | | |

[1] See **map 3-1**
[2] DF-3 site was relocated to DF-4 in 2012
[3] Million bank cubic yards
Source: WFW 2016

Because $PM_{2.5}$ monitoring is not required by WDEQ-AQD, data were not gathered onsite. However, data from $PM_{2.5}$ monitors located nearby were used to estimate $PM_{2.5}$ emissions at the mine. $PM_{2.5}$ data gathered from four sites between 2011 and 2015 (**map 3-1**) were used to assess $PM_{2.5}$ levels at the DFM (**table 3-6**). Exceptional events (if observed) are noted in the data acquired from the EPA database. Exceptional events are defined as occasional instances where a natural and exceptional occurring event impacts monitoring, causing a reading that is in exceedance with the NAAQS (WDEQ-AQD 2016). In the case that this occurs, the Final

**Table 3-6. Measured $PM_{2.5}$ Concentrations[1] in Campbell County, Wyoming (2011-2015)**

| Site ID[1] | Year | 24-hour (µg/m³) | Annual (µg/m³) |
|---|---|---|---|
| Btm-26-2 (Black Thunder Mine) | 2007 | 19 | 6.6 |
| | 2008 | 11 | 4.9* |
| Btm-36-2 (Black Thunder Mine) (560050891) | 2011 | 14 | 3.4* |
| | 2012 | 16 | 4.9* |
| | 2013 | 14 | 4.2* |
| | 2014 | 10 | 3.9 |
| | 2015 | 22 | 4.9* |
| | 2016 | 12 | 3.3* |
| Belle Ayr Ba-4,5n,5s (560050892) | 2011 | 20 | 5.3* |
| | 2012 | 22 | 7.9* |
| | 2013 | 14 | 6.4* |
| | 2014 | 10 | 5.2 |
| | 2015 | 18 | 5.0 |
| | 2016 | 14 | 4.6* |
| Buckskin Mine North Site (560051899) | 2011 | 16 | 4.8* |
| | 2012 | 18 | 5.9* |
| | 2013 | 14 | 4.8 |
| | 2014 | 12 | 5.5 |
| | 2015 | 21 | 2.2 |
| | 2016 | 10 | 2.5* |

[1] See **map 3-3** for locations
* indicates the mean does not satisfy minimum data completeness criteria
Source: EPA 2015a

"Treatment of Data Influenced by Exceptional Events" Rule (40 CFR 50.14) allows the state to request a data flag and justify the flag by submitting documentation showing that NAAQS exceedance would not have occurred in the absence of a natural/exceptional event. Monitoring during the period of 2011 to 2015 demonstrated that ambient concentrations of $PM_{2.5}$, as determined by the 98th Percentile 24-hour standard and annual average values, were within established short-term (24-hour) and long term (annual) NAAQS and WAAQS values indicated in **table 3-3**.

EPA referenced emission factors are available for use in estimating $PM_{2.5}$ values based on $PM_{10}$ values (Pace 2005). Because no specific data were available for western coal mines, these emission factors were developed from sources with similar characteristics, including large open cut aggregate mines and large-scale construction projects with considerations toward unpaved fugitive emissions from heavy haul trucks. Generally accepted estimates consistently presented emission fractions of $PM_{2.5}$ values at a range of 0.1 to 0.15 of $PM_{10}$ values for unpaved roadways and 0.15 to 0.2 for wind erosion from industrial and construction sites (Pace 2005). DFM-specific $PM_{10}$ monitoring data were used to estimate $PM_{2.5}$ ambient concentrations for annual mean and annual high 24-hour by application a 0.2 factor ($PM_{2.5}$ to $PM_{10}$) (**tables 3-7** and **3-8**, respectively).

**Table 3-7. Estimated Annual High 24-Hour STP $PM_{2.5}$ Concentrations (µg/m³) ($PM_{2.5}$ WAAQS: 35 µg/m³ Annual, 24-hour)**

| Site Name[1] | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| DF-1 | ** | ** | ** | ** | ** |
| DF-2 | 9 | 10.4 | 11.4 | 5.6 | 12.2 |
| DF-3 | 6.2 | 3 | ** | ** | ** |
| DF-4N & 4M | ** | 8.6 | 4.6 | 6 | 10.8 |
| DF-4S | ** | 7.8 | 4 | 3.2 | 10.6 |

[1] See map 3-1 for site locations
** Indicates that the site is inactive

**Table 3-8. Estimated Annual Mean STP PM2.5 Concentrations (µg/m$^3$) (Annual Mean $PM_{2.5}$ WAAQS: 12 µg/m$^3$; NAAQS: 12 µg/m$^3$)**

| Site Name[1] | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| DF-1 | ** | ** | ** | ** | ** |
| DF-2 | 2.4 | 2.9 | 2.9 | 2.4 | 2.7 |
| DF-3 | 1.1 | ** | ** | ** | ** |
| DF-4N & 4M | ** | 2.6 | 1.6 | 1.56 | 1.9 |
| DF-4S | ** | 2.7 | 1.5 | 1.4 | 1.8 |

[1] See map 3-1 for site locations
** Indicates that the site is inactive

These data indicate that projected $PM_{2.5}$ ambient design concentrations should be below the prescribed 24-Hour WAAQS and NAAQS (35 µg/m$^3$) and the annual WAAQS and NAAQS (15 µg/m$^3$ and 12 µg/m$^3$, respectively), which supports the findings of Gillette area $PM_{2.5}$ data evaluation presented in **table 3-5**.

Under the CAA, EPA has set protective health-based standards for $O_3$ in the air we breathe. Prior to May 27, 2008, the NAAQS 8-hour standard for $O_3$ was 0.080 ppm (157 µg/m$^3$ at standard temperature and pressure [STP]). On March 27, 2008 (effective May 27, 2008), EPA revised the 8-hour standard to 0.075 ppm (148 µg/m$^3$ at STP) and EPA revised the 8-hour standard for $O_3$ again on October 26, 2015 (effective on December 28, 2015) to 0.070 ppm (138 µg/m$^3$ at STP). $O_3$ monitoring is not required at the DFM but levels have been monitored at the Thunder Basin National Grassland Air Quality System (AQS) Site (560050123), which is located approximately 22 miles north of the A2Tr1 tract, and at the South Campbell County air quality (AQ) Site (560050456), which is located approximately 17 miles south of the A2Tr1 tract (**map 3-3**). An exceedance of the O3 8-hour standard occurs if the 4th-highest daily maximum value is above the level of the standard (0.08 parts per million [ppm] prior to 2008 0.075 ppm from 2008 to October 2015). **Table 3-9** shows one exceedance of the 8-hour standard for the NAAQS $O_3$ standard having occurred during the 2011-2015 monitoring period.

**Table 3-9. Measured $O_3$ Concentrations (4$^{th}$-Highest Daily Maximum Value) at Selected AQS Monitoring Sites[1], 2011 – 2015**

| Parameter Measure | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Thunder Basin (560050123) | | | | | |
| 8-hour (ppm)[2] | 0.061 | 0.071 | 0.061 | 0.058 | 0.059 |
| 8-hour (µg/m$^3$) at STP | 119.8 | 139.4 | 119.8 | 113.9 | 115.8 |
| # of Days Maximum Exceeded | 0 | 1* | 0 | 0 | 0 |
| South Campbell County (560050456) | | | | | |
| 8-hour (ppm) | 0.062 | 0.069 | 0.061 | 0.059 | 0.062 |
| 8-hour (µg/m$^3$) at STP | 121.7 | 135.5 | 119.8 | 115.8 | 121.7 |
| # of Days Maximum Exceeded | 0 | 0 | 0 | 0 | 0 |

[1] See map 3-3 for locations
[2] ppm – parts per million. The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 parts per million (235 µg/m3) is equal to or less than 1, as determined by Appendix H of 40 CFR 50.
* This is not an exceedance based on 2012 NAAQS.

$NO_2$ concentrations (98$^{th}$ percentile, 1-hour) are currently being monitored in Campbell County at four AQS monitoring sites (**table 3-10**). These monitoring sites are the closest to the DFM, and the distances between the monitoring sites and the A2Tr1 tract range between approximately 17 miles and approximately 37 miles (**map 3-3**). As shown in **table 3-10**, all monitored $NO_2$ values are well below the NAAQS and WAAQS of 100 µg/m$^3$.

**Table 3-10. Measured $NO_2$ Concentrations in Campbell County, Wyoming, 2011-2015, 98th Percentile 1-Hour $NO_2$ Concentrations (µg/m³)**

| AQS[1] Site ID | Sampler ID | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| 560050011 | Hilight-Reno Junction Gas Plant | ** | 46 | 52 | 55 | 41 |
| 560050123 | Thunder Basin Grassland Site | 11 | 11 | 9 | 10 | 8 |
| 560050456 | South Campbell County | 33 | 32 | 32 | 32 | 32 |
| 560050892 | Belle Ayr Ba-4,5n,5s | 36 | 34 | 35 | 35 | 32 |

[1] See **map 3-3** for location
** Indicates the monitoring site was inactive
Source: EPA 2015a

$SO_2$ concentrations (99th percentile, 1-hour) are currently being monitored in Campbell County at one AQS monitoring site (**table 3-11**). This monitoring site is approximately 7 miles from the A2Tr1 tract (**map 3-3**). As shown in **table 3-11**, all monitored $SO_2$ values are well below the NAAQS and WAAQS of 75 parts per billion (ppb).

**Table 3-11. Measured $SO_2$ Concentrations in Campbell County, Wyoming, 2011-2015, 99th Percentile 1-Hour $NO_2$ Concentrations (µg/m³)**

| AQS[1] Site ID[2] | Sampler ID | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| 560050857 | Wyodak Site 4 | 37 | 39 | 37 | 32 | 16 |

[1] AQS-Air Quality System
[2] See **map 3-3** for location
Source: EPA 2015a

Annual Hg (a HAP) and Pb (a criteria pollutant) monitoring values are not collected specifically for the DFM. **Table 3-12** shows the Hg emissions from three coal fired power plants in Campbell County.

**Table 3-12. Measured Annual Hg Air Emissions from Power Stations in Campbell County (Pounds)**

| Power Station | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Wyodak Plant | 159.8 | 250.9 | 204.3 | 301.1 | 111.2 |
| Dry Fork Station | 63.0 | 67.0 | 67.0 | 50.0 | 38.3 |
| Neil Simpson Complex | 379.0 | 357.0 | 378.0 | 354.0 | 351.0 |
| Combined Percent of Total Emission Emitted to Air | 71% | 57% | --[1] | 66% | 46% |

[1] 2013 Neil Simpson total emissions value on website appears to be incorrect given the significantly lower values in 2011, 2012, 2014, and 2015 so 2013 calculations are not included
Source: EPA (2017)

**Table 3-13** shows the Pb emissions from three coal fired power plants, one mine, and one AQS monitoring site in Campbell County. As shown in **table 3-13**, the Pb values from the Thunder Basin site (the only station reporting in µg/m³) are well below the NAAQS and WAAQS of 0.15 µg/m³.

**Table 3-13. Measured Annual[1] Pb Air Emissions[1] from Power Stations and One Coal Mine in Campbell County**

| Power Station | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Wyodak Plant (pounds) | 20.5 | 42.6 | 43.1 | 35.3 | 33.2 |
| Dry Fork Station (pounds) | 32.0 | 9.0 | 9.0 | 21.0 | 8.6 |
| Neil Simpson Complex (pounds) | 63.0 | 62.0 | 60.0 | 31.0 | 24.0 |
| Buckskin Mining Co (pounds) | 18.0 | 15.9 | 8.1 | 9.2 | 6.6 |
| Thunder Basin (560050123) (µg/m³) | 0.005 | 0.002 | 0.002 | 0.001 | 0.002 |

[1] Pb monitoring at the Thunder Basin AQS site in presented as annual 1st maximum value
Source: EPA (2017)

### *3.4.7.3 Air Quality Related Values*

The evaluation of air quality related values (AQRVs) is based on the closest Class I PSD area. AQRVs are evaluated by the land management agency responsible for a Class I area, according to the agency's level of acceptable change (LAC). These AQRVs include potential air pollutant effects on visibility and the acidification of lakes and streams. The AQRVs, and the associated LAC, are applied to PSD Class I and sensitive Class II areas and are the land management agency's policy and are not legally enforceable as a standard. WAAQS do include a standard for visibility. Class I areas are afforded specific AQRV protection under the Clean Air Act. The Class I designation allows very little deterioration of air quality. The AQRVs associated with this action include visibility and acidification of lakes. The nearest federal Class I area is located approximately 74 miles north-northwest of the proposed tracts at the Northern Cheyenne Indian Reservation (**map 3-3**). CO was not monitored in Campbell County so monitoring results are not available.

#### 3.4.7.3.1 Visibility

Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ Rules and Regulations (chapter 6, section 4). Therefore, the State of Wyoming does not require mines to evaluate their impacts on Class I areas, though the BLM does consider such issues during leasing. The current visibility discussions have been inferred from the currently permitted mining activities related to the existing coal leases at the DFM. Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. Particulates finer than 2.5 microns in effective diameter ($PM_{2.5}$) are the main cause of visibility impairment. Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the EPA's Regional Haze Rule to achieve the National Visibility Goal. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment. **Figure 3-4** shows annual averages for the 20 percent best, worst, and middle visibility days at Northern Cheyenne Indian Reservation monitoring site (the nearest PSD Class I area, see **map 3-3**) for 2003 through 2014 (Interagency Monitoring of Protected Environments [IMPROVE] 2016). Lower dv values indicate better visibility conditions (BLM 2014). As indicated on **figure 3-4**, the long-term trend in visibility at the Northern Cheyenne Indian Reservation appears to be relatively stable, if not improving slightly.

#### 3.4.7.3.2 Air Quality Related Values Related to Coal Combustion

Emissions that affect air quality also result from combustion of fossil fuels. **Table 3-14** presents the estimated $PM_{10,}$ $PM_{2.5}$, SO2, $NO_X$, Hg, and CO emissions estimates for coal mined at the DFM that was used for power generation.

#### 3.4.7.3.3 Acidification of Lakes/Acid Deposition

**Table 3-3** includes the WAAQS standards for $H_2S$. Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ Rules and Regulations (chapter 6, section 4). Therefore, the state of Wyoming does not require mines to monitor $H_2S$. Because the DFM is not required by WDEQ to monitor $H_2S$, a direct comparison to WAAQS standards is not possible. The current $H_2S$ values for the DFM have been inferred from the currently permitted impacts of mining the existing coal leases at the DFM. The primary concern related to $H_2S$ associated with mining is from acid deposition. Acid deposition causes acidification of lakes and streams, which has direct impacts on aquatic habitats, and contributes to the damage of trees at high elevation and many sensitive forest soils (EPA 2016c). According to the EPA

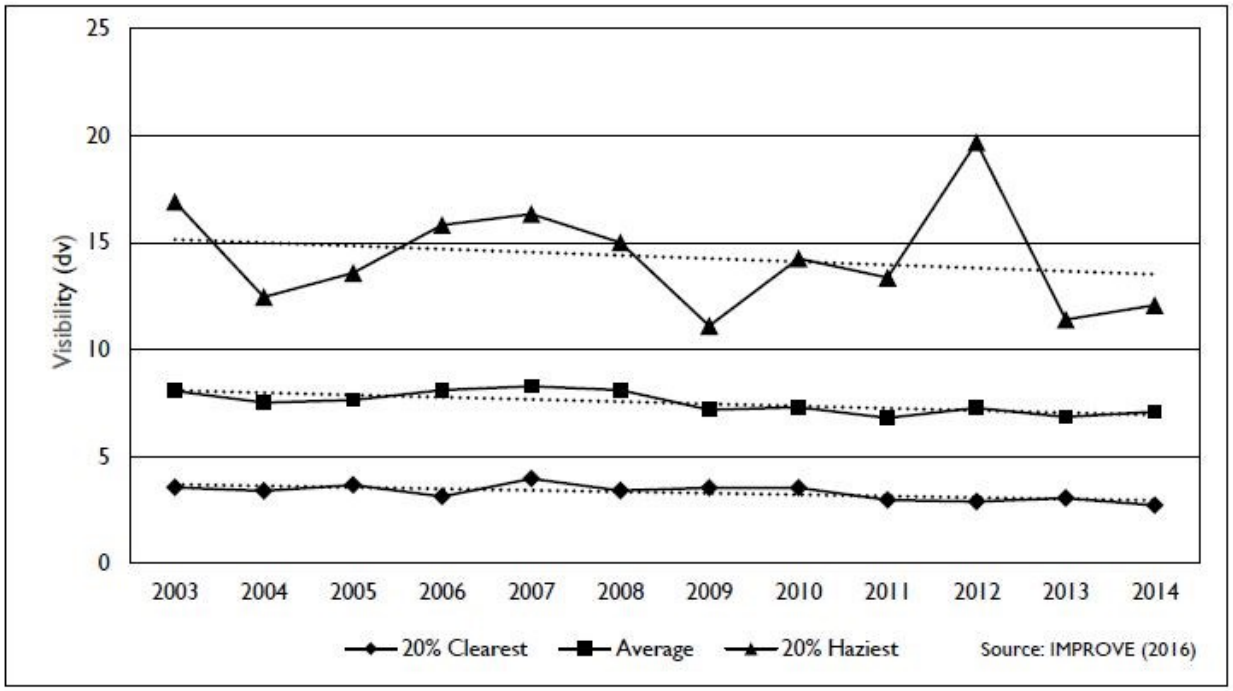



**Figure 3-4. Visibility in the Northern Cheyenne Indian Reservation**

**Table 3-14. Estimated Annual PM10, PM2.5, SO2, NOX, and Hg Contributions from Combustion of Coal Mined at the DFM1, 2011-2015**

| Source | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|
| Tons of Coal Recovered | 5,770,964 | 6,006,787 | 5,433,936 | 5,373,973 | 6,369,206 | 6,135,546 |
| $PM_{10}$ (Tons) | 4,009.9 | 4,173.7 | 3,775.7 | 3,734.0 | 4,425.5 | 4,263.2 |
| $PM_{2.5}$ (Tons) | 1,223.0 | 1,273.0 | 1,151.6 | 1,138.9 | 1,349.8 | 1,300.3 |
| $SO_2$ (Tons) | 50,495.9 | 52,559.4 | 47,546.9 | 47,022.3 | 55,730.6 | 53,686.0 |
| $NO_X$ (Tons) | 20,775.5 | 21,624.4 | 19,562.2 | 19,346.3 | 22,929.1 | 22,088.0 |
| Hg (Tons) | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 |
| CO (Tons) | 1,442.7 | 1,501.7 | 1,358.5 | 1,343.5 | 1,592.3 | 1,533.9 |

[1] Source: WWC Engineering (WWC) completed the calculations, which are provided in **appendix C**

(2002), hydrogen ion ($H^+$) concentrations are the primary indicator of precipitation acidity. **Table 3-15** provides the measured hydrogen ion concentrations as determined at the Site WY99, the closest to the DFM, for the years 2011 through 2015. The location of WY99 in relationship to the DFM is indicated on **map 3-3.** As indicated in **table 3-15,** the 2011-2015 trend in H+ at monitoring site WY99 appears to be relatively stable.

**Table 3-15. Measured Hydrogen Ion (H+) Concentrations[1] at Monitoring Site WY99, 2011–2015**

| Parameter | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| pH | 5.7 | 5.8 | 5.8 | 5.7 | 5.8 |
| Wet (kg/hectare) | 0.01 | <0.01 | 0.01 | 0.01 | 0.01 |

[1] Measured as pH and WET (whole effluent toxicity) deposition
[2] EPA 2015a

### *3.4.7.4 Greenhouse Gases (GHG)*

According to the EPA, GHG include $CO_2$, methane ($CH_4$), nitrous oxide ($N_2O$) and several fluorinated species of gas (EPA 2016d). $CO_2$ is emitted from the combustion of fossil fuels, including coal. $CH_4$ can be emitted during the production and transport of coal and $N_2O$ is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels

and solid waste. $CO_2$ and other GHGs are naturally occurring gases in the atmosphere; their status as a pollutant is not related to their toxicity but instead is due to the added long-term impacts they have on climate because of their increased incremental levels in the earth's atmosphere.

The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1.0 ton of $CO_2$ (EPA 2014c). Each GHG has a different lifetime in the atmosphere and a different ability to trap heat in the atmosphere. To allow different gases to be compared and added together, emissions can be converted into carbon dioxide equivalent ($CO_2e$) emissions. The $CO_2e$ emissions that occurred at the DFM from 2011 through 2016 have been estimated, based on an estimated annual coal production (**table 3-16**). The inventories included emissions from all sources, including all types of carbon fuels used in the mining operations; electricity used on site (i.e., lighting for facilities, roads, and operations and conveyors); and mining processes (i.e., blasting, coal fires caused by spontaneous combustion, and methane released [vented] from exposed coal seams). $CO_2e$ emissions generated by transporting the coal via rail to final destinations at power plants and loading terminals are also estimated, which were calculated using annual average rail miles from the DFM to final destinations. The average haul distances were calculated using the weighted average of haul distances from the DFM for annual coal sales for 2011 through 2016 (WFW 2016a).

The amount of $CO_2e$ emitted during the combustion of fossil fuels varies according to the carbon content and heating value of the fuel used (EPA 2008). As indicated in **table 3-16**, approximately 10.3 million metric tons of $CO_2e$ were produced in 2016 from the combustion of the 6.1 million tons of coal mined at the DFM (see **appendix C** for calculations).

Approximately 98 percent of the coal mined in 2015 in the Wyoming PRB was used to generate electricity by coal-fired power plants in the United States (USEIA 2016a).

The potential for emissions of dust can be an environmental concern for coal use/transport projects due to the large volumes of coal transported to large generating stations (Ramboll Environ 2016). Coal dust and fines blowing or sifting from moving, loaded rail cars has been linked to railroad track stability problems resulting in train derailments and to rangeland fires caused by spontaneous combustion of accumulated coal dust (BLM 2009). While no specific studies of coal dust impacts have been conducted in the PRB, BNSF has been involved in research regarding the impacts of coal dust escaping from loaded coal cars on rail lines in the PRB. BNSF has determined that coal dust poses a serious threat to the stability of the track structure and the operational integrity of rail lines in, and close to, the mines in the PRB.

#### *3.4.7.5 Emission Standards at Coal Combustion Sources*

As stated in **section 1.2.1**, the DFM currently supplies the DFS with approximately 2.0 Mtpy of coal for use for power generation. The CAA enacted the NSPS and National Emissions Standards for HAPS for specific types of equipment located at new or modified stationary pollutant sources. NSPS regulations limit emissions from new, modified, or reconstructed emission units under the regulated source categories. Stationary sources typically meet the NSPS limits by installing modern equipment and/or adding air pollution control equipment. Specific to this EA, NSPS emissions standards apply to combustion of coal at the DFS. Other NSPS standards also may apply at the DFS Station related to coal processing (i.e., crushing and screening).

## Table 3-16. Estimated 2011-2016 Direct and Indirect $CO_2e$ Emissions[1] at the DFM from Coal Combustion

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Average |
|---|---|---|---|---|---|---|---|
| **General** | | | | | | | |
| Mt of Coal Recovered | 5.77 | 6.01 | 5.43 | 5.37 | 6.37 | 6.14 | 5.8 |
| Mt of Coal Shipped by Conveyor (All to DFS) | 1.01 | 2.03 | 1.99 | 2.14 | 2.10 | 1.83 | 1.85 |
| Mt of Coal Shipped by Rail | 4.76 | 3.98 | 3.44 | 3.24 | 4.27 | 4.30 | 3.94 |
| Average Transport Miles (One Way) | 365 | 192 | 250 | 142 | 132 | 141 | 216 |
| Number of Train Trips (One Way) | 308 | 257 | 222 | 209 | 276 | 278 | 258 |
| **Direct Emissions Sources** | | | | | | | |
| Fuel | 18,853 | 19,624 | 19,624 | 17,556 | 20,808 | 20,026 | 19,415 |
| Electricity Consumed in Mining Process | 15,409 | 16,039 | 16,039 | 14,349 | 17,006 | 16,368 | 15,868 |
| Mining Process | 6,623 | 6,894 | 6,894 | 6,168 | 7,310 | 7,035 | 6,821 |
| **Total Direct Emissions** | 40,886 | 42,556 | 42,556 | 38,073 | 45,124 | 43,429 | 42,104 |
| **Indirect Emissions Sources** | | | | | | | |
| Rail Transport[2] | 60,693 | 26,675 | 30,030 | 16,044 | 19,687 | 21,199 | 29,055 |
| From Coal Combustion[3] | 9,666,365 | 10,061,368 | 9,101,843 | 9,001,405 | 10,668,420 | 10,277,040 | 9,796,073 |
| **Total Indirect Emissions** | **9,727,058** | **10,088,043** | **9,131,873** | **9,017,448** | **10,688,107** | **10,298,239** | **9,825,128** |
| **Total Estimated $CO_2e$ Emissions** | **9,767,943** | **10,130,599** | **9,174,429** | **9,055,521** | **10,733,231** | **10,341,668** | **9,867,232** |

1 In metric tons - see **appendix E** for calculations

2 Coal haulage emissions based on 130-car trains with four locomotives, train trips per year; 488.2 kg $CO_2e$ per mile per loaded train, 96.1 Kg $CO_2e$ per mile per empty train; and round-trip mileage to power plants. Coal haulage emissions calculations includes a loaded train and a returning empty train, per train trip.

3 Based on 1.683 metric tons $CO_2e$ per ton of coal burned for electrical generation (EPA 2008) and calculated by WWC (2017).

Beginning in 2011, the DFS and other electricity generating facilities became subject to new emission standards to reduce Hg and other toxic air pollution from coal and oil combustion at Electric Generating Units (EGUs). These rules set technology-based emission limitation standards for Hg and other toxic air pollutants, reflecting levels achieved by the best-performing sources currently in operation. The final rule established HAP standards for new and existing coal- and oil-fired EGUs with a capacity of 25 MW or greater. All regulated EGUs are considered major sources under the final rule. While new sources must meet the standards at start-up of operations, existing sources generally have up to 4 years to comply with the MATS. The emissions limits associated with the MATS rule are presented in **table 3-17**. The DFS Station is considered an existing facility and currently only burns coal to generate electricity. As indicated in WDEQ-AQD correspondence, as of the time of the inspection (October 6, 2015), the DFS was in compliance with all applicable WAQSR (WDEQ-AQD 2014). There are four existing coal-fired EGUs currently operating in Campbell County.

**Table 3-17. MATS Emission Requirements[1] for Coal-Fired Units**

| | EGU Subcategory | Mercury Emission Limit (lb./GWh) |
|---|---|---|
| **Existing** | Regular Coal | 0.013 |
| | Designed for Low Rank Coal[2] | 0.12 or 0.040 |
| **New** | Regular Coal | 0.0002 |
| | Designed for Low Rank Coal | 0.04 |

[1] The Supreme Court recently held that the EPA did not properly consider the costs of the MATS rule. See Michigan v. USEPA, 192 L. Ed. 2d 674 (June 29, 2015). The consequences of this decision are still being assessed by EPA and the lower courts. For purposes of the A2Tr1 EA, the analysis includes the 2011 MATS rule because the DFS has already complied with those standards.
[2] Most of these units burn lignite coal.
lb./GWh = pounds of pollutant per gigawatt hour – electric output.
Source: EPA 2012.

The DFS is located adjacent to the DFM and is operated by Basin Electric Power Cooperative. The DFS consists of one coal-fired steam driven EGU with a net electric generating capacity of 422 MW. The DFM provides all of the coal utilized at the DFS. Actual emissions data for DFS are listed in **table 3-18**.

**Table 3-18. Dry Fork Station Reported Emissions, 2011-2015**

| Emissions | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| $CO_2$ (Tons) | 1,342,695 | 3,555,746 | 3,588,183 | 3,635,576 | 3,415,773 |
| $NO_X$ (Tons) | 232.1 | 619.6 | 635.6 | 657.2 | 672.0 |
| $SO_2$ (Tons) | 278.6 | 691.5 | 829.7 | 884.1 | 869.7 |
| Hg (Tons) | 0.036 | 0.042 | 0.043 | 0.035 | 0.033 |

Source: SNL 2016 ($CO_2$, $NO_X$, and $SO_2$), EPA 2017a (Hg)

The Wyodak Power Plant (owned and operated by PacifiCorp) is located approximately 7 miles southeast of the A2Tr1 tract. It consists of one coal-fired steam-driven EGU. The Wyodak plant has a rating of 402 MW. The DFM does not provide coal to the Wyodak Power Plant.

Neil Simpson Complex consists of the Neil Simpson I and Neil Simpson II stations, owned and operated by Black Hills Corporation. The complex is located approximately 7 miles southeast of the A2Tr1 tract. The Neil Simpson I station was retired in 2014. The Neil Simpson II has a rating of 80 MW. The DFM does not provide coal to the Neil Simpson Complex.

Wygen Station is a coal-fired power station owned and operated by Black Hills Corporation located approximately 7 miles southeast of the A2Tr1 tract. It consists of three coal-fired steam-driven stations (Wygen I, II, and III). The Wygen Station has a combined rating of 294 MW. The DFM does not provide coal to the Wygen Station.

## 3.5 Water Resources

### 3.5.1 Surface Water

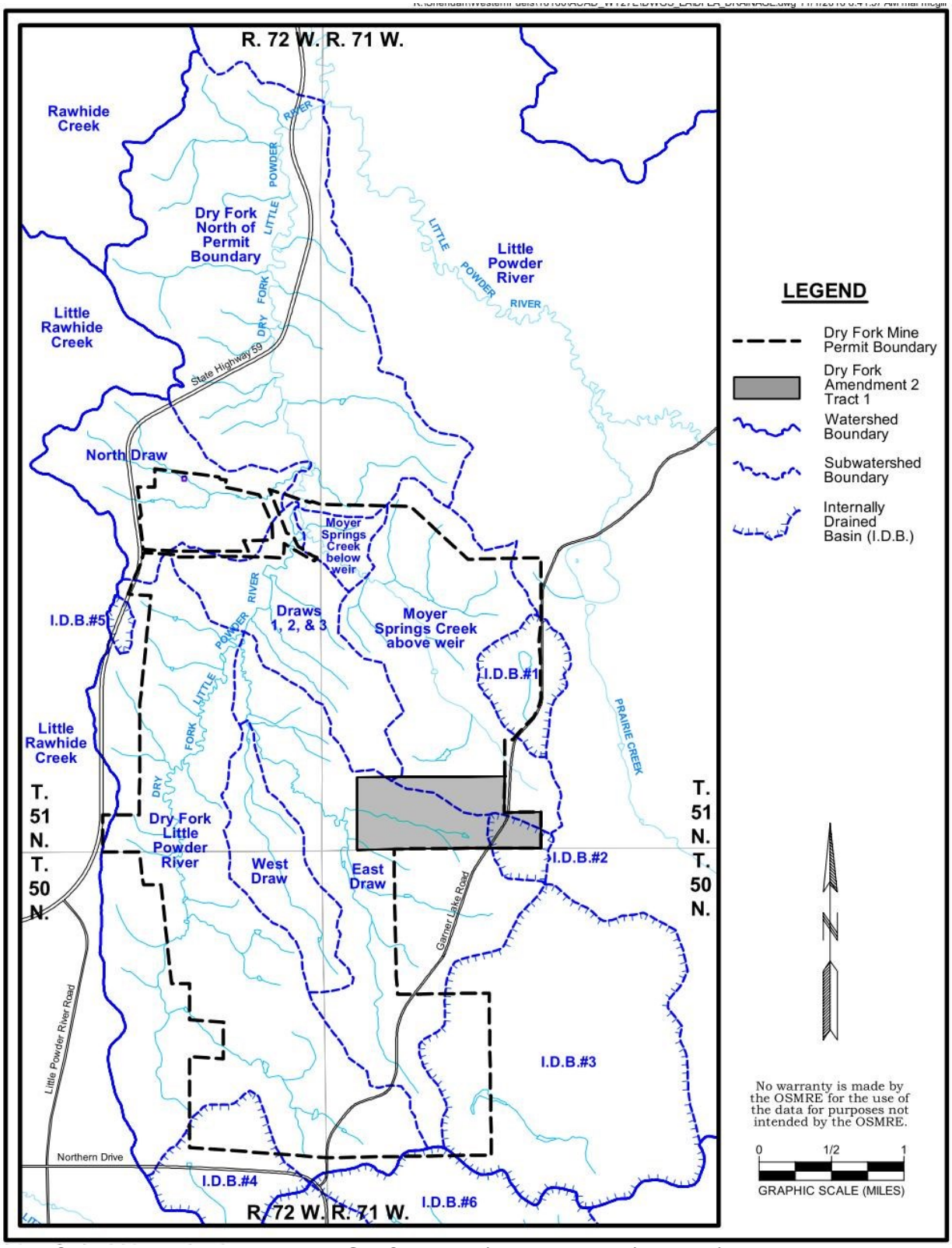
The following discussions on surface water are summarized from Appendix D6 (Hydrology) of the DFM Permit No. PT0599 (WFW 2011) and from the WDEQ-LQD's *Cumulative Hydrologic Impact Assessment of Coal Mining in the Northern Powder River Basin, Wyoming* (2013 CHIA) (WDEQ-LQD/Lidstone 2013).

The DFM is located along the Dry Fork Little Powder River (LPR). Watersheds and surface drainages associated with the DFM are shown on **map 3-4**. Dry Fork LPR is joined within the permit boundary by Moyer Springs Creek. The drainage area of Dry Fork LPR is approximately 10,720 acres (16.75 square miles). Dry Fork LPR joins the Little Powder River about 2.5 miles north of the permit boundary. The Little Powder River joins the Powder River in Montana, and the Powder River then flows into the Yellowstone River. According to information included in the 2013 CHIA, Dry Fork LPR is ephemeral upstream of Moyer Springs Creek. Streamflows monitored at Dry Fork Mine station CR-3 upstream of the confluence with Moyer Springs Creek illustrate the effect of Moyer Springs on the flow regime of the Dry Fork LPR. From October 1980 to December 1982, flow was only recorded during 23 days, or 3 percent of the period. Streamflow at the station was caused by snowmelt or summer rain events, with flows usually lasting less than five days after an event. The maximum mean daily discharge during the monitoring period was 13.6 cubic feet per second (cfs).

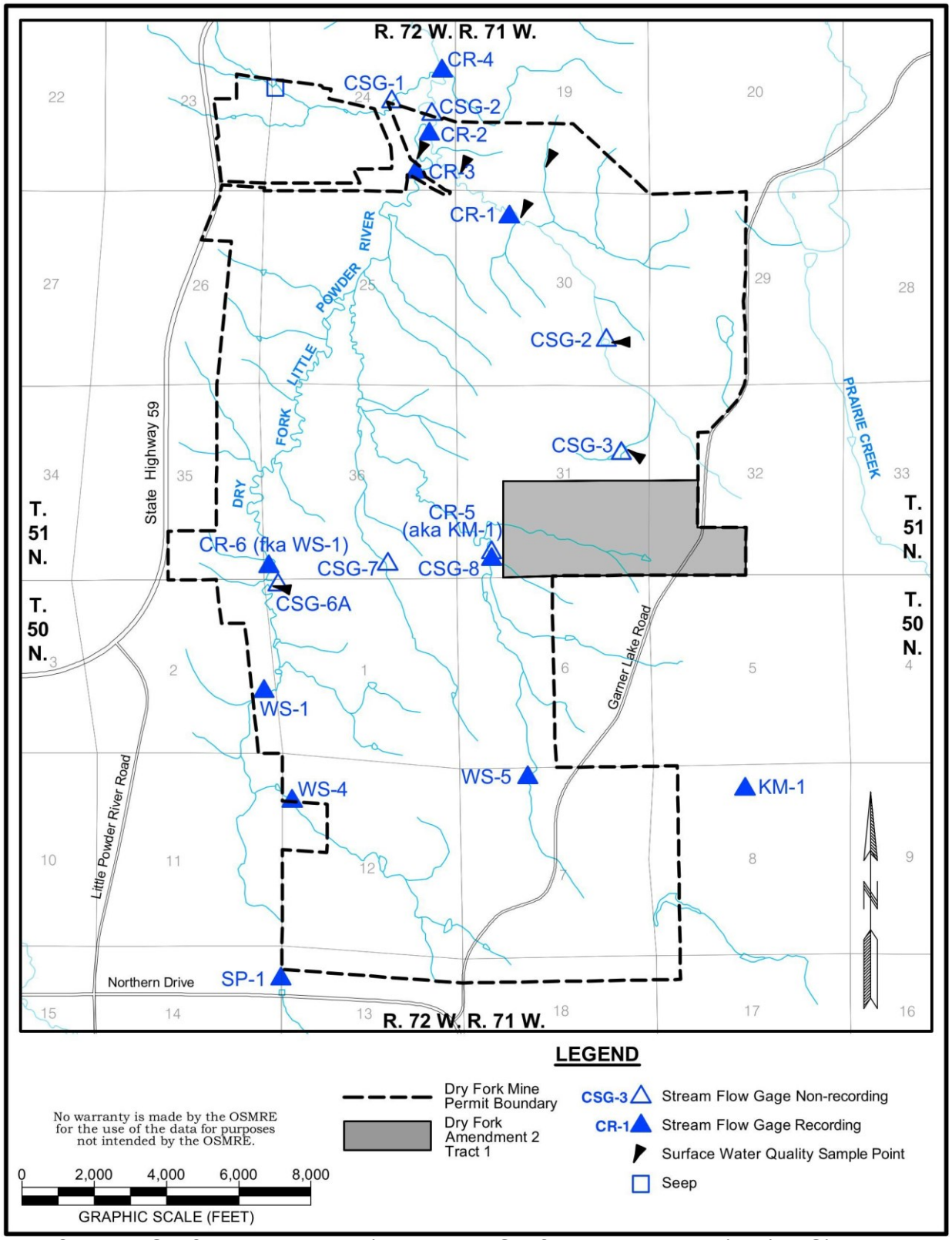
At CR-3 on Dry Fork upstream of the confluence with Moyer Springs (**map 3-5**), five water quality samples were collected from May 1981 to August 1982 (WDEQ-LQD/Lidstone 2013). The dominant ions were calcium and sulfate. Total dissolved solids (TDS) and total suspended solids (TSS) concentrations were generally higher and more variable than further downstream. TDS ranged from 218 to 4,710 milligrams per liter (mg/L), with a median of 2,720 mg/L. TSS ranged from 34 to 2,680 mg/L, with a median of 60 mg/L. Most dissolved metals had concentrations below detection limits. There were no exceedances of Class 3B standards (WDEQ-WQD 2016) for any constituent. Water quality of the surface waters within the DFM permit area is suitable for livestock watering.

Boron and sulfate concentrations consistently exceed domestic and agricultural use standards, with total dissolved solids, Pb, and cadmium levels occasionally exceeding the maximum values for domestic and agricultural use, particularly during the summer months. Streamflow and surface-water quality associated with the DFM are currently being monitored at five monitoring sites (**map 3-5**). Water-quality data from surface water sites are included in the 2013 CHIA.

The surface water hydrologic system within the A2Tr1 tract is dominated by two drainage systems. One of these is Moyer Springs Creek and the other is East Draw. These drainage systems or basins are tributaries to Dry Fork LPR. A very small portion of the combined Draw 1, 2, and 3 system and one internally drained basin (IDB) #2 are also associated with the tract. According to information presented in Appendix D6 (Hydrology) of the DFM Permit No. PT0599, the portions of Moyer Springs Draw, East Draw, and the combined Draw 1, 2, and 3 system within the tract have ephemeral flows (respond only to rainfall or snowmelt events) (WFW 2011). Moyer Springs Creek below Moyer Springs maintains a perennial flow due to ground-water discharge from Moyer Springs. Within the A2Tr1 tract, the drainage area of Moyer Springs Creek is approximately 95.8 acres, East Draw is approximately 221.9 acres in size, the combined size of Draws 1, 2, and 3 system is approximately 0.7 acres, and IDB 2 is approximately 46.1 acres in size.




**Map 3-4. Watersheds and Surface Drainages Associated with the DFM**




**Map 3-5. Surface Water Drainages and Surface Water Monitoring Sites at the DFM**

The surface-water quality varies with stream flow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. Due to the flow fluctuations (no flow to 3.3 cfs, as determined from flows at CS-1, CS-2, CS-4, CS-5, CS-6 surface water monitoring sites [WFW 2014]), the surface water quality is usually unsuitable for domestic use but suitable for irrigation and livestock use, as determined from parameters presented in Ayers and Westcot (1976).

According to information included in the 2013 CHIA, Moyer Springs is comprised of a series of groundwater discharge points along the lower reaches of Moyer Springs Creek. Discharge from the springs originates in coal and scoria aquifers in the east, south, and southeast. Recharge to the aquifers is affected by precipitation inputs, which in turn affect the quantity of discharge from Moyer Springs. The DFM estimated that approximately 0.25 cfs of base flow can be attributed to clinker recharge and 0.17 cfs of base flow comes from the coal overburden aquifer groundwater discharging along the Dry Fork LPR. An additional 0.04 cfs is predicted to be lost to evaporation, totaling 0.42 cfs of groundwater discharge to surface flows. Water balance calculations demonstrate that the outflow from the Moyer Springs Creek valley totals approximately 948 acre-feet (ac-ft), with 919 ac-ft being contributed from Moyer Springs and groundwater in alluvium (WDEQ-LQD/Lidstone 2013).

The dominant ions measured in samples collected from the Moyer Springs between 1979 and 1982 were calcium and sulfate. The pH ranged from 6.7 to 9.7, with a median of 7.8. The maximum pH of 9.7 exceeds Class 2AB standards (WDEQ-WQD 2016). TDS ranged from 1,030 to 1,256 mg/L, with a median of 1,119 mg/L. The consistent TDS concentrations reflect the quality of the spring discharge in contrast to the more variable surface water concentrations usually observed following runoff events. TSS concentrations were very low and reflective of spring discharge, ranging from 1 to 19 mg/L with a median of 1 mg/L. Dissolved metal concentrations were also very low, with numerous values below detection limits. Class 2AB criteria were met with the exception of 18 exceedances of Pb, seven exceedances of copper, and 18 exceedances of cadmium. The cadmium and Pb exceedances occurred during the first 2 years of sampling (WDEQ-LQD/Lidstone 2013).

### 3.5.2 Groundwater

The following discussions on groundwater are summarized from Appendix D6 (Hydrology) of the DFM WDEQ-LQD Permit No. PT0599 (WFW 2011) and from the 2013 CHIA (WDEQ-LQD/Lidstone 2013).

Hodson et al. (1973) list a number of geologic units in the mine area that are water-bearing. Only five of these will be affected by the proposed mining operations. The affected aquifers are the Quaternary alluvium, the burned and fused bedrock (Wyoming porcelanite or scoria), the early Tertiary Wasatch Formation, the coals of the Paleocene Fort Union Formation, and the reclaimed backfill. The Fort Union Formation that underlies the target coal seams will not be physically disturbed by mining activities but may be used for water supply.

#### *3.5.2.1 Alluvium*

Groundwater in recent alluvium (sediments deposited by water flow) occurs primarily near and along the valley and draw bottoms associated with Dry Fork LPR. Most of the alluvial deposits within the Dry Fork Mine property are very fine-grained, reflecting the texture of the Wasatch Formation from which they were derived. Some coarse-grained material occurs in the lowermost alluvial strata and exhibits the greatest permeability of the alluvial deposits. This alluvium is directly connected to and recharged by groundwater in adjacent clinker and the Wasatch overburden. Alluvial groundwater flow generally follows topography, flowing out of

upland areas into the valley and draw bottoms, then down-valley along the Dry Fork LPR drainage.

The 2013 CHIA presented water quality analysis from 50 alluvial wells in the northern PRB. When compared to select parameters with the WDEQ/WQD Class III livestock standards, exceedances were observed for aluminum (one well), arsenic (one well), boron (five wells), chromium (nine wells), Pb (12 wells), Hg (44 wells), selenium (one well), sulfate (24 wells), TDS (24 wells), and pH (two wells). TDS ranged from 300 to 15,636 mg/L with a median of 3,859 mg/L (Table 21). The water quality of the alluvial aquifer generally exhibited the highest TDS concentrations among all the aquifers. Water-quality data from the 50 alluvial wells are included in the 2013 CHIA.

Hydraulic gradients are similar to the topographic and valley-bottom slopes on which the deposits reside. The hydraulic conductivities in the alluvial aquifer ranged from 0.42 to 203 feet per day (ft/d). The median hydraulic conductivity of the alluvial aquifer was 12 ft/d. The hydraulic conductivities of the alluvial aquifer are generally higher when they are in close proximity to the clinker. Additionally, the hydraulic conductivity in the alluvial aquifer varies due to the discontinuous nature of the lenses within the sediments (WDEQ-LQD/Lidstone 2013).

#### *3.5.2.2 Clinker (Wyoming Porcelanite or Scoria)*

The other major bedrock unit is clinker (also variously called porcelanite, shale, or scoria). Clinker is generally resistant to erosion and forms round topped hills. Clinker is a material that results from the baking and fusing of overlying rocks during the burning of underlying coal beds. It is red to purple, porcelaneous and hard, and has a slag-like texture. Drainages developed on porcelanite usually exhibit an irregular pattern due to fracturing and a low drainage density due to high infiltration rates.

The 2013 CHIA presented water quality analysis from 15 clinker wells in the northern PRB. The analysis showed that the water quality of the clinker is poor, with six parameters exceeding the Class III livestock standards, including: chromium (one well), Pb (one well), Hg (seven wells), sulfate (two wells), TDS (two wells), and pH (one well). TDS ranged from 530 to 7,930 mg/L, with a median of 2,051 mg/L. A water quality type analysis indicated that the dominant baseline water quality type in the clinker was calcium sulfate (WDEQ-LQD/Lidstone 2013). Water-quality data from the 15 clinker wells are included in the 2013 CHIA.

Aquifer tests were conducted at a total of 17 wells completed in the clinker at the Rawhide, Dry Fork, and Synthetic Fuels mines. Hydraulic conductivities ranged from 3.0 to 504,000 ft/d, with a median of 414 ft/d. The high hydraulic conductivities calculated for the clinker likely incorporate a considerable level of uncertainty due to the difficulty of calculating conductivity from the small amount of drawdown measured in the observation wells (WDEQ-LQD/Lidstone 2013).

#### *3.5.2.3 Wasatch (Overburden) Formation*

The overburden in the DFM permit area is almost entirely composed of the Eocene Wasatch Formation and is commonly overlain by weathered residuum. In the permit area, the overburden ranges from approximately 10 feet to 210 feet thick and averages approximately 110 feet. In the permit area, the Wasatch Formation is a complex interfingering of claystones, shales, siltstones, sandstones, and minor, thin limestone beds. The overburden is dominated by claystones and siltstones, but is extremely variable.

There are some relatively thick sandstone units present, but these are very discontinuous and usually well cemented. The result is isolated and perched aquifers in the Wasatch overburden

that are capable of producing, at best, only low yields. Perched aquifers tend to drain fast and to be quite seasonal, becoming dry during periods of low rainfall.

The 2013 CHIA presented water quality analysis collected at 22 overburden wells. When compared to select parameters with the WDEQ/WQD Class III livestock standards, exceedances were observed for aluminum (one well), chromium (two wells), Pb (two wells), Hg (12 wells), sulfate (two wells), TDS (one well), and pH (six wells). TDS concentrations ranged from 180 to 5,290 mg/L, with a median of 1,975 mg/L. In general, TDS concentrations were less variable and lower in concentration than in the alluvial wells. A water quality type analysis (piper diagram) indicated that the baseline water type in the overburden varied between calcium sulfate, sodium sulfate, and sodium bicarbonate (WDEQ-LQD/Lidstone 2013).

Aquifer tests were conducted at a total of 38 overburden wells. The median hydraulic conductivity was 0.34 ft/d, with a maximum of 103 ft/d and a minimum of 0.001 ft/d. The variability in conductivity is likely due to the discontinuous nature of the sediments and the difficulty in testing wells that are low yielding (WDEQ-LQD/Lidstone 2013).

#### *3.5.2.4 Coal Aquifers*

As described in **section 3.3.1**, the coal to be mined is within the Wyodak-Anderson coal seam (made up of the upper Anderson coal seam and the lower Canyon coal seam separated by a claystones and carbonaceous coal lens) is the uppermost unit of the Tongue River Member of the Paleocene Fort Union Formation. In terms of lithology, the Fort Union Formation consists of approximately 2,500 feet of a predominantly claystone and siltstone sequence with some coal units and lenticular sandstones. The thicker coal units, such as the Wyodak-Anderson seam, are generally suitable for use as low yield aquifers.

The 2013 CHIA presented water quality analysis collected at 61 coal wells. When compared to select parameters with the WDEQ/WQD Class III livestock standards, Exceedances were observed for aluminum (one well), boron (two wells), cadmium (one well), chromium (four wells), Pb (three wells), Hg (30 wells), sulfate (six wells), TDS (three wells) and pH (13 wells). TDS concentrations ranged from 324 to 5,620 mg/L with a median of 1,117 mg/L. The water quality type in the coal was highly variable as it is dependent on several factors, including the proximity of a coal well to the clinker and the alluvial aquifers, depth of the well, and the local geochemistry (WDEQ-LQD/Lidstone 2013). Water-quality data from the 61 coal wells are included in the 2013 CHIA.

There were 59 aquifer tests conducted in the Wyodak-Anderson coal aquifer by the six coal mines. The permeability of coal is characterized by cleat permeability (natural opening-mode fractures in coal beds) and secondary permeability due to folding and faulting. The median hydraulic conductivity was 1.1 ft/d, with a maximum of 715 ft/d and a minimum of 0.01 ft/d.

#### *3.5.2.5 Backfill Aquifer*

When coal mines are reclaimed, the overburden is returned to the mined-out portion of the pit as backfill, and the mined area is reclaimed to the approved post-mining topography. The backfill material gradually saturates with groundwater entering through surface infiltration and from the adjacent aquifers and becomes a shallow backfill aquifer with unique aquifer properties and water chemistry (WDEQ-LQD/Lidstone 2013). Backfill aquifers include deeper backfill aquifer and shallow backfill aquifer in reclaimed alluvial valley floors (AVFs), if present.

The 2013 CHIA presented water quality analysis collected at 26 deeper backfill wells located within the Dry Fork, Rawhide, Buckskin, Eagle Butte, and Wyodak mines. The minimum median TDS was 1,265 mg/L and the maximum median TDS 8,590 mg/L. There were eight wells with a

2009-2011 median TDS greater than 5,000 mg/L. The TDS time-series plots show trends of increasing TDS concentrations until the mid-1990s and then concentrations generally stabilize. The predominant water quality type in the backfill is calcium sulfate or magnesium sulfate. Although calcium and sulfate are the dominant ions, significant quantities of bicarbonate, sodium, and magnesium are also present (WDEQ-LQD/Lidstone 2013). Water-quality data from the 26 deeper backfill wells are included in the 2013 CHIA.

The 2013 CHIA presented water quality analysis collected at four alluvial backfill wells. TDS concentrations have varied between the AVF backfill wells. TDS concentrations have exceeded the WQD Class III livestock standard of 5,000 mg/L beginning in 2001 at three of the four alluvial backfill wells, with a maximum value of 17,900 mg/L in one well. While TDS concentrations at two wells are elevated relative to baseline conditions, recent data from two of the AVF backfill wells suggests that water quality is comparable to pre-mining conditions (WDEQ-LQD/Lidstone 2013). Water-quality data from the four alluvial backfill wells are included in the 2013 CHIA.

There were eight aquifer tests conducted by the mines in the backfill aquifer. The median hydraulic conductivity was 0.07 ft/d, with a maximum of 2.7 ft/d and a minimum of 0.004 ft/d (WDEQ-LQD/Lidstone 2013).

### 3.5.3 Water Rights

The State Engineer's Office administers water rights in Wyoming, which are granted for both groundwater and surface water. Their records indicate that, as of October 2016, 311 permits for ground-water rights are within 2 miles of the A2Tr1 tract, 109 of which are for valid, non-coal applicants. Valid ground-water rights for non-coal applicants are listed in **appendix D**. The breakdown of non-coal ground-water rights is as follows:

- 25 Stock
- 19 Miscellaneous
- 19 Monitoring
- 11 CBNG
- 7 CBNG, Miscellaneous
- 7 Domestic, Stock
- 7 Industrial
- 5 Domestic
- 5 Industrial, Miscellaneous
- 1 CBNG, Irrigation
- 1 CBNG, Miscellaneous, Stock
- 1 CBNG, Stock
- 1 Domestic, Industrial

State Engineer's Office records indicate that, as of October 2016, 71 permits for surface water rights are within 2 miles of the A2Tr1 tract, 38 of which are for non-coal applicants. Surface water rights for non-coal applicants are listed in **appendix D**. The breakdown of non-coal surface water rights is as follows:

- 14 Irrigation Stock
- 13 Reservoir Supply
- 6 Domestic, Irrigation
- 2 Industrial
- 1 CBNG, Industrial

- 1 Industrial, Storage
- 1 Blank

## 3.6 Wetlands/Aquatic Resources

Wetlands are aquatic features defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3(b)). The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetland (hydric) soils (EPA 2017b). Vegetation in wetland environments is highly productive and diverse and provides habitat for many wildlife species. These systems as a whole play important roles in controlling floodwaters, recharging groundwater, and filtering pollutants (Niering 1985).

Jurisdictional wetlands are defined as those wetlands that are within the extent of the U.S. Army Corps of Engineers (USACE) regulatory review. These wetlands must contain three components: hydric soil, a dominance of hydrophytic vegetation, and wetland hydrology. Nonjurisdictional wetlands are generally associated with internally drained depressions/playas that are isolated; nonjurisdictional other waters generally occur where areas of open water are ponded in a depression/playa area.

Aquatic resources associated with the A2Tr1 tract (the analysis area) were delineated according to the 1987 USACE wetlands delineation Manual and the 2008 Great Plains Regional Supplement. Other Waters of the United States were determined according to definitions in 33 CFR 328.3. Potential aquatic resources were identified by examining topographic maps and National Wetlands Inventory (NWI) maps. All potential wetlands identified through those reviews were surveyed in the field from May through September of 2010. Surveys were also conducted on the remainder of the lands in traverses across the study area. Vegetation, hydrology, and soil characteristics of aquatic sites and uplands were recorded on field data sheets and locations of observations were plotted on topographic maps.

Four sites within the A2Tr1 tract were evaluated for wetland characteristics in 1997 and 2011 by Intermountain Resources (WFW 2011). Based on the results of the surveys, no wetlands were identified in the A2Tr1 tract. The USACE determined that Department of Army authorization is not required for the remaining LOM coal mining activities at Dry Fork Mine (USACE 2012).

## 3.7 Soils

The following discussions on soils resources are summarized from Appendix D7.2 (Soils) of the DFM WDEQ-LQD Permit No. PT0599 (WFW 2011).

The soil resources of the A2Tr1 tract (the analysis area) were investigated by Jim Nyenhuis, Certified Professional Soil Scientist/Soil Classifier, during the spring, summer, and fall of 2010. All lands within the area were mapped at the Order 1-2 level of intensity. The entire area was traversed on foot. Soil map unit boundaries were delineated by observing surface conditions, vegetation, slope position, and soil profiles exposed using a sharpshooter and bucket auger. Soil survey information for adjacent and nearby permitted areas was reviewed to determine whether soils and their recommended salvage depths were similar to those within the A2Tr1 tract. WDEQ-LQD determined that the soils within the tract are similar to those currently being salvaged and utilized for reclamation at the DFM (WDEQ-LQD Permit No. PT0599), and these soils have been previously sampled a sufficient number of times.

**Table 3-19** lists the 17 soil map units (plus disturbed lands [DL], reclaimed lands [RL], and water [W]) within the A2Tr1 tract (**map 3-6**). Also included in the table are the total soil depths, the current recommended soil salvage depths, and any limitations to deeper salvage.

According to information provided on the Natural Resources Conservation Service (NRCS) website, no soil map units within the A2Tr1 tract were classified as prime or unique farmlands (NRCS 2016).

## 3.8 Vegetation

The following discussions on vegetation are summarized from Appendix D8.2 (Vegetation Assessment) of the DFM WDEQ-LQD Permit No. PT0599 (WFW 2011).

The field mapping of the area was completed in 2010. This survey was designed to map vegetation types, prepare a plant species list and collect sampling data. Cover data was collected in July for the grassland, upland sagebrush, bottomland, clinker/breaks, pastureland and reclaimed community types on the A2Tr1 tract. Shrub density sampling was also completed for the grassland, upland sagebrush, and clinker/breaks types, and shrub density sampling was completed on the reclaimed land and pastureland. Vegetation types were determined through identification of major plant species, approximate coverage of these species, dominant ground cover classes, and percentage of bare ground.

The vegetation community types identified on the study areas include grassland, upland sagebrush, bottomland, clinker/breaks, pastureland and reclamation. No cultivated croplands are found within the tract (**map 3-7**).

### 3.8.1 Vegetation Community Types

Grassland - Western wheatgrass *(Agropyron smithi)* was the dominant plant species recorded on this amendment area vegetation type, followed by blue grama *(Bouteloua gracilis),* threadleaf sedge *(Carex filifolia),* needleandthread *(Stipa comata)*, and crested wheatgrass *(Agropyron cristatum).* Perennial forb species made up 6.0 percent of the total absolute vegetation cover for the grassland vegetation type. The shrub density data for the area showed that fringed sagewort (*Artemisia frigida*) was the most dominant subshrub species recorded on this area while silver sagebrush (*Artemisia cana*) was the most dominant full shrub species. Other common shrub species recorded on this type included big sagebrush (*Artemisia tridentata*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Other commonly recorded subshrubs on this type included broom snakeweed (*Gutierrezia sarothrae*), granite pricklygilia (*Leptodactylon pungens*) and Gardner saltbush (*Atriplex gardnen*).

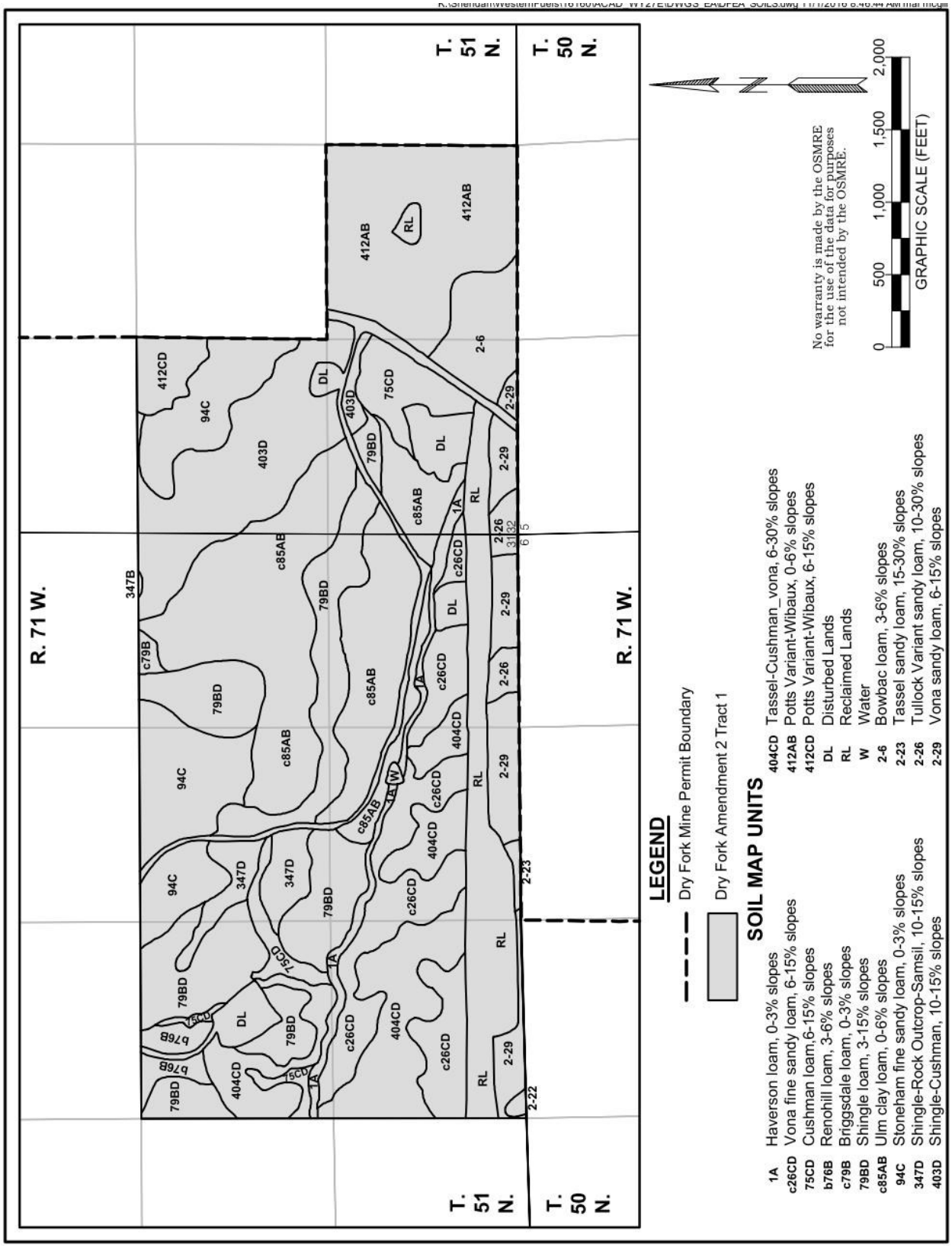
Upland Sagebrush - Western wheatgrass was the dominant plant species recorded on this vegetation type, followed blue grama, big sagebrush, needleandthread and fringed sagewort. Perennial forb species made up 7.2 percent of the total absolute vegetation cover for the upland sagebrush vegetation type. Big sagebrush was the most dominant species recorded in shrub density transects on this vegetation type. Fringed sagewort was the most dominant subshrub species recorded on this vegetation type. Silver sagebrush (*Artemisia cana*) was also commonly recorded on this type in 2010. Other shrub and subshrub species were also recorded but were observed in limited numbers.

Bottomland - Western wheatgrass was the dominant plant species recorded on this amendment area vegetation type followed by Kentucky bluegrass (Poa pratensis), crested wheatgrass, and foxtail barley (*Hordeum jubatum*). Perennial forb species made up 10.0 percent of the total absolute vegetation cover for the bottom land vegetation type. Shrub density sampling was not required by the WDEQ-LQD for this vegetation community in 2010.

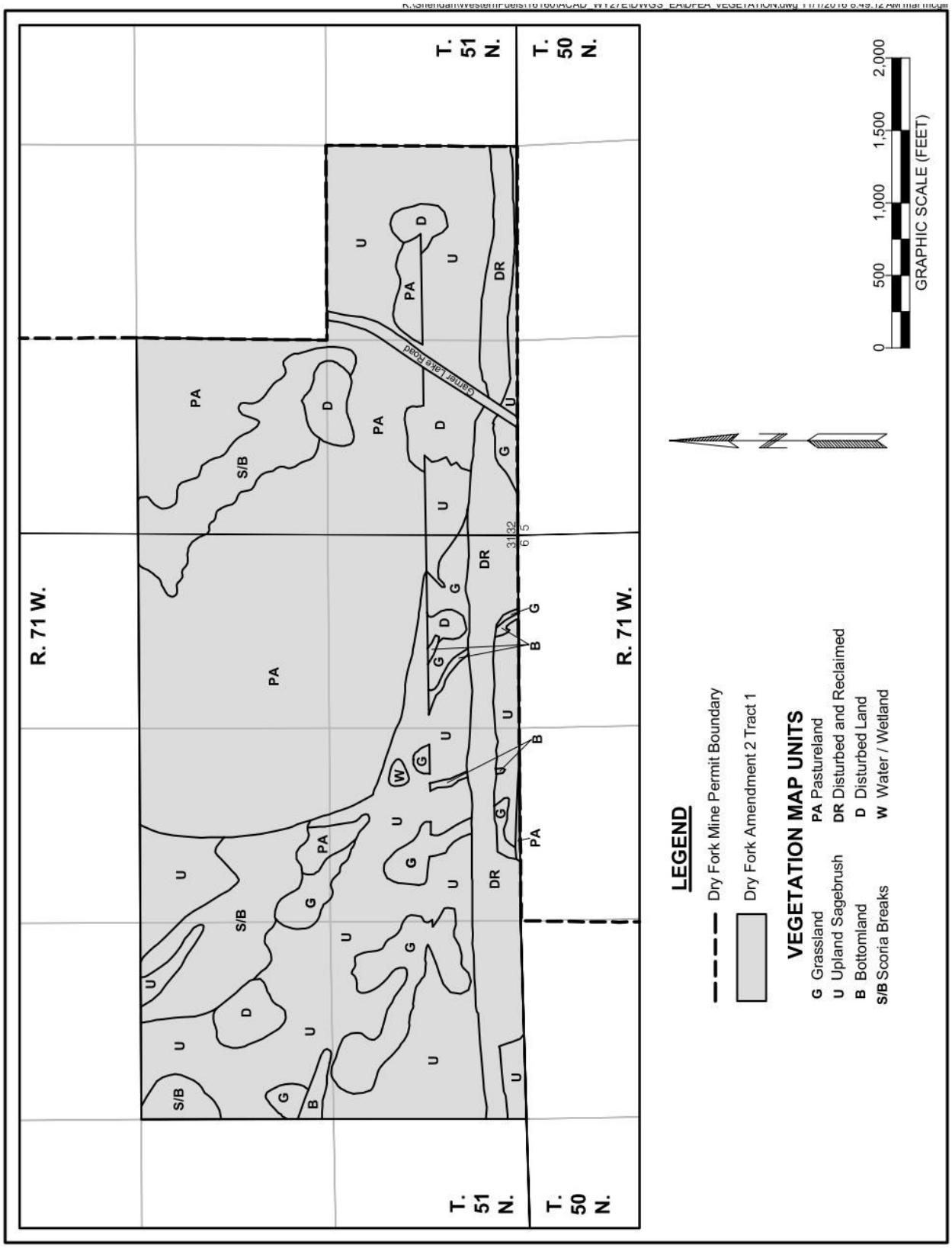
## Table 3-19. List of Map Units and Topsoil Salvage Depths for the A2Tr1 Tract

| Map Unit Symbol | Map Unit Name | Total Soil Depth (in.) | Total Salvage Depth (in.) | Limitations to Deeper Salvage |
|---|---|---|---|---|
| 1A | Haverson loam, 0 to 0.03 slopes | 60+ | 60 | High salinity at depth |
| c26CD | Vona fine sandy loam, 6 to 15% slopes | 60+ | 31 | Low organic matter content below 31", possible loamy sand texture at depth |
| 75CD | Cushman loam, 3 to 6% slopes | 20-40 | 30 | Possible high salinity at depth |
| b768 | Renohill loam, 3 to 6% slopes | 20-40 | 24 | No major limits |
| 79DB | Shingle loam, 3 to 15% slopes | 10-20 | 8 | Heavy clay texture |
| c798 | Briggsdale loam, 3 to 6% slopes | 20-40 | 30 | Heavy clay texture |
| c85AB | Ulm clay loam, 0 to 6% slopes | 60+ | 36 | Possible higher sodicity at depth |
| 94C | Stoneham fine sandy loam, 6 to 15% slopes | 60+ | 45 | No unsuitability but higher sodium adsorption rate (SAR) and EC below 45" |
| 347D | Shingle-Rock Outcrop-Samsil, 10 to 15% slopes | 10-20 RO=0 | 0 | Soil depth, heavy clay texture (Samsil) |
| 403D | Shingle-Cushman, 10 to 15% slopes | 10-20 (Sh) 20-40 (Cu) | 15 | Soil depth, possible high salinity at depth (Cushman) |
| 404CD | Tassel-Tullock-Vona, 6 to 30% slopes | TA: 10-20 Tu: 20-40 Vo:60+ | 26 | Salvage to sandstone bedrock or coarse sand texture |
| 412AB | Potts Variant-Wibux, 0 to 6% slopes | PV: 60+ Wi: 10-20 | 24 | Fragmental subsoil |
| 412CD | Potts Variant-Wibaux, 6 to 15% slopes | PV: 60+ Wi: 10-20 | 12 | Fragmental subsoil |
| 2-6 | Bowbac loam, 3 to 6% slopes | 20-40 | 24 | Heavy clay texture below 24" |
| 2-26 | Tullock Variant sandy loam, 10 to 30% slopes | 20-40 | 30 | Weathered bedrock, loamy sand texture at depth |
| 2-29 | Vona sandy loam, 6 to 15% slopes | 60+ | 33 | Low organic matter content and possible loamy sand or sand texture below 33" |
| DL | Disturbed Land | -- | -- | No soil salvage |
| RL | Reclaimed Land | -- | 18 | No more topsoil to salvage |
| W | Water | -- | -- | No soil salvage |

Source: WFW 2011




**Map 3-6. Soil Types Associated with the A2Tr1 Tract**




**Map 3-7. Vegetation Map Units (Community Types) Associated with the A2Tr1 Tract**

Scoria/Breaks - Crested wheatgrass was the dominant plant species recorded on this amendment area vegetation type followed by bluebunch wheatgrass (*Agropyron spicatum*), western wheatgrass, big sagebrush and green needlegrass (*Stipa viridula*). Perennial forb species made up 11.2 percent of the total absolute vegetation cover for the scoria/breaks vegetation type. The shrub density data for this map unit shows that big sagebrush was the most dominant full shrub species while fringed sagewort was the most dominant subshrub species recorded on this area. Other common shrub species recorded on this type included rubber rabbitbrush. Other commonly recorded subshrubs on this type included broom snakeweed and fewflower wildbuckwheat (*Eriogonum pauciflorum*).

Pastureland - Crested wheatgrass was the dominant plant species recorded on this amendment area vegetation type and accounted for approximately 93.5 percent of the total vegetation cover recorded on this type. Other plant species were also recorded but in lower numbers. Perennial forb species made up 1.4 percent of the total absolute vegetation cover for the pastureland vegetation type. Broom snakeweed was the most dominant subshrub species recorded in shrub density transects on this vegetation type. Woods rose (*Rosa woodsii*) was the most dominant shrub species recorded on this vegetation type in 2010. Other shrub and subshrub species were also recorded but were observed in limited numbers.

Reclaimed - The most dominant plant species recorded on this type was intermediate wheatgrass (*Agropyron intermedium*) followed by western wheatgrass, slender wheatgrass (*Agropyron trachycaulum*), the annual forb flixweed tansymustard (*Descurainia sophia*) and green needlegrass. Perennial forb species made up 3.2 percent of the total absolute vegetation cover for the reclaimed vegetation type. No shrub or subshrub species were recorded in shrub density transects on this type. However, a few shrub and subshrub species were observed growing on this type in 2010.

Disturbed Land - This type is typically oil well pads, paved roads or ranch associated areas. This area was not sampled during the 2010 study because of the limited amount of vegetation present on those areas.

Water/Wetland - This type is discussed in detail in **section 3.6** and consists of stockponds, playas, wet ephemeral streams and small depressions.

### 3.8.2 Special Status Plant Species

Threatened or endangered plants or other plant species of special concern, as listed by the USFWS and other agencies, were not encountered within the DFM A2Tr1 tract (WFW 2011). Habitat for the Ute ladies' tresses orchid (*Spiranthes diluvialis*) is marginal on this amendment area due to the lack of suitable wetlands. However, the marginal wetlands were surveyed on August 13, 2010 but no Ute ladies'-tresses orchids were found.

The State of Wyoming maintains a list of designated noxious weeds (Wyoming Department of Agriculture [WDOA] 2016). This list includes invasive and nonnative plant species, that once established, can out-compete and eventually replace native species, thereby reducing forage productivity and the overall vigor and diversity of existing native plant communities. The following 26 plant species are currently designated as noxious weeds by the State of Wyoming:

1. Field bindweed (*Convolvulus arvensis*),
2. Canada thistle (Cirsium arvense),
3. Leafy spurge (*Euphorbia esula*),
4. Perennial sowthistle (*Sonchus arvensis*)
5. Quackgrass (*Agropyron repens*),

6. Hoary cress (*Cardaria draba*),
7. Perennial pepperweed (giant whitetop) (*Lepidium latifolium*),
8. Ox-eye daisy (*Chrysanthemum leucanthemum*),
9. Skeletonleaf bursage (*Franseria discolor Nutt.*),
10. Russian knapweed (*Centaurea repens*),
11. Yellow toadflax (*Linaria vulgaris*),
12. Dalmatian toadflax (*Linaria dalmatica*),
13. Scotch thistle (*Onopordum acanthium*),
14. Musk thistle (*Carduus nutans*),
15. Common burdock (*Arctium minus*),
16. Plumeless thistle (*Carduus acanthoides*),
17. Dyers woad (*Isatis tinctoria*),
18. Houndstongue (*Cynoglossum officinale*),
19. Spotted knapweed (*Centaurea maculosa*),
20. Diffuse knapweed (*Centaurea diffusa*),
21. Purple loosestrife (*Lythrum salicaria.*),
22. Saltcedar (*Tamarix* spp.),
23. Common St. Johnswort (*Hypericum perforatum*),
24. Common tansy (*Tanacetum vulgare*),
25. Russian olive (*Elaeagnus angustifolia.*), and
26. Black Henbane (*Hyoscyamus niger*).

The following three plant species are currently designated as noxious weeds by Campbell County in addition to those listed above.

1. Buffalobur (*Solanum rostratum*),
2. Common cocklebur (*Iva xanthifolia*),
3. Poison hemlock (*Conium maculatumand*), and
4. Jointed goatgrass (*Aegilops cylindrical*).

The state listed noxious weed species that were found within the A2Tr1 tract include Canada thistle, Scotch thistle, dalmatian toadflax, musk thistle, salt cedar, skeletonleaf bursage, and field bindweed. These noxious weeds were not abundant. Selenium indicator species were not common on this amendment area in 2010.

Cheatgrass brome (*Bromus inermis*), an annual grass, is not designated as a noxious weed but is considered a noxious weed in some Wyoming counties. Total annual grasses comprised from 0.4 to 3.0 percent of the total relative vegetative cover on the 2010 study areas. Cheatgrass was the major annual grass species encountered during the 2010 amendment area study.

## 3.9 Wildlife

The following discussions on wildlife resources are summarized from Appendix D9.2 (Wildlife) of the DFM WDEQ-LQD Permit No. PT0599 (WFW 2011). **Sections 3.1**, **3.2**, and **3.8** provide

detailed descriptions of the general setting, topography, and vegetative composition, respectively, of the general analysis area.

There has been an extensive amount of wildlife data collected associated with the DFM. The primary baseline inventory on the mine area was conducted starting in 1981, but early work was conducted in 1974, 1975, and 1979. Studies were conducted to determine the species of mammals, birds, reptiles and amphibians occupying principal habitats on and adjacent to the study area, and to determine distributions and relative abundance of these species, where possible. Annual monitoring was initiated in 1989 and continues at present. The following information is derived from the baseline data and the subsequent studies and WDEQ-LQD Annual Reports that have been completed for the DFM. OSMRE determined that Appendix D9 of the DFM Permit adequately described the affected environment for big game, small mammals, lagomorphs, passerine bird species, upland game birds (excluding the Greater sage-grouse [GRSG] [*Centrocercus urophasianus*]), and reptiles and amphibians. Because no significant changes to wildlife use areas for these species have been noted from the discussion presented in Appendix D9, these species specific data are incorporated by reference into the affected environment portion of this EA in their entirety and not reiterated. There have been changes in discussions related to raptor nest locations; the status of GRSG; T&E species; and other species of special interest (SOSI, including federal Migratory Birds of Conservation Concern [MBCC] and WGFD Native Species Status). Therefore, these species discussions have been updated in this EA.

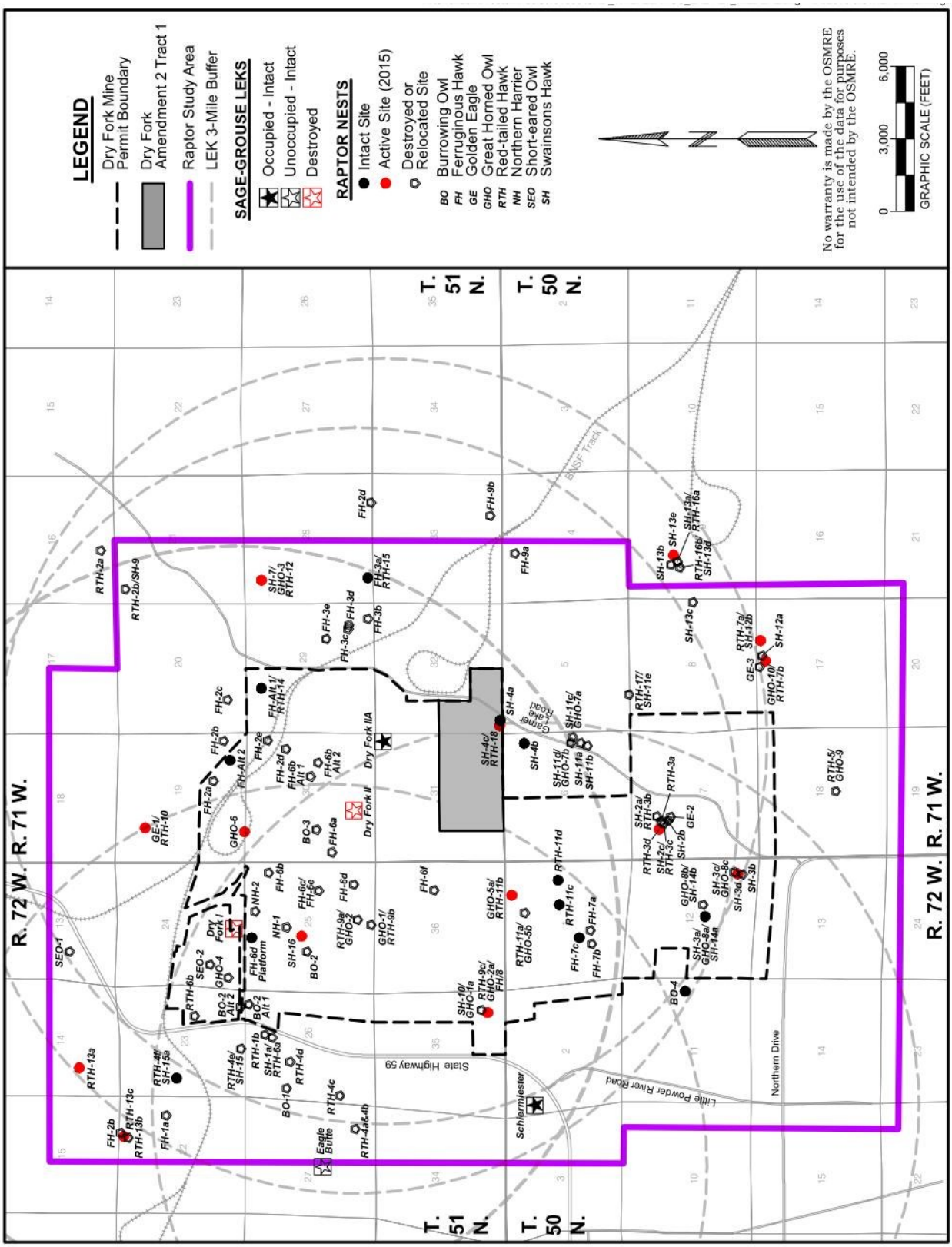
Because of the elevated level of concern in recent years for GRSG leks, a 3-mile radius was also analyzed for this EA. The 3-mile radius is the area in which two-thirds of the hens that were bred at those leks would be expected to nest.

### 3.9.1 Raptors

Eleven raptor species (northern harrier [*Circus cyaneus*], ferruginous hawk [*Buteo swainsoni*], Swainson's hawk [*Buteo swainsoni*] red-tailed hawk [*Buteo jamaicensis*], golden eagle [*Aquila chrysaetos*], bald eagle [*Haliaeetus leucocephalus*], prairie falcon [*Falco mexicanus*], American kestrel [*Falco sparverius*], great-horned owl [*Bubo virginianus*], short-eared owl [*Asio flammeus*], and burrowing owl [*Athene cunicularia*]) were recorded within the raptor monitoring area (**map 3-8**) during DFM baseline inventories. The ferruginous hawk, red-tailed hawk, Swainson's hawk, golden eagle, burrowing owl, and great horned owl are raptor species common to the region that are known to have nested within the DFM raptor monitoring area in the past. The 2015 annual report identified the location of and annual status of raptor nests for 2015 (WFW 2015b). The location and status of raptor nests as of 2015 are included on **map 3-8**. Two intact raptor nests (SH-4a and SH-4c/RTH-18) are located within the A2Tr1 tract. Nest SH-4a was last active in 2007, producing one young. SH-4c/RTH-18 was successful in 2015 when two red-tailed hawks fledged from the nest. Both nests are located in trees associated with a ranch facility and home site. BLM sensitive raptor species that could potentially occur in the area include the burrowing owl, ferruginous hawk, golden eagle, northern goshawk (*Accipiter gentilis*), Swainson's hawk, and peregrine falcon (*Falco peregrinus*) (**appendix E**). None of these species has been documented as nesting within the tract (**map 3-8**).

### 3.9.2 Greater Sage-Grouse

Five historical GRSG leks have been documented within 3 miles of the A2Tr1 tract (**map 3-8**). Three leks (Dry Fork IIA, Schiemiester, and Eagle Butte) are intact and two leks (Dry Fork I and Dry Fork II) have been destroyed by mining. The WGFD currently classifies the Dry Fork IIA, Schiemiester leks as occupied and the Eagle Butte lek as unoccupied (WGFD 2016). The summary of sage-grouse strutting ground inventories shown in **Table 3-20** indicates that bird numbers on all leks have fluctuated over the past 16 years. However, counts from 2000 through 2015 indicated overall lek attendance numbers have significantly declined to zero. No sage-grouse were observed at the alternate Dry Fork II Lek site (Lek IIA Lek) in 2015. No sage-grouse were




**Map 3-8. Wildlife Use Associated with the A2Tr1 Tract**

**Table 3-20. Sage-grouse Strutting Ground Survey Results (Maximum Male Attendance) for the Dry Fork Mine**

| | Schiermiester Lek | Dry Fork II Lek | Dry Fork IIA Lek | Eagle Butte Lek |
|---|---|---|---|---|
| 2000 | 12 | 20 | * | NM |
| 2001 | 7 | 15 | * | 7 |
| 2002 | 6 | 15 | * | 6 |
| 2003 | 8 | 6 | * | NM |
| 2004 | 2 | 2 | * | NM |
| 2005 | 5 | -- | 6 | 0 |
| 2006 | 0 | -- | 6 | NM |
| 2007 | 0 | -- | 4 | NM |
| 2008 | 0 | -- | 0 | 0 |
| 2009 | 0 | -- | 2 | NM |
| 2010 | 0 | -- | 0 | NM |
| 2011 | 0 | -- | 1 | NM |
| 2012 | 0 | -- | 0 | NM |
| 2013 | 0 | -- | 0 | 0 |
| 2014 | 0 | -- | 0 | NM |
| 2015 | 0 | -- | 0 | NM |

NM - Not monitored
* - Lek not in existence
-- Lek destroyed by mining
Source: WFW 2015

observed at the Schiermiester Lek during the 2015 surveys either. Both the Dry Fork IIA Lek and the Schiermiester Lek have been exposed to increasing disturbances since 2002 that may have caused these birds to find more suitable areas to display.

On September 22, 2015, USFWS determined that listing the GRSG as an endangered or threatened species under the Endangered Species Act (Act) was not warranted (USFWS 2015). Recent documents regarding GRSG include the Approved Resource Management Plan (ARMP) and Final Environmental Impact Statement (FEIS) for the Buffalo Field Office Planning Area (Buffalo ARMP/FEIS) (BLM 2015a), the Wyoming Greater Sage-Grouse Amendment (BLM 2015b), and the State of Wyoming, Office of the Governor, Executive Order 2015-4 (Office of the Governor 2015). The documents include management procedures to consolidate GRSG protection within the State of Wyoming in light of the federal government's recent decision not to list the GRSG under the ESA.

Executive Order 2015-4 regarding sage-grouse core area protection on state trust lands (Office of the Governor 2015). The sage-grouse core area protection concept came about because of work by the Sage-Grouse Implementation Team. The implementation team developed a core population strategy for the state "to maintain habitats and viable populations of sage-grouse in areas where they are most abundant." As part of that effort, the team delineated approximately 40 areas of state trust lands around Wyoming with a goal of maintenance and enhancement of grouse habitats and populations within the core areas. Using mapping included in the Executive Order, it has been determined that the closest core area is over 10 miles from the A2Tr1 tract.

### 3.9.3 Threatened, Endangered, and Candidate Species, and Special Status Species

#### *3.9.3.1 Threatened, Endangered, and Candidate Species*

The USFWS maintains a list of T&E species, and designated critical habitats on their official website for each county in Wyoming (USFWS 2016a). The USFWS also provides the Information for Planning and Conservation (IPaC) system in order to evaluate the potential of encountering USFWS trust resources, including T&E species, related to a specific project area. The agency updates those species lists annually, or more frequently if any listing changes occur. An official list of potential T&E species within the project area was requested on October 10, 2016 (USFWS

2016b). The USFWS list of wildlife species includes the black-footed ferrets (*Mustela nigripes*), which is listed as experimental, non-essential, and the northern long-eared bat (*Myotis septentrionalis*), which is listed as threatened. The analysis area for most T&E species includes the DFM permit boundary. The analysis area for the northern long-eared bat includes the airshed analysis boundary for Hg deposition from mining and coal combustion. Additional information was gathered through incidental observations of species recorded during other field surveys. No critical habitat for these species was identified.

On March 6, 2013, the USFWS issued a letter acknowledging 'block clearance' for the State of Wyoming in response to a request from the Wyoming Game and Fish Department. Consequently, the USFWS no longer recommends surveys for the black-footed ferrets in either black- or white-tailed prairie dog towns in the State of Wyoming (USFWS 2016c). Prairie dog towns, which provide habitat for black-footed ferrets, are not found within the A2Tr1 tract.

While USFWS information indicates that the northern long-eared bat could occur in the area, habitat (caves and mine shafts as winter habitat and caves, mine shafts, and trees for summer habitat, USFWS [2016d]) is not present in the A2Tr1 tract to support the threatened northern long-eared bat.

#### *3.9.3.2 Other Species of Special Interest*

The A2Tr1 tract provides habitat for wildlife species that are classified as SOSI. Watch was kept during all surveys and site visits for species that are listed as SOSI.

For the purposes of this discussion, other SOSI include federal birds of conservation concern and Wyoming Natural Diversity Database (WYNDD) species of concern. The USFWS has identified birds of conservation concern as species, subspecies, and populations of migratory and non-migratory birds that "…without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act" (USFWS 2008). As defined by the USFWS, bird species considered for inclusion on lists of birds of conservation concern include nongame birds, gamebirds without hunting seasons, candidate and proposed endangered or threatened species, and recently delisted species (USFWS 2008). These species represent the USFWS's highest conservation priorities beyond those species already designated as T&E species. The conservation concerns may be related to population declines, small range or population sizes due to natural or human-caused influences, threats to habitat, or other factors.

The most current list of MBCC is included in **appendix E**. The bald eagle is present on the study area as a migrant and winter resident as discussed previously. The Brewer's sparrow is common during the spring and summer as a breeder. The ferruginous hawk nested on the DFM raptor study area in 2015. The golden eagle is a yearlong resident and was observed on the DFM raptor study area in 2015 but active nests were not found. The prairie falcon was observed as a transient however suitable nesting habitat is not present on the site for this species. The Swainson's hawk was present as a spring and summer breeder and, as discussed above, nested within the A2Tr1 tract in 2015. The grasshopper sparrow (*Ammodramus savannarum*), loggerhead shrike (*Lanius ludovicianus*), sage thrasher (*Oreoscoptes montanus*), short-eared owl, burrowing owl, GRSG, long-billed curlew (*Numenius americanus*), McCown's longspur (*Calcarius mccownii*), and upland sandpiper (*Bartramia longicauda*) have been recorded on the DFM wildlife study area. The American bittern (*Botaurus lentiginosus*), black rosy-finch (*Leucosticte atrata*), dickcissel (*Spiza americana*), Lewis woodpecker (*Melanerpes lewis*), mountain plover (*Charadrius montanus)*, pinyon jay (*Gymnorhinus cyanocephalus*), and Sprague's pipit have not been recorded on the study area, as habitat for most of these species does not occur on the study area.

## 3.10 Land Use and Recreation

Campbell County completed a comprehensive countywide land use plan in 2013, which provides general goals and policies for land use in the county, including countywide coal and mineral extraction and its integral part of the overall plan for Campbell County (Campbell County 2013). The proposed modification area is within an area recognized by Campbell County as a mining land use.

The surface ownership within the DFM permit boundary includes 5,613.42 acres of private surface, 39.43 acres of federal surface, and 824.63 acres of state surface (**map 3-9**). The entire surface of the A2Tr1 tract is owned by Western Fuels-Wyoming, Inc. All of the coal reserves in the A2Tr1 tract are federally owned, whereas the remaining subsurface minerals (i.e., oil and gas reserves) are under a mixture of private and federal ownership (**map 3-10**). All oil and gas production infrastructure located in the tract is privately owned. Coal mining has been ongoing in the general analysis area since 1918 (Wyodak Mine). Mining has been the primary land uses in the general analysis area since the early 1980s. Secondary land uses include pastureland (ranching), dryland cropland, transportation, wildlife habitat, and CBNG development. Coal mining has been the dominant land use in the general analysis area since the mid-1980s.

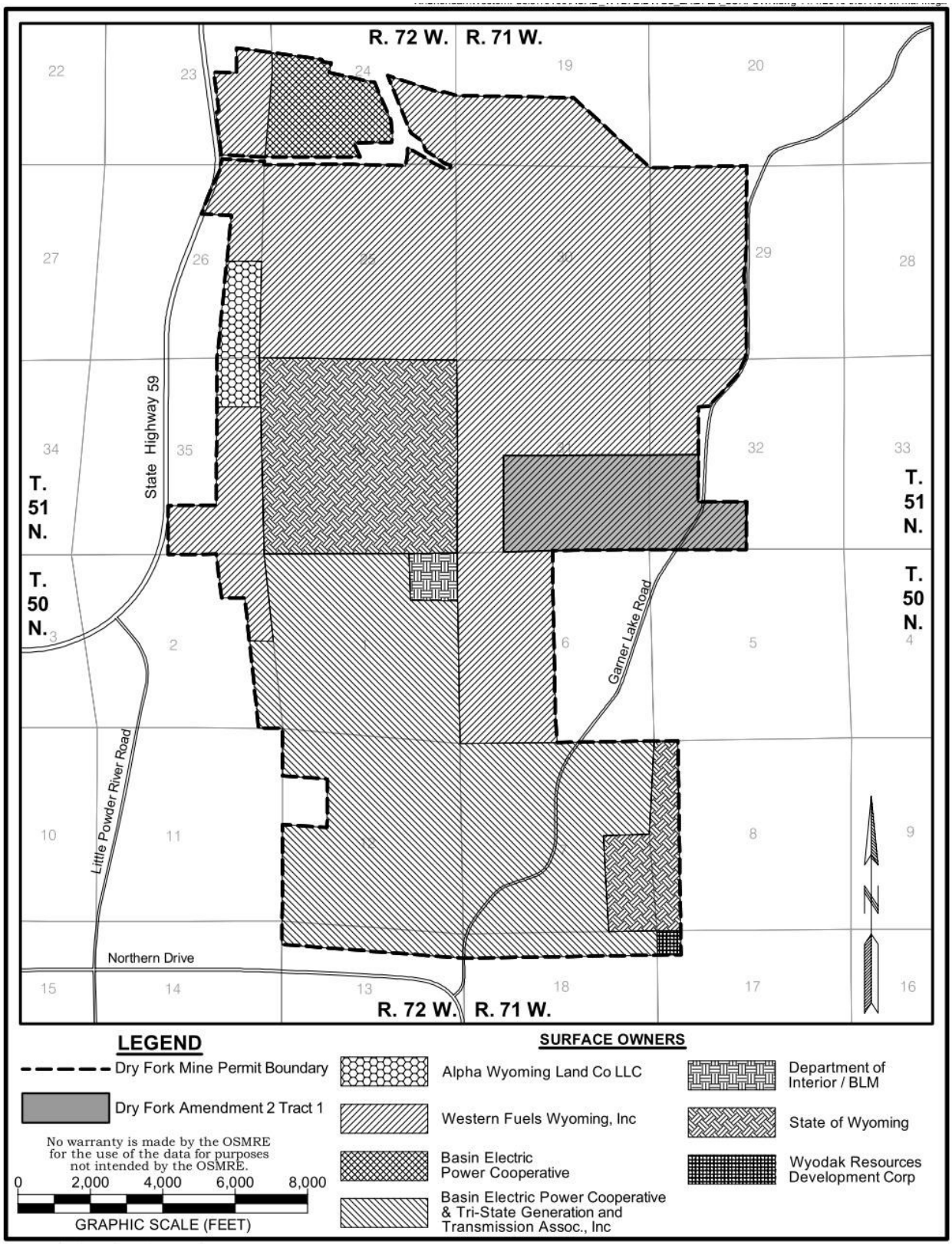
## 3.11 Cultural Resources

Information regarding background cultural resources within the current DFM WDEQ-LQD PT0599 permit boundary was summarized from Appendices D-2.2 (Historic Cultural Resources Inventory, Amendment 2 Area) and D-3.2 (Prehistoric and Paleontological Resources Inventory, Amendment 2 Area) of the DFM WDEQ-LQD Permit No. PT0599 (WFW 2011). According to information provided in these appendices, two cultural resources sites have been identified within the A2Tr1 tract. Both sites are associated with historic activity (post-1920 era) and both sites are ineligible for listing on the National Register of Historic Places (NRHP) (OSMRE 2011).

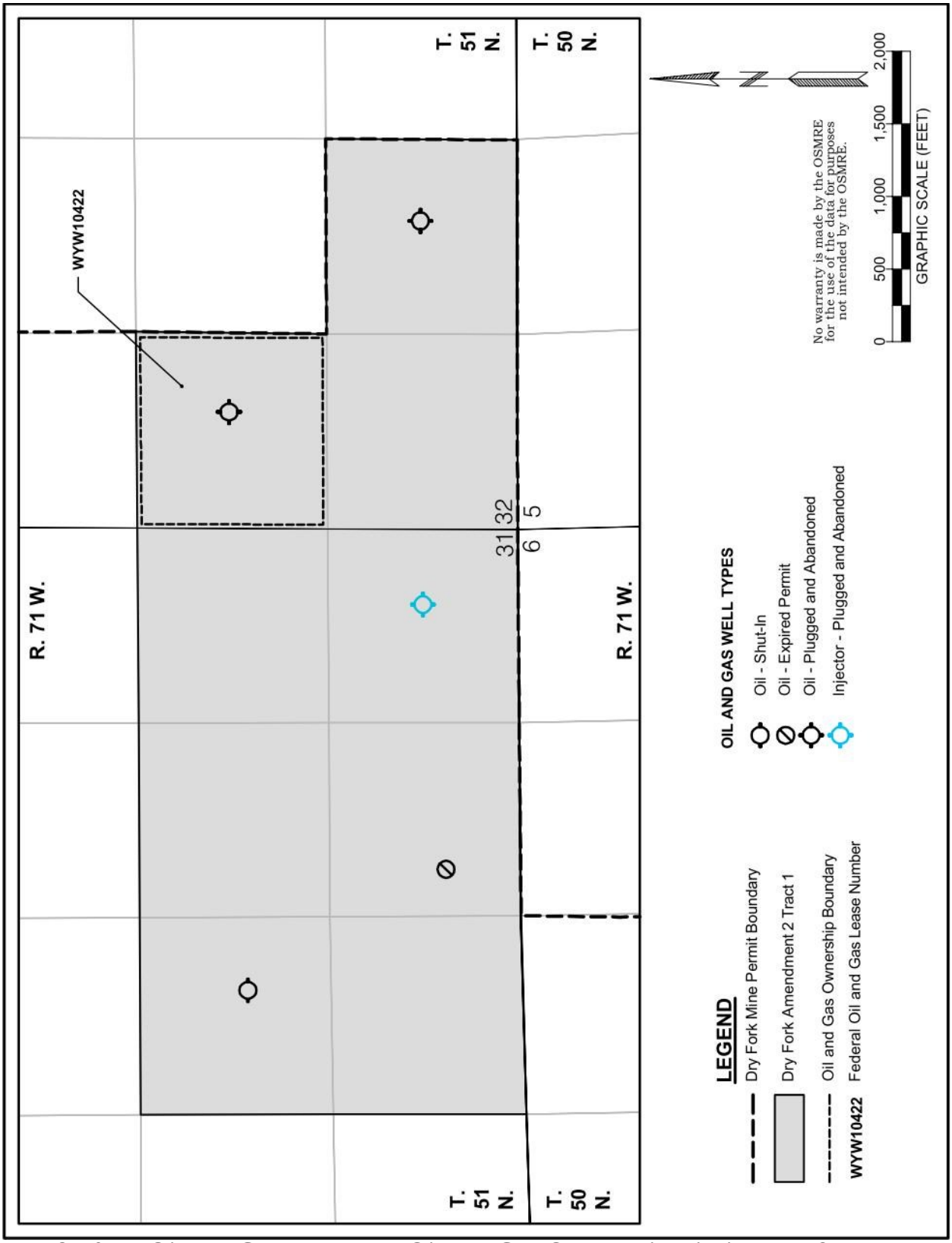
Letters of consultation were sent out to 30 Native American tribes/tribal representatives during the scoping process. No tribes responded to the consultation requests.

## 3.12 Visual Resources

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within and around the A2Tr1 tract are characterized by a gently rolling topography and large, open expanses of sagebrush and short-grass prairie, which are common throughout the PRB. There are also areas of altered landscape, such as oil and gas fields and surface coal mines. The existing active surface mines that are located on the eastern side of the PRB form three geographic groups that are separated by areas with no mining operations. The tract is located within a group of coal mines located on the east side of U.S. Highway 14/16 from Gillette going north for about 13 miles. Two other groups of surface mines are located east of State Highway 59 from south of Gillette to south of Wright, a distance of about 50 miles. Other man-made intrusions on the natural landscape in the area include oil and gas development (oil well pumpjacks, pipeline and utility right-of-way (ROW), water storage reservoirs, access roads, CBNG well shelters, and natural gas compressor stations), transportation facilities (public and private roads, road signage, power and utility transmission lines, and railroads), ranching activities (fences, ranch buildings, livestock, and abandoned homesteads), and environmental monitoring installations. The natural scenic quality in and near the A2Tr1 tract is fairly low because of the industrial nature of the adjacent existing mining operations and oil and gas field development.




**Map 3-9. Surface Ownership within the A2Tr1 Tract**




**Map 3-10. Oil and Gas Wells and Oil and Gas Ownership within the A2Tr1 Tract**

State Highway 59 is adjacent to the DFM permit boundary and lies approximately 1.75 miles to the west of the A2Tr1 tract. Active mining (Eagle Butte and DFM) can be viewed from this roadway. The Garner Lake Road passes through the eastern portion of the A2Tr1 tract, and active mining at the DFM is visible from the road.

For management purposes, the BLM evaluated the visual resources on lands under its jurisdiction in the 2015 Buffalo Approved RMP. The inventoried lands were classified into visual resource management (VRM) classes used to describe increasing levels of change within the characteristic landscape (BLM 2015b). The objectives of the four VRM classes are:

1. Class I - To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention. It is applied to wilderness and wilderness study areas, some natural areas, wild portions of Wild and Scenic Rivers, and other similar situations in which management activities are to be restricted.
2. Class II - To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Proposed alterations should be designed so as to retain the existing character of the landscape. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
3. Class III - To partially retain the existing character of the landscape. Contrasts to the basic elements (form, line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape; however, the changes should remain subordinate to the existing characteristic landscape. The level of change to the characteristic landscape should not exceed the moderate threshold.
4. Class IV - To provide for management activities that require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, changes should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape. The level of change to the characteristic landscape can be high.

According to Map 3-24 of the 2015 Buffalo Approved RMP, the general analysis area is classified as VRM Class IV because of the industrial nature of the energy development and active farming and residential use in the area (BLM 2015a). The overall natural scenic quality of Class IV area is considered relatively low.

## 3.13 Noise

Existing noise sources in the A2Tr1 tract analysis area (DFM permit boundary) includes coal mining activities, rail traffic, traffic on nearby federal and state highways, county and access roads, natural gas compressor stations, and wind. Noise originating from CBNG development equipment (e.g., drilling rigs and construction vehicles) is apparent locally over the short term (i.e., 30 to 60 days) where well drilling and associated construction activities are occurring. The amount of noise overlap between well sites is variable and depends on the timing of drilling activities on adjacent sites and the distance between the site locations. Studies of background noise levels at PRB mines indicate that ambient sound levels generally are low, owing to the

isolated nature of the area. Mining operations are conducted 24 hours a day, 7 days a week, which contributes to nearly continuous noise from the mine.

The unit of measure used to represent sound pressure levels (decibels) using the A-weighted scale is a dBA (A-weighted decibel). It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies. **Figure 3-5** presents noise levels associated with some commonly heard sounds.

In 2004, Matheson Mining Consultants, Inc. conducted a noise survey at the two occupied locations closest to the existing Antelope Mine operations. The Antelope Mine is located about 57 miles south of the A2Tr1 tract. Measurements were taken at a residence located directly west of the Antelope Mine on State Highway 59 and at the Dyno Nobel West Region office located northeast of the Antelope Mine on Campbell County Road 4 (Antelope Road). The maximum $L_{eq}$ (equivalent noise level) noise readings at the residence and the Dyno Nobel office were 51 and 52.6 dBA, respectively, which is equivalent to the noise level of light traffic (Kimley-Horn and Associates 2008).

No site-specific noise level data are available for the proposed lease modification tract, however, the physical setting and general land uses are similar at the Dry Fork and Antelope mines; therefore, the current median noise level is estimated to be similar at 40-60 dBA for day and night, with the noise level increasing with proximity to the currently active mining operations. Mining activities are characterized by noise levels of 85-95 dBA in the immediate vicinity of mining operations and activities (BLM 1992). The nearest residence is approximately 1,900 feet from the proposed A2Tr1 tract.

## 3.14 Transportation Facilities

Potential impacts to transportation facilities within the analysis area (DFM permit boundary) would include impacts to State Highway 59 and Garner Lake Road (County Road 38N), several unimproved local roads and accesses (unnamed two-track trails), mine rail spurs used by the BNSF Railroad, oil and gas pipelines, utility/power lines, telephone lines, and associated ROW.

State Highway 59 and the Garner Lake Road are the major north-south public transportation corridors in this area (**map 1-2**). State Highway 59 is located directly adjacent to the west side of the DFM permit boundary. The Garner Lake Road passes through the eastern portion of the A2Tr1 tract. Both roadways are paved two-lane roads. The DFM facilities are accessed from Garner Lake Road.

As discussed in **section 1.2.1**, coal is conveyed from the DFM to the DFS via a 0.86-mile overland conveyor system (**map 3-11**). The mine is the sole-source of coal for the DFS, providing approximately 2.0 Mt of coal per year to the power plant. This conveyor does not cross any public roads.

The nearest railroad facilities are rail spurs that provide access to the Dry Fork, Buckskin, Rawhide, and Eagle Butte mines (**map 1-2**). The rail spurs are connected to a BNSF rail line which runs south and connects to the east-west BNSF rail which runs through Gillette. The closest railroad is the Synthetic Fuels Mine rail spur, which is adjacent to the A2Tr1 tract. Coal mined from the tract would be processed and shipped from the existing DFM facilities.

Coal extracted from the existing surface coal mines in the Wyoming PRB is transported in rail cars along the BNSF and Union Pacific (UP) rail lines. The coal mines north of Gillette, including the DFM, ship most of their coal via the east-west BNSF rail line that runs through Gillette for destinations in the Midwest. The coal mines south of Gillette ship most of their coal via the

| Noise Source (at Given Distance) | Noise Environment | A-Weighted Sound Level | Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 decibels*) |
|---|---|---|---|
| Military jet Takeoff With Afterburner (50 ft) | Carrier Flight Deck | 140 Decibels | 128 times as loud |
| Civil Defense Siren (100 ft) | | 130 | 64 time as loud |
| Commercial Jet Take-off (200 ft) | | 120 | 32 times as loud **Threshold of Pain** |
| Pile Driver (50 ft) | Rock Music Concert Inside Subway Station (New York) | 110 | 16 times as loud |
| Ambulance Siren (100 ft) Newspaper Press (5 ft) Gas Lawn Mower (3 ft) | | 100 | 8 times as loud **Very Loud** |
| Food Blender (3 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck (150 ft) | Boiler Room Printing Press Plant | 90 | 4 time as loud |
| Garbage Disposal (3 ft) | Higher Limit of Urban Ambient Sound | 80 | 2 times as loud |
| Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (10 ft) | | 70 | Reference Loudness **Moderately Loud** |
| Normal Conversation (5 ft) Air Conditioning Unit (100 ft) | Data Processing Center Department Store | 60 | 1/2 as loud |
| Light Traffic (100 ft) | Large Business Office Quiet Urban Daytime | 50 | 1/4 as loud |
| Bird Calls (distant) | Quiet Urban Nighttime | 40 | 1/8 as loud **Quiet** |
| Soft Whisper (5 ft) | Library and Bedroom at Night Quiet Rural Nighttime | 30 | 1/16 as loud |
| | Broadcast and Recording Studio | 20 | 1/32 as loud **Just Audible** |
| | | 10 | 1/64 as loud |
| | | 0 | 1/128 as loud **Threshold of Hearing** |

Source: Kimley-Horn and Associates 2008

**Figure 3-5. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life**

Gillette to Douglas BNSF and UP joint trackage that runs south through Campbell and Converse Counties and then east over separate BNSF and UP mainlines for destinations in the Midwest.

Power lines, utility corridors, and oil and gas pipelines are present within and adjacent to the A2Tr1 tract. An overhead power line runs through the tract; this power line serves an abandoned residence and an oil pad facility. Several abandoned pipelines and one active pipeline run within the A2Tr1 tract (**map 3-11**).

## 3.15 Hazardous and Solid Wastes

Potential sources of hazardous or solid waste within the analysis area (DFM permit boundary) would include spilled, leaked or dumped hazardous substances, petroleum products, and/or solid waste associated with coal and oil and gas exploration, oil and gas development, the BNSF railroad, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present on any of the hazardous or solid waste analysis area.

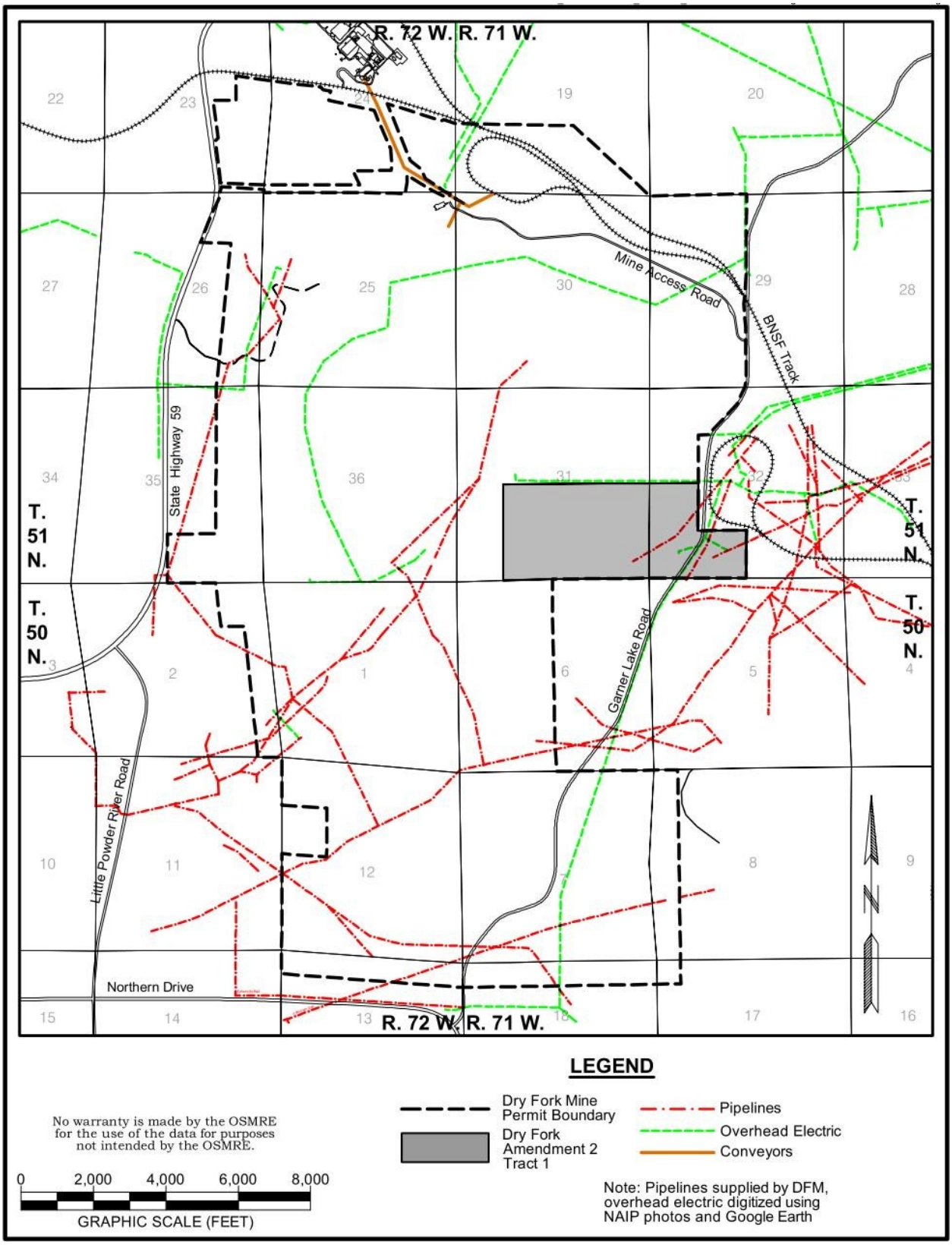
Wastes produced by current mining activities at the DFM are handled according to the Waste Disposal Program described in DFM WDEQ-LQD Permit No. PT0599. The program is summarized below.

DFM does not have an on-site solid waste landfill. Most waste generated at the mine is disposed of offsite at the Campbell County Municipal Landfill. General mining wastes are disposed in the municipal landfill only if generated on site, and only if non-hazardous per regulation under the Resource Conservation and Recovery Act (RCRA). The mine is permitted to occasionally construct disposal areas for inert non-toxic wastes such as scrap wood, scrap metal, tires, and broken concrete. Typically, these wastes are too large for dumpsters or generated in areas away from dumpsters. Examples may include wood pallets and paper. The mine rarely operates an on-site solid waste pit.

No hazardous wastes are transported to the municipal landfill or any on-site solid waste pits. While some of the following items are permitted for onsite disposal, scrap metal, tires, batteries, used filters, computers, and most wood pallets are recycled. Used filters are drained, crushed and recycled. Fifty-five-gallon drums and totes are properly emptied, cleaned and are then are recycled. Spent lead acid batteries and fluorescent lamps are stored in designated areas with secondary containment for periodic shipment to an approved recycling vendor.

As stated in **section 2.3**, the mine is permitted to take the CCB wastes from the DFS (**map 2-2**). CCBs are utility wastes generated during the burning of coal and include fly ash, bottom ash, and scrubber sludge. The CCB is permitted according to the requirements of Chapter 3 – Industrial Landfill Regulation of the WDEQ Solid Waste Rules and Regulations (Wyoming Administrative Rules 2017). An estimated 100,000 tons annually are placed at the DFM in an area located within the DFM permit boundary, but outside of the A2Tr1 tract. CCB waste is in dry form (not a slurry), and is hauled via belly or side dump trucks from the DFS to the active disposal cell. CCB waste is laid in the cells in lifts, watered for dust control, and compacted with the water to harden the ash to a concrete form. Runoff from cells drains to a lined pond where it is stored for use for dust control in the ash landfill. CCBs from DFS are in the process of being tested for use in cement products, wallboard, or as road base.

Used oil is collected from equipment, the shop oil/water separator and other sources in an above ground tank with secondary containment. It is disposed, recycled, burned for energy recovery, or otherwise handled in accordance with RCRA. Ethylene glycol (antifreeze) is stored in bulk within the lube room in the maintenance shop, distributed via a service truck throughout the mine and via pipes to the shop. Used glycol is also collected for onsite recycling and reuse. In the




**Map 3-11. Transportation Facilities Associated with the A2Tr1 Tract**

unlikely event of coolant spills, the spill will be contained and prevented from mixing with flowing water.

DFM's WDEQ-LQD Permit PT0599 allows the mine to operate an onsite landfarm for treatment of oil or glycol contaminated soils. In accordance with the permit, contaminated soils are placed in 6 inch lifts and are periodically disced or rotated to assist with breakdown of the oil products.

## 3.16 Socioeconomics

This section describes existing socioeconomic conditions in Wyoming and Campbell County specific to the local and state economy, population, employment, and environmental justice.

### 3.16.1 Local Economy

Wyoming's coal mines produced an estimate 372.6 million tons in 2015, a decrease of about 93.7 million tons (20%) over the record 466.3 million tons produced in 2008. Coal produced from 14 active mines in Campbell County, which makes up approximately 5 percent of the surface area of Wyoming, accounted for approximately 97% of total statewide coal production in 2015 (Wyoming Department of Workforce Services [WDWS] 2015). According to coal production numbers from the USEIA, the coal from Campbell County accounted for approximately 45 percent of the coal produced in the U.S. in 2015 (USEIA 2016a).

The estimated total fiscal benefit from coal production in Campbell County to the State of Wyoming in 2016 was calculated by including half of the bonus bid payments, half of the federal mineral royalties based on current prices, a designated portion the AML fees, and all of the ad valorem taxes, severance taxes, and sales and use taxes for coal produced in Campbell County in 2015. The sale of coal from Campbell County in 2015 resulted in an estimated $1,633.7 million, or $2.54 per ton (**figure 3-6)**.

### 3.16.2 Environmental Justice

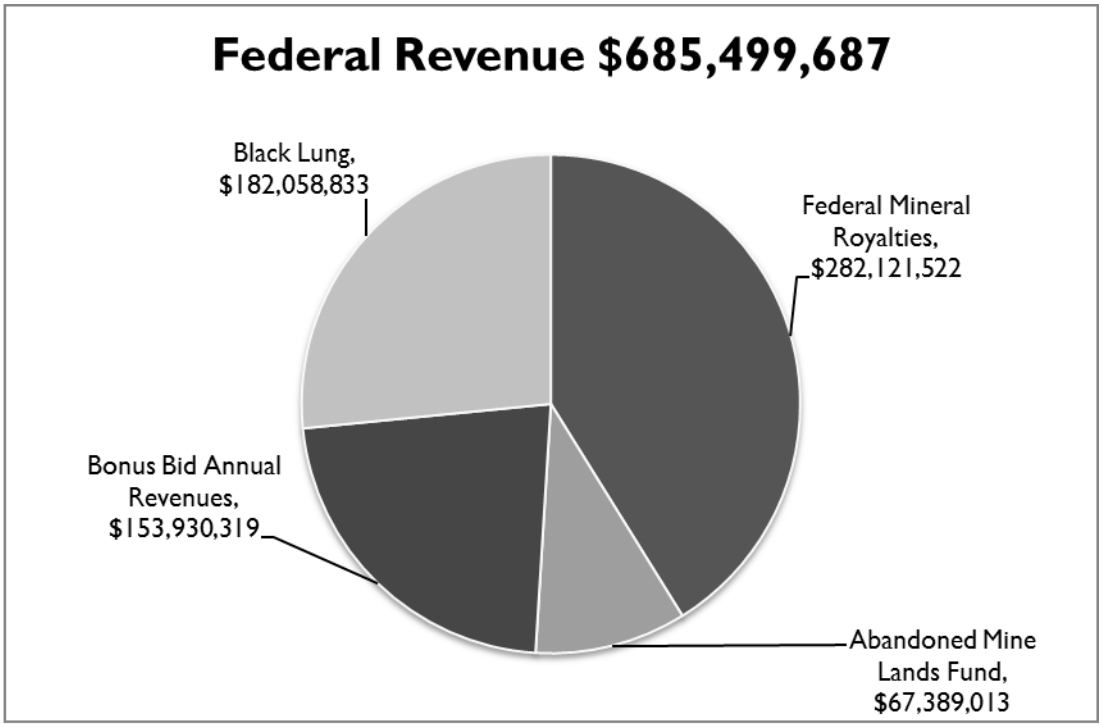
Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level make up "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, or that they would be unequally impacted if the DFM federal mining plan modification request is approved. Also, the Native American population is smaller than in the state as a whole and there are no known Native American sacred sites on or near the A2Tr1 tract. Consequently, no environmental justice populations or concerns are present in Campbell County.

Recent (2015) Gross Domestic Product (GDP) calculations for Wyoming indicate that the minerals industry (mining and oil and gas) accounted for about 23 percent of the state's total GDP of $38.6 billion, which made it the largest sector of the Wyoming economy. The contribution of mining was nearly three times that of government, the next largest sector, and nearly three times more than the contribution of the real estate industry, the next largest private sector. In 2014, mining alone accounted for 11 percent of the Wyoming GDP (WDAI-EAD 2016).

Wyoming's economy was exposed to a substantial decline in the price of oil in 2015, an extended period of low natural gas prices, and the decline in the price of coal (WDWS 2016). This trend continued into 2016. As well as direct effects to oil and gas and mining employment, the effects of the reduced demand for these natural resources also effects the required support industries for the mining and quarrying of minerals and for the extraction of oil and gas.

### 3.16.3 Population

According to U.S. census data, in 2015 Campbell County had a population of 49,220 (U.S. Census Bureau 2016a). The 2011 population of Campbell County was 46,600. Campbell County's



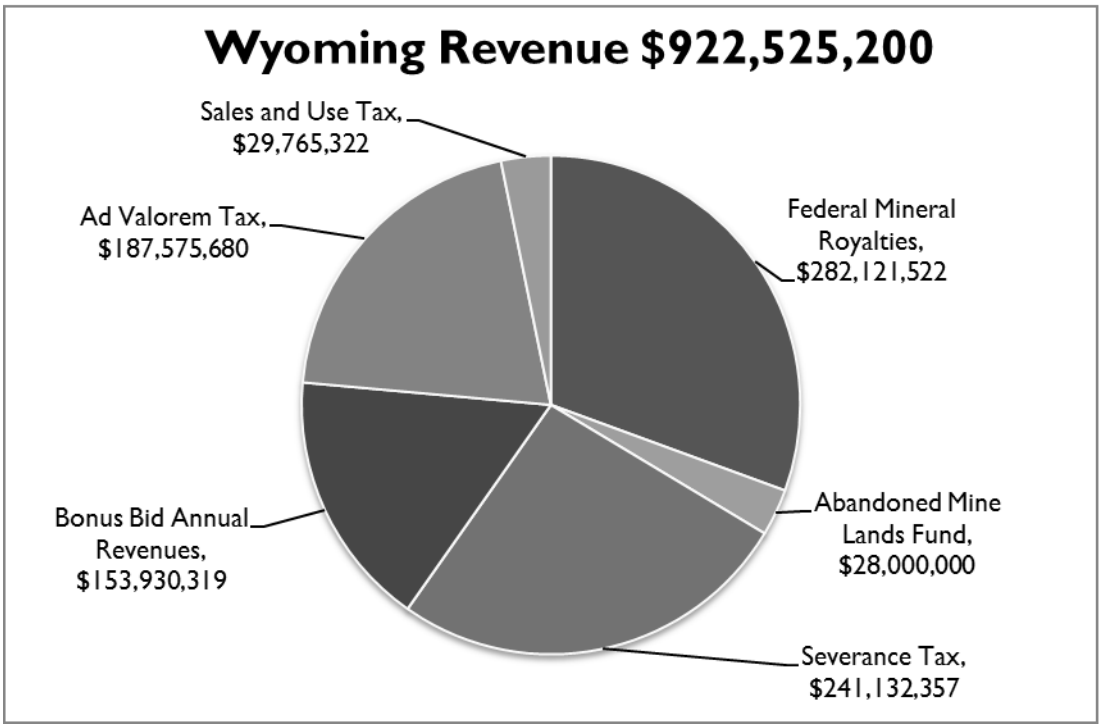




**Figure 3-6. Estimated 2016 Wyoming and Federal Revenues from 2015 Coal Production in Campbell County**

population ranks it as the third most populous of Wyoming's 23 counties (U.S. Census Bureau 2016).

The majority of the Campbell County mine employees and support services reside in Gillette. It is estimated that the total population in the Gillette city limits increased from 19,646 in 2000 to 32,649 in July 2015, an increase of 66.2 percent over the period (U.S. Census Bureau 2017). **Table 3-21** presents the population changes for Campbell County and Gillette. As of July 2015, Gillette accounted for roughly 66.3 percent of the county's residents (WDAI-EAD 2016a and 2016b). Gillette was the third largest city in the state, following Cheyenne and Casper (U.S. Census Bureau 2017).

**Table 3-21. Campbell County and City of Gillette Population Change, 2000 to 2015**

| | 2000 | 2011 | 2012 | 2013 | 2014 | 2015 | 2000-2015 Increase | 2000-2015 % Change |
|---|---|---|---|---|---|---|---|---|
| Campbell County | 33,698 | 46,600 | 47,881 | 48,121 | 48,243 | 49,220 | 14,478 | 43.0 |
| City of Gillette | 19,646 | 30,432 | 31,423 | 31,732 | 31,920 | 32,649 | 13,003 | 66.2 |

Source: U.S. Census Bureau (2016 and 2017)

### 3.16.4 Employment

**Table 3-22** presents the employment changes for Wyoming and Campbell County. The statewide total employment increased by 4,243 jobs (1.5 percent) from 2011 to 2015 while the employment in Campbell County increased by 338 (1.4 percent) during the same time period (Bureau of Labor 2016). The average unemployment rate in Campbell County for 2011 was 4.9 percent and 3.8 percent for 2015 (Bureau of Labor 2016). Between the second quarter of 2014 and the second quarter of 2016, the mining sector is projected to lose approximately 1,644 jobs (WDWS 2015). The Natural Resources and Mining sector in Campbell County experienced an approximate 14.7 percent decline in employment between June 2015 and June 2016 (WDWS 2016).

**Table 3-22. Wyoming and Campbell County Employment Rate Change, 2000 to 2015**

| | 2000 | 2011 | 2012 | 2013 | 2014 | 2015 | August 2016 |
|---|---|---|---|---|---|---|---|
| Wyoming (Number Employed) | 256,414 | 289,019 | 291,076 | 292,157 | 294,207 | 293,262 | 287,084 |
| Wyoming (Number Unemployed) | 10,394 | 17,796 | 16,349 | 14,414 | 12,726 | 12,750 | 14,686 |
| Wyoming Unemployment Rate | 3.9 | 5.8 | 5.3 | 4.7 | 4.1 | 4.2 | 5.5 |
| Campbell County (Number Employed) | 17,975 | 24,605 | 24,919 | 24,609 | 25,423 | 24,943 | 23,446 |
| Campbell County (Number Unemployed) | 830 | 1,267 | 1,213 | 1,087 | 882 | 987 | 1,708 |
| Campbell County Unemployment Rate | 3.4 | 4.9 | 4.6 | 4.2 | 3.4 | 3.8 | 6.8 |

Source: Bureau of Labor & Statistics 2016

# 4.0 Environmental Consequences/Cumulative Effects

## 4.1 Introduction

This chapter discusses the potential direct, indirect, and cumulative effects of the Proposed Action and the No Action Alternative, as described in **chapter 2**. The discussion is organized by the affected resource in the same order as they are described in **chapter 3** and then by alternative. The environmental consequences have been assessed assuming an estimated 6 Mtpy production rate, which was provided by WFW based on current contract and anticipated demand (WFW 2016a). The estimated annual production is in line with recent annual production (see **table 3-14**).

An impact, or effect, is defined as a modification to the environment brought about by an outside action. Impacts vary in significance from no change, or only slightly discernible change, to a full modification or elimination of the resource. Impacts can be beneficial (positive) or adverse (negative). Impacts are described by their level of significance (i.e., significant, moderate, minor, negligible, or no impact). For purposes of discussion and to enable use of a common scale for all resources, resource specialists considered the following impact levels in qualitative terms.

**Significant Impact**: Impacts that potentially could cause irretrievable loss of a resource; significant depletion, change, or stress to resources; or stress within the social, cultural, and economic realm.

**Moderate Impact**: Impacts that potentially could cause some change or stress to an environmental resource but the impact levels are not considered significant.

**Minor Impact**: Impacts that potentially could be detectable but slight.

**Negligible Impact**: Impacts in the lower limit of detection that potentially could cause an insignificant change or stress to an environmental resource or use.

**No Impact**: No discernible or measurable impacts.

Direct impacts are defined as those impacts which are caused by the action and occur at the same time and place (40 CFR 1508.8[a]). Indirect impacts are those that are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). Cumulative impacts are those impacts that result from incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or other entity undertakes such other actions. Cumulative impacts occur over a given time period. The time period for cumulative effects includes the time period when the impacts of past and present actions and reasonably foreseeable future actions overlap with the time period when project impacts would occur (including construction, operation, and reclamation phases).

Impacts can be short term meaning these impacts generally occur over a short period during a specific point in the mining process and these changes generally revert to pre-disturbance conditions at or within a few years after the ground disturbance has taken place. Long-term impacts are defined as those that substantially would remain beyond short-term ground-disturbing activities. Long-term impacts would generally last the life of the federal mining plan modification approval and beyond.

The direct, indirect, and cumulative effects of the Proposed Action and No Action Alternative are described below. In addition to addressing the specific issues identified in **chapter 1**, this

environmental consequences analyses reflect changes to the mining operations presented in **chapter 2** and updated descriptions of the affected environment presented in **chapter 3**.

Regarding other relevant regional activity, WFW submitted Amendment 2 PAP for WDEQ-LQD Permit No. PT0599 to WDEQ-LQD on January 12, 2012 to revise the permit boundary. WDEQ-LQD approved the Amendment 2 application on August 19, 2013 with the condition that the DFM may not mine coal from any federal coal lease prior to receiving approval from the ASLM. The Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines (northern group of mines) are adjacent to or in the immediate vicinity of the A2Tr1 tract (**Map 1-1**). Information regarding ownership, permitted acres, and 2015 coal production from these mines in included in **table 4-1**.

**Table 4-1. Ownership, Permitted Acres, and Production of Mines Adjacent to the DFM**

| Mine | Ownership | Permitted Acres | 2015 Production (Mt) |
|---|---|---|---|
| Rawhide | Peabody Caballo Coal, LLC | 9,171 | 15.2 |
| Buckskin | Buckskin Mining Company | 9,020 | 13.6 |
| Eagle Butte | Contura Coal West, LLC | 10,261 | 19.6 |
| Synthetic Fuels | Green Bridge Holdings Inc. | 2,370 | 0.0 |
| Wyodak | Wyodak Resources Development Corporation | 6,038 | 4.1 |
| **Total** | | **36,860** | **52.5** |

Four power plants are located adjacent to or in the vicinity of the A2Tr1 tract (**map 3-2**). Information regarding ownership and power output of the power plants is included in **table 4-2**.

**Table 4-2. Ownership and Power Output of Power Plants Adjacent to the DFM**

| Mine | Ownership | Power Output (MW) |
|---|---|---|
| Dry Fork Station | Basin Electric Power Cooperative | 422 |
| Wyodak Power Plant | PacifiCorp | 402 |
| Neil Simpson Complex | Black Hills Corporation | 80 |
| Wygen Station | Black Hills Corporation | 294 |

The environmental and cumulative effects discussions below assume that under the Proposed Action, the federal mining plan modification to mine coal in the federal coal leases within the A2Tr1 tract, would be approved. Coal recovery would continue within the DFM permit boundary at an estimated annual rate of 6 Mt, in accordance with WDEQ-LQD approved mine permit. The recovery of the federal coal would continue for approximately 5.3 additional years over the No Action Alternative.

Under the No Action Alternative, the mining plan modification to recover the federal coal within the A2Tr1 tract would not be approved. Currently approved mining operations associated with existing coal leases would continue for approximately 31.7 years within state coal lease 0-26652; federal coal leases WYW-5035, WYW-0271199, WYW-0271200, WYW-0271201, and WYW-0311810, and the Marshall et al. private coal lease.

### 4.1.1 Summary Comparison of Direct and Indirect Environmental Impacts

A summary comparison of the direct and indirect environmental impacts is included in **table 4-3**.

**Table 4-3. Summary Comparison of Direct and Indirect Environmental Impacts as Compared to the Existing DFM Federal Mining Plan**

| Resource Name | Proposed Action | No Action Alternative |
|---|---|---|
| Added In-Place Coal (Mt) | 32.0 | 0.0 |
| Added disturbance | 151.0 Acres | 0.0<br>(155.4 acres with the A2Tr1 tract currently approved for disturbance to recover coal on adjacent leases) |
| Topography and Physiography | Moderate, permanent on the tract. Local impacts only. | Moderate, permanent on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Geology, Minerals and Paleontology | Moderate, permanent on the tract. Recovery of 32 Mt of Wyodak-Anderson coal and CBNG within Wyodak-Anderson coal. While CBNG is not part of the Proposed Action, there would be a loss of CBNG through venting and/or depletion of hydrostatic pressure in Wyodak-Anderson coal resulting from mining adjacent areas. However, CBNG recovery has been greatly reduced in the area. Local impacts only. | Moderate, permanent on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Approximately 32 Mt of coal would not be removed on the tract but loss of CBNG would occur though venting and/or depletion of hydrostatic pressure in Wyodak-Anderson coal resulting from mining adjacent areas. Local impacts only. |
| Air Quality | Moderate to minor, short term (5.3 years) from full mining on the tract. Primarily local impacts, with the potential for regional and global impacts from transportation and combustion of coal. | Moderate to minor, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Primarily local impacts, with the potential for regional and global impacts from transportation and combustion of coal. |
| Water Resources-Groundwater | Moderate, short and long term on the tract due to aquifer (alluvial, overburden, and coal) removal. Local impacts only. | Moderate, short and long term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |

**Table 4-3. Summary Comparison of Direct and Indirect Environmental Impacts as Compared to the Existing DFM Federal Mining Plan (Continued)**

| Resource Name | Proposed Action | No Action Alternative |
|---|---|---|
| Water Resources – Surface Water | Moderate, short term (5.3 years) on the tract from full mining. Primarily local impacts, with the potential for regional impacts from combustion of coal. | Moderate, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Primarily local impacts, with the potential for regional impacts from combustion of coal. |
| Alluvial Valley Floors | No impact – Not present | Same as Proposed Action |
| Wetlands | No impact -Not present | Same as Proposed Action |
| **Resource Name** | **Proposed Action** | **No Action Alternative** |
| Soils | Moderate, short term (5.3 years) on the tract from full mining. Local impacts only. | Moderate, short term on the tract due to mine-related activity authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Vegetation | Moderate, short term (5.3 years) on the tract from full mining. Local impacts only. | Moderate, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Wildlife | Moderate, short term (5.3 years) on the tract from full mining. Loss of critical grouse areas would occur. Mitigation would be required for the loss of these critical areas. Local impacts only for most species. Hg emissions would be extended by 5.3 years, which could have a minor effect on northern long-eared bats. | Moderate, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. The critical grouse areas would not be removed. Local impacts only. |
| Ownership and Use of Land | Moderate, short term (5.3 years) on the tract from full mining. Local impacts only. | Moderate, short term on the tract due to mine related activity authorized under a revised state mine permit and federal mining plan. |

**Table 4-3. Summary Comparison of Direct and Indirect Environmental Impacts as Compared to the Existing DFM Federal Mining Plan (Continued)**

| Resource Name | Proposed Action | No Action Alternative |
|---|---|---|
| Cultural Resources | Negligible, long term on the tract from full mining. No NRHP eligible cultural resources sites would be disturbed. Local impacts only. | Negligible, long term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Visual Resources | Moderate, short term (5.3 years) on the tract from full mining. Local impacts only. | Moderate, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Noise | Minor to moderate, short term (5.3 years) on the tract from full mining. The moderate effects would moderate rapidly due to the reduction effect related to distance. | Minor to moderate, short term on the tract due to coal recovery activity on adjacent lands authorized under a revised state mine permit and revised federal mining plan. Local impacts only. |
| Transportation facilities | No impact | Same as Proposed Action |
| Hazardous and Solid Waste | Negligible | Same as Proposed Action |
| Socioeconomics | Moderate, beneficial, short term (5.3 years) on the tract from full mining. LOM State and Federal revenues from tract coal would be $124 million. Local and regional impacts. | Significant direct and indirect negative socioeconomic effects short term on the tract due the loss of $124 million in federal and state revenues, compared to Proposed Action. Local and regional impacts. |

## 4.2 Topography and Physiography

### 4.2.1 Direct and Indirect Effects

#### *4.2.1.1 Proposed Action*

The Proposed Action would impact the topography and physiography of lands included in the A2Tr1 tract but these impacts would be similar to those currently occurring on the existing DFM coal leases as coal is mined and the mined-out areas are reclaimed. The direct effects on topography and physiography resulting from the Proposed Action are expected to be moderate and permanent on the tract. Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. Portions of the original topography of the tract are somewhat rugged. As a result, the expected post-mining topography would be more subdued, but would blend with the undisturbed surroundings. Following reclamation, the average post-mining topography would be slightly lower in elevation than the pre-mining topography due to removal of the coal. The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted, excavated, and backfilled. There would be no indirect effects under the Proposed Action. As discussed in **section 1.2**, WDEQ-LQD, through the PAP process, considered and approved the impacts of mining coal related to within the A2Tr1 tract, including effects to topography and physiography and reclaiming the area to approximate original contour as required by provisions included in WDEQ-LQD Permit No. PT0599. **Table 2-1** provides comparisons between the acres of disturbance versus the acres of reclamation, by bond release phase, as of September 2016. The DFM is bound by reclamation responsibilities included in WDEQ-LQD Permit No. PT0599 and the BLM-approved R2P2.

#### *4.2.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. The impacts to topography under the No Action Alternative would be similar to those under the Proposed Action although the impacts to approximately 151 acres to recover federal coal within the tract would not occur.

### 4.2.2 Cumulative Effects

The cumulative impacts to topography and physiography would not be substantially different than those described in the existing DFM federal mining plan. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). The cumulative effects would primarily be related to the northern group of mines. Following surface coal mining and reclamation, topography would be modified within the permit boundary of the DFM. The cumulative effects on topography and physiography resulting from the Proposed Action are expected to be moderate and permanent on the tract.

### 4.2.3 Mitigation Measures

No mitigation measures would be necessary for topography.

# 4.3 Geology, Mineral Resources, and Paleontology

## 4.3.1 Direct and Indirect Effects

### *4.3.1.1 Proposed Action*

The direct and indirect effects to geology, mineral resources, and paleontology would not be substantially different than those described in the existing DFM federal mining plan. The geology from the base of the Wyodak-Anderson coal seam to the land surface would be subject to permanent change on the areas of coal removal and mining would substantially alter the resulting subsurface physical characteristics of these lands. These impacts are occurring on the existing DFM coal leases as coal is mined and the mined-out areas are reclaimed. The Proposed Action would result in the recovery of approximately 32 Mt of federal coal within the Wyodak-Anderson coal seam. The Proposed Action would also result in the loss of CBNG though venting and/or depletion of hydrostatic pressure in Wyodak-Anderson coal resulting from mining adjacent areas.

As described in **section 3.3.2**, as of October 14, 2016, 341 CBNG wells had been completed within the general analysis area (WOGCC 2016), with six CBNG wells completed within the tract. Three of those wells are currently producing gas. CBNG would be recovered from the Wyodak-Anderson coal seam within the A2Tr1 tract until mining approaches near enough to the wells to result in loss through venting and/or depletion of hydrostatic pressure. CBNG reserves not recovered from the Wyodak-Anderson coal seam prior to mining would be vented to the atmosphere. There are existing facilities and equipment associated with CBNG production and development within the tract.

A locality search for paleontological resources (conducted through geological references and paleontological records) that included the A2Tr1 tract showed that no known vertebrate fossil localities are recorded from within either the original mine permit area or the A2Tr1 tract. However, site specific paleontological ground surveys have not been conducted and the tract lies on the Paleocene-Eocene Wasatch Formation, which is known to yield significant paleontological resources in nearby areas. If vertebrate fossils do exist, they would be scientifically significant and could be negatively impacted by mining operations. Potential impacts to vertebrate fossils during construction could be both direct and indirect. Ground disturbance of significant fossil beds could result in direct damage to or destruction of fossils. Indirect effects during construction include erosion of fossil beds due to slope re-grading and vegetation clearing, and unauthorized collection of significant fossils by construction workers or the public due to increased public access to fossil localities. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area must stop and measures must be taken to assess and protect the site.

The direct and indirect effects on mineral resources and paleontology are expected to be moderate and permanent on the tract.

### *4.3.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts to the geological resources have resulted from current mining activity and therefore under this alternative, geological resources in the area would be similar to those under the Proposed Action although the impacts to the geological and paleontological resources on approximately 151 acres to recover

federal coal within the tract would not occur. Impacts to CBNG resources may still occur as a result of mining activities in adjacent lands.

### 4.3.2 Cumulative Effects

The cumulative effects on geology, mineral resources, and paleontology would primarily be related to the northern group of mines. The PRB coalfield encompasses an area of about 12,000 square miles. As presented in **table 4-1**, the combined area of the permit boundaries of the northern group of Campbell County mines totals approximately 36,860 acres (57.6 $mi^2$), or approximately 0.5 percent of the PRB coalfield (WDEQ-LQD 2016). The U.S. Geological Survey (USGS) estimates that there are approximately 162 billion tons of recoverable coal in the PRB, of which, an estimated 25 billion tons are considered economically recoverable coal, with a maximum stripping ratio of 10:1 (USGS 2013). Information in **table 4-1** shows that annual coal recovery at the six mines identified as the northern group of mines accounts for 52.5 Mt of coal, or 0.2 percent of the recoverable coal within the PRB.

According to October 17, 2016 information from the WOGCC website, 21,360 CBNG wells have been drilled in Campbell County. The WOGCC records indicate that a majority of the wells are privately held or state minerals, with approximately 36.7 percent of the wells (7,846 of 21,360) being federal minerals. Status of these wells includes shut-in, producing, plugged and abandoned, and injection. Currently, 139 of the 341 CBNG wells completed in the analysis area are considered to be in production. The pace of CBNG development in Wyoming has recently slowed considerably (WOGCC 2016).

Impacts to paleontological resources as a result of the currently authorized and reasonably foreseeable cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and would result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

### 4.3.3 Mitigation Measures

No mitigation measures would be necessary for geology or mineral resources. Should significant paleontological resources be encountered as a result of the Proposed Action, the appropriate agencies would be consulted.

## 4.4 Air Quality

### 4.4.1 Particulate Matter

#### *4.4.1.1 Direct and Indirect Effects*

##### 4.4.1.1.1 Proposed Action

Based on values included in **table 3-5**, between 2011 and 2015, $PM_{10}$ concentrations measured at the four air quality monitoring sites at the DFM ranged between approximately 11 and 92 percent of the annual WAAQS of 50 $\mu g/m^3$. During the same time period, the $PM_{10}$ values ranged between approximately 10 to 73 percent of the 24-hour WAAQS/NAAQS of 150 $\mu g/m^3$. $PM_{2.5}$ monitoring at the DFM is not required by WDEQ. Actual $PM_{2.5}$ values presented in **table 3-5** from four

monitoring locations in Campbell County (**map 3-3**) reveal that between 2011 and 2015, $PM_{2.5}$ concentrations ranged between approximately 29 and 63 percent of the 24-hour NAAQS of 35 μg/m$^3$. During the same time period, $PM_{2.5}$ concentrations ranged between approximately 18 and 66 percent of the annual NAAQS of 12 μg/m$^3$. The estimated $PM_{2.5}$ values for the DFM presented in **tables 3-7** and **3-8** also show that estimated 2011 through 2015 $PM_{2.5}$ concentrations were below the prescribed NAAQS.

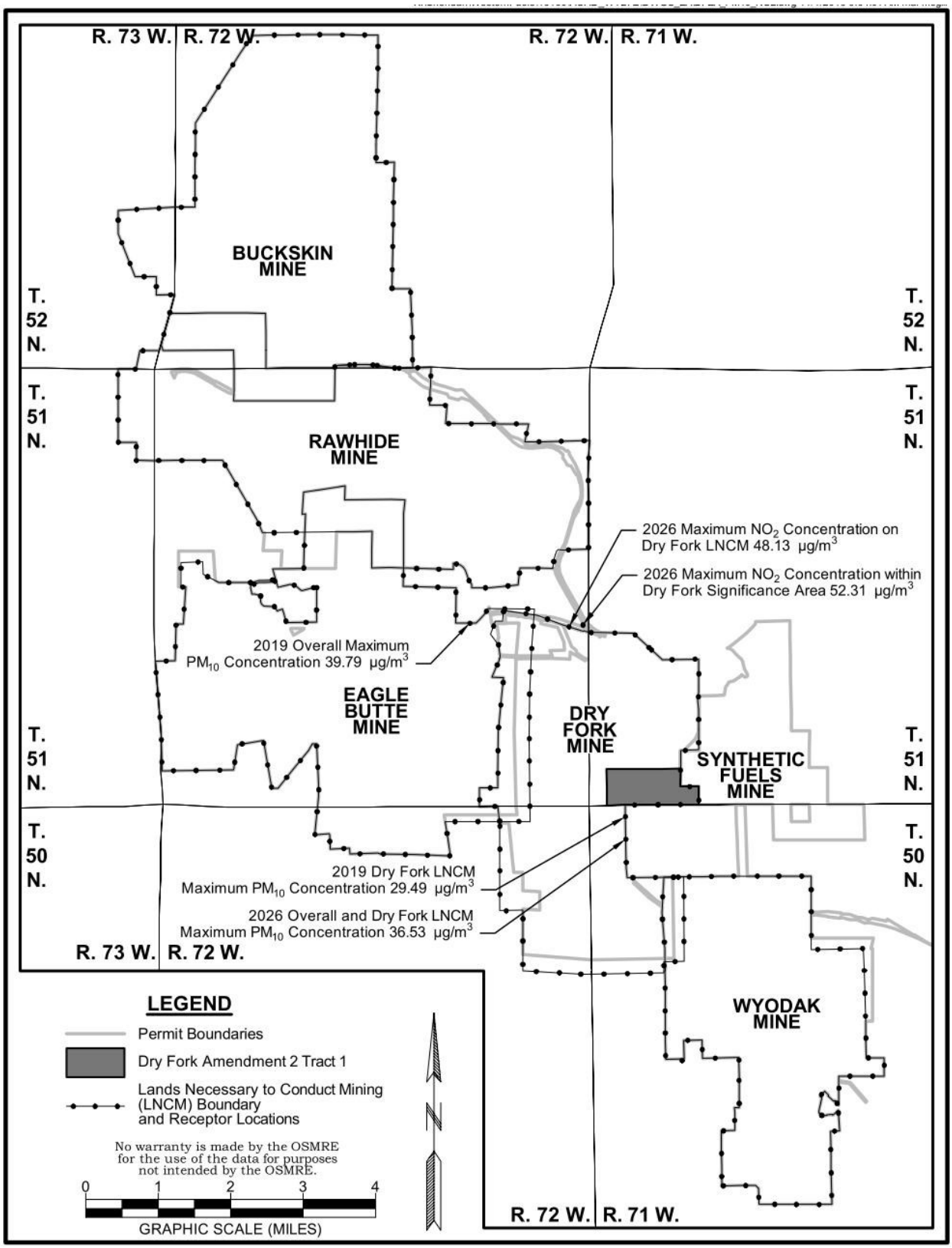
WFW projects that the annual coal production is expected to average 6 Mt with mining the remaining federal coal within the A2Tr1 tract (WFW 2016a). DFM's currently approved air quality permit (MD-11723) from WDEQ limits annual coal production to 15 Mt of coal. According to WFW, production would continue at an average rate of 6 Mtpy for approximately 5.3 additional years under the Proposed Action. Public exposure to particulate emissions from surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of residences in the area could also be affected. As indicated on **map 3-1**, the closest occupied residence is located approximately 1,900 feet from A2Tr1 disturbance and the closest public transportation route is the Garner Lake Road (County Road 38N), which is immediately adjacent to disturbance associated with the A2Tr1 tract. The nearest recreational opportunities are within the Gillette city limits, approximately 15,000 feet from the A2Tr1 tract.

WDEQ-AQD issued air quality permit MD-11723 for the DFM on September 20, 2011. This air quality permit was issued based on an analysis using emission factors, estimation methods, and model selection consistent with WDEQ-AQD policy. The emission inventory was prepared based on site-specific operations projections associated with the 15 Mtpy mine plan.

$PM_{10}$ inventories for the mining activities at DFM were prepared for all years in the currently anticipated LOM. Two years were then selected for worst-case dispersion modeling of $PM_{10}$ based on mine plan parameters and emission inventories. Fugitive emission sources and point sources were modeled using the Industrial Source Complex Long Term 3 (ISCLT3) model. The modeling follows the methods presented in a dispersion modeling protocol for the project originally submitted to WDEQ-AQD in February 2011 (Carter Lake Consulting 2011). Based on comments received from WDEQ-AQD, the package was resubmitted in April, 2011.

Modeling indicates the currently projected mine activities would be in compliance with the 24-hour and annual $PM_{10}$ ambient air standard for the life of the DFM. Based on mine plan parameters and highest emissions inventories, the years 2015 and 2019 were selected as the worst-case years for $PM_{10}$ evaluation, because those years had the highest modeled $PM_{10}$ concentrations. Coal production in both years was modeled at the maximum permitted production level of 15 Mt (Carter Lake Consulting 2011). The results of 24-hour and annual dispersion modeling are included in **table 4-4**. The locations of the maximum-modeled $PM_{10}$ concentrations for 2015 and 2019 are shown on **map 4-1**. Under the modified mining plan proposed, the DFM would not cause or contribute to a violation of the federal 24-hour $PM_{10}$ NAAQS of 150 μg/m$^3$ (Carter Lake Consulting 2011).

WDEQ has determined that the DFM is not a major stationary source, in accordance with Chapter 6, Section 4 of the WAQSR (WDEQ-AQD 2011); therefore, a PSD increment consumption analysis was not necessary.




**Map 4-1. Maximum Modeled $PM_{10}$ and $NO_2$ Concentrations**

**Table 4-4. DFM Particulate Matter Dispersion Modeling Results (μg/m³)**

| Pollutant | Averaging Period | Modeled Concentration | Background Concentration | Total Concentration | WAAQS/NAAQS |
|---|---|---|---|---|---|
| | | **2015** | **Mine** | **Year** | |
| $PM_{10}$ | Annual[a] | 38.4 [b] | 11.4 | 49.8 | 50 [c] |
| | | **2019** | **Mine** | **Year** | |
| $PM_{10}$ | Annual[a] | 37.7 [b] | 12.0 | 49.7 | 50 [c] |

a Violation occurs with more than one expected exceedance per calendar year, averaged over 3-years
b Highest modeled value
c Violation occurs when the 3-year average of the arithmetic means over a calendar year exceeds the value. EPA revoked the annual $PM_{10}$ standard effective December 17, 2006.

There have been no recorded exceedances of the 24-hour or annual $PM_{10}$ WAAQS or NAAQS at the DFM and, based on estimated $PM_{2.5}$ values, there were no exceedances of the 24-hour or annual $PM_{2.5}$ WAAQS/NAAQS at the mine. While the initial modeling predicted exceedances of annual $PM_{10}$ WAAQS at two receptors along the Buckskin Mine lands necessary to conduct mining (LNCM), refined ISCLT3 modeling conducted in 2011 predicted no future exceedances of the annual $PM_{10}$ WAAQS/NAAQS at a 15-Mtpy production rate (Carter Lake Consulting 2011). The DFM used the existing $PM_{2.5}$ monitor in the north group of mines to demonstrate that the WAAQS/NAAQS for $PM_{2.5}$ would be protected during the life of the mine (Carter Lake Consulting 2011). The measured and estimated $PM_{2.5}$ values, as shown in **tables 3-6**, **3-7**, and **3-8**, indicate that the $PM_{2.5}$ WAAQS/NAAQS will be protected.

At the estimated average annual production rate of 6 Mt there would be an extension of approximately 5.3 years in the time the mine would produce and there would be an increase in overburden thickness, but fugitive dust emissions are projected to remain within daily and annual WAAQS and NAAQS limits (Carter Lake Consulting 2011). The direct and indirect effects from particulate matter emissions resulting from the Proposed Action are expected to be moderate and they would be extended by approximately 5.3 years. As discussed in **section 4.4.3**, the effects of particulate matter emissions from coal combustion would be minor.

#### 4.4.1.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts from particulate matter emissions have resulted from current mining activity and therefore under this alternative, particulate matter emission impacts in the area would be similar to those under the Proposed Action but would not be extended for an additional 5.3 years.

#### *4.4.1.2 Cumulative Effects*

The adjacent northern group of mines would contribute additional particulate matter emissions to the surrounding area. Cumulative impacts from particulate matter emissions could be higher in the short term in this area due to coal mining activities if surface inversions occur in the northern portion of the PRB. This would be temporary, lasting only during the inversion event. Air quality impacts would cease to occur after mining and reclamation are completed. The effects of particulate matter emissions from coal combustion are included in **section 4.4.5**. Modeling conducted for MD-11723 air quality permit included effects the adjacent northern group of mines. As the revised model indicated, the requested modification to DFM's federal mining plan would

not contribute to a violation of the federal annual $PM_{10}$ WAAQS/NAAQS of 50 μg/m$^3$ (Carter Lake Consulting 2011). As discussed in **section 3.4.2**, the city of Sheridan is a nonattainment area for $PM_{10}$. According to WDEQ-AQD information (WDEQ-AQD 2016), the Sheridan nonattainment area has attained the $PM_{10}$ NAAQS for over 25 years. In light of the data from the past 25 years that shows compliance with $PM_{10}$ NAAQS while mining has been ongoing in the PRB, it can be projected that the Proposed Action would not significantly contribute particulate matter to this nonattainment area. The cumulative effects from particulate matter emissions are expected to be moderate and they would be extended by approximately 5.3 years.

*4.4.1.3 Mitigation Measures*

No mitigation measures beyond those required by the DFM air quality permit would be required for emissions of particulate matter (WDEQ-AQD 2011).

### 4.4.2 Emissions of Carbon Monoxide (CO), Sulfur Dioxide ($SO_2$), and Lead (Pb)

*4.4.2.1 Direct and Indirect Effects*

4.4.2.1.1 Proposed Action

WFW projects that the annual coal production is expected to average 6 Mt, with mining of the federal coal associated with the A2Tr1 tract (WFW 2016a). DFM's currently approved air quality permit from WDEQ limits annual coal production to 15 Mt of coal. According to WFW, the recovery of federal coal would continue at an average rate of 6 Mtpy for approximately 5.3 additional years under the Proposed Action. The DFM is not required to monitor CO, $SO_2$, or Pb so a direct comparison between current CO, $SO_2$, or Pb at the mine and state or federal standards is not possible.

$SO_2$ monitoring data were available from Wyodak Site 4 (560050857), which is approximately 7 miles south of the A2Tr1 tract. As presented in **table 3-11**, $SO_2$ data collected at the Wyodak Site 4 were below the 1-hour NAAQS and WAAQS 99th percentile concentration of 75 ppb, indicated in **table 3-3**. Therefore, it is likely that ambient air quality within the vicinity of the proposed action is currently in compliance with the $SO_2$ WAAQS and NAAQS.

Hg emissions data collected from three coal-fired power plants are shown in **table 3-12.** A direct comparison between the monitored values at the power plants and NAAQS and WAAQS is not possible since the monitored values were presented in pounds, rather than the NAAQS and WAAQS units (μg/m$^3$). According to WDEQ-AQD annual inspection reports, the DFS appeared to be operating in compliance with all applicable Wyoming Air Quality Standards & Regulations (WAQSR), including those for Hg (WDEQ-AQD 2011, 2012, 2013, 2014, and 2015).

Pb emissions data collected from three coal-fired power plants, one mine, and one AQS site are shown in **table 3-13**. A direct comparison between the monitored values at the power plants/ mine and NAAQS and WAAQS is not possible since the monitored values were presented in pounds, rather than the NAAQS and WAAQS units (μg/m$^3$). According to WDEQ-AQD annual inspection reports, the DFS appeared to be operating in compliance with all applicable WAQSR, including those for Pb (WDEQ-AQD 2011, 2012, 2013, 2014, and 2015). The 2011-2015 monitoring results from the Thunder Basin AQS site showed that annual 1$^{st}$ maximum Pb monitoring values were well below the 90-day average NAAQS and WAAQS of 0.15 μg/m$^3$.

CO is not monitored in Campbell County, therefore the effects of CO emissions from the Proposed Action are difficult to assess based on monitored values. However, there are currently

no counties/cities in Wyoming, Montana, or South Dakota that are considered as nonattainment for CO, based on NAAQS and WAAQS (EPA 2016b).

The effects of emissions of CO, $SO_2$ and Pb from the Proposed Action would be minor.

4.4.2.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts from CO, $SO_2$, and Pb emissions have resulted from current mining activity and therefore the impacts related to CO, $SO_2$, and Pb emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended for an additional 5.3 years.

*4.4.2.2 Cumulative Effects*

The adjacent northern group of mines would contribute additional CO, $SO_2$, and Pb emissions to the surrounding area. Based on past monitoring, the permit modification request would not likely increase CO, $SO_2$, or Pb emissions. Cumulative impacts from CO, $SO_2$, and Pb could be higher in the short term in this area due to coal mining activities if surface inversion occurs in the northern portion of the PRB. This would be temporary, lasting only during the inversion. Air quality impacts would cease to occur after mining and reclamation are complete. The cumulative effects from CO, $SO_2$, and Pb emissions are expected to be minor and they would be extended by approximately 5.3 years.

*4.4.2.3 Mitigation Measures*

No mitigation measures beyond those required by the DFM air quality permit would be required for emissions of CO, $SO_2$, or $Pb_3$.

### 4.4.3 Emissions of Nitrogen Oxides ($NO_X$) and $O_3$

*4.4.3.1 Direct and Indirect Effects*

4.4.3.1.1 Proposed Action

WFW projects that the annual coal production is expected to average 6 Mt with mining of the federal coal associated with the A2Tr1 tract (WFW 2016a). DFM's currently approved air quality permit from WDEQ limits annual coal production to 15 Mt of coal. According to WFW, the recovery of federal coal would continue at an average rate of 6 Mtpy for approximately 5.3 additional years under the Proposed Action. The DFM is not required to monitor $NO_X$ or $O_3$ so a direct comparison between current $NO_X$ or $O_3$ at the mine and state or federal standards is not possible.

As presented in **table 3-9**, $NO_2$ data collected at the currently active AQS monitoring sites in Campbell County nearest to the DFM were below the 1-hour NAAQS 98th percentile concentration of 100 ppb (188 μg/m$^3$, as indicated in **table 3-3**) and below the 1-hour WAAQS 98th percentile concentration of 189 μg/m$^3$ indicated in **table 3-3**. Therefore, ambient air quality within the vicinity of the proposed action is currently in compliance with the $NO_2$ WAAQS and NAAQS.

While, per WDEQ guidance, modeling for $NO_2$ is not required because estimated $NO_x$ PTE would be well below 40 tpy, modeling was conducted a part of the MD-11723 air quality permit application. The year 2026 was selected as the worst-case year because that year had the highest

modeled $NO_X$ concentrations. $NO_X$ modeling closely followed many of the same procedures used in the $PM_{10}$ analysis. Emissions were apportioned in a similar manner and the same meteorological data set was used. Area source, haul road, and point source information for the DFM and Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines and information for railroads, roads, power plants, and regional sources provided by WDEQ-AQD were included in the model (Carter Lake Consulting 2011). The amount of $NO_X$ emissions from blasting is related to the amount of ammonium nitrate fuel oil (ANFO) blasting agent used. Total annual $NO_X$ emission rate for 2026 is expected to be 558.9 tons. This $NO_X$ value is included in WFW's 2014 air quality permit application that was submitted to WDEQ-AQD for a revision to MD-11723 (Carter Lake Consulting 2011). WDEQ-AQD determined that, based on the modeling analysis and past monitoring, the permit modification request would not likely substantially degrade air quality (WDEQ-AQD 2014). Public exposure to $NO_X$ emissions caused by surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of residences in the area could also be affected. The closest public transportation route is the Garner Lake Road (County Road 38N), which runs through A2Tr1 and there are occupied dwellings located approximately 1,900 feet south of the A2Tr1 tract. The nearest recreational opportunities are within the City of Gillette, approximately 15,000 feet from the A2Tr1 tract. The direct and indirect effects from $NO_X$ emissions resulting from the Proposed Action are expected to be moderate and they would be extended by approximately 5.3 years on the tract.

As indicated in **section 3.4.7.3**, $O_3$ monitoring is not required at the DFM but $O_3$ levels have been monitored at AQS sites 560050123 and 560050456 (**map 3-3**) since 2011, which are located approximately 22 miles north and 17 miles south of the tract, respectively. No exceedances of the 8-hour or $O_3$ standard have occurred at monitoring site 560050123 since monitoring began in 2010. Based on information provided by WFW that mining methods would not be significantly different that those currently employed at the mine (WFW 2016a), the direct and indirect effects from $O_3$ emissions resulting from the Proposed Action are expected to be minor they would be extended by approximately 5.3 years.

#### 4.4.3.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts from $NO_X$ and $O_3$ emissions have resulted from current mining activity and therefore the impacts related to $NO_X$ and $O_3$ emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended for an additional 5.3 years.

### *4.4.3.2 Cumulative Effects*

The adjacent northern group of mines would contribute additional $NO_X$ and $O_3$ emissions to the surrounding area. Modeling conducted for MD-11723 air quality permit included effects the adjacent northern group of mines. WDEQ-AQD determined that, based on the modeling analysis and past monitoring, the permit modification request would not likely substantially degrade air quality (WDEQ-AQD 2014). Cumulative impacts from $NO_X$ and $O_3$ could be higher in the short term in this area due to coal mining activities if surface inversion occurs in the northern portion of the PRB. This would be temporary, lasting only during the inversion. Air quality impacts would cease to occur after mining and reclamation are complete. The cumulative effects from $NO_X$ and

$O_3$ emissions are expected to be moderate and they would be extended by approximately 5.3 years.

$O_3$ monitoring at AQS sites 560050123 and 560050456 (**map 3-3**), which are located approximately 22 miles north and 17 miles south of the tract, respectively, has been conducted since 2010. Monitoring at these sites provides an estimate of cumulative $O_3$ emissions effects. No exceedances of the 8-hour or $O_3$ standard have occurred at the monitoring sites since monitoring began in 2010. The cumulative effects from $O_3$ emissions resulting from the Proposed Action are expected to be minor but they would be extended by approximately 5.3 years.

*4.4.3.3 Mitigation Measures*

No mitigation measures beyond those required by the DFM air quality permit would be required for emissions of $NO_X$ or $O_3$.

### 4.4.4 Air Quality Related Values (AQRVs)

*4.4.4.1 Direct and Indirect Effects*

4.4.4.1.1 Proposed Action

Visibility

WDEQ has determined that the DFM is not a major stationary source, in accordance with Chapter 6, Section 4 of the WAQSR (WDEQ-AQD 2011). While the state of Wyoming does not require mines to evaluate impacts on Class I areas, OSMRE considers such issues during the federal mining plan modification review process.

Because WDEQ does not require the DFM to evaluate visibility impacts on Class I areas, the mine does not monitor visibility. Therefore, a direct comparison with the Wyoming standards is not possible. The impacts to visibility from mining the A2Tr1 tract have been inferred from the currently permitted impacts of mining the existing coal leases at the DFM. The nearest Class I area is located approximately 74 miles northwest of the A2Tr1 tract at the Northern Cheyenne Indian Reservation. As indicated on **figure 3-1**, the long-term trend in visibility at the Northern Cheyenne Indian Reservation appears to be relatively stable, if not improving slightly. If the coal within the tract is mined, the tract would be mined as an integral part of the DFM. The average annual coal production for the mine is anticipated to be approximately 6 Mt if the federal mining plan modification is approved to include the remaining federal coal in the A2Tr1 tract.

Overburden is generally thicker in the tract than the current lease areas; therefore, state-of-the-art methods to minimize any increases in blast sizes and/or blasting agents would be employed. Thus, emissions from blasting are not expected to increase substantially, notwithstanding the increased thicknesses of overburden that would be excavated in the tract. The expected levels of pollutants and particulates that effect visibility would be within the approved MD-11723. The proposed project area is not directly influenced by other air quality regulations (i.e. Class I air shed). The direct and indirect effects to visibility resulting from the Proposed Action are expected to be moderate and they would be extended by approximately 5.3 years.

Acidification of Lakes/Acid Deposition

Because the DFM is not required by WDEQ to monitor $H_2S$, a direct comparison to WAAQS standards is not possible. Because factors affecting $H_2S$ emissions would not change as a result of the Proposed Action, the direct and indirect effects have been inferred from the currently permitted impacts of mining the existing coal leases at the DFM. As indicated in **table 3-15,** the

2011-2015 trend in H+ at monitoring site WY99 appears to be relatively stable. Based on this comparison of the current information available, the Proposed Action is not expected to contribute to increased direct or indirect effects from acidification of lakes or to acid deposition that may affect soils.

#### 4.4.4.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts to the air quality related values have resulted from current mining activity and therefore under this alternative, impacts to air quality related values in the area would be similar to those under the Proposed Action but would not be extended by approximately 5.3 years.

### *4.4.4.2 Cumulative Effects*

The cumulative AQRVs would be affected by mines in Campbell County. One method of evaluating the cumulative effects of the Proposed Action on AQRVs would be to assess the air quality index (AQI) for Campbell County. As described by the AirNow website, the AQI provides an index of how clean or polluted the air is within an area, and what associated health effects might be a concern (AirNow 2017). The AQI focuses on health affects experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), CO, $SO_2$, and $NO_2$. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. The AQI evaluates air quality based on six levels (categories) of health concern that correspond to a different level of health concern.

The six categories of health concern are:

Good - Number of days in the year having an AQI value 0 through 50, indicating that air quality is considered satisfactory, and air pollution poses little or no risk.

Moderate - Number of days in the year having and AQI value 51 through 100, which means that air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.

Unhealthy for Sensitive Groups - Number of days in the year having an AQI value 101 through 150, where members of sensitive groups may experience health effects. The general public is not likely to be affected.

Unhealthy - Number of days in the year having an AQI value 151 through 200. Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.

Very Unhealthy - Number of days in the year having an AQI value 201 or higher. This category is a health alert: everyone may experience more serious health effects.

Hazardous - Number of days in the year having an AQI greater than 300. This would trigger a health warnings of emergency conditions with the entire population more likely to be affected.

According to information obtained from the AirNow Website, approximately 98.7 percent of the days between 2011 and 2015 were classified as having a good or moderate AQI and no days were classified as very unhealthy or hazardous (**table 4-5**).

**Table 4-5. Average Annual Campbell County Air Quality Index Values, 2011-2016**

| | Good | Moderate | Unhealthy for Sensitive Groups | Unhealthy | Very Unhealthy | Hazardous |
|---|---|---|---|---|---|---|
| 2011 | 201 | 159 | 4 | 1 | 0 | 0 |
| 2012 | 130 | 221 | 13 | 2 | 0 | 0 |
| 2013 | 222 | 142 | 1 | 0 | 0 | 0 |
| 2014 | 262 | 102 | 1 | 0 | 0 | 0 |
| 2015 | 252 | 110 | 2 | 1 | 0 | 0 |
| 2016[1] | 274 | 195 | 79 | 0 | 0 | 0 |
| **Average** | **--** | **212.8** | **137.4** | **3.1** | **1.0** | **0** |
| Percent of Total Average | -- | 60.1% | 38.8% | 0.9% | 0.1% | 0.0% |

[1] Annual statistics for 2016 are not final until May 1, 2017
Source: EPA (2017)

Blasting, coal crushing, loading and hauling of coal, moving equipment, and other activities associated with surface coal mining and the combustion of coal at power plants produce particulates that can be released into the air, which could impact AQRVs. The cumulative effects on AQRVs are expected to be minor but they would be extended by approximately 5.3 years. Impacts to AQRVs from mining the federal coal within the A2Tr1 tracts would cease to occur after mining and reclamation are completed.

*4.4.4.3 Mitigation Measures*

No mitigation measures beyond those required by the DFM air quality permit would be required for AQRVs.

### 4.4.5 Air Quality Related to Coal Combustion

*4.4.5.1 Direct and Indirect Effects*

4.4.5.1.1 Proposed Action

Emissions that affect air quality also result from combustion of fossil fuels. **Table 4-6** presents the $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_X$, and Hg emissions estimates from coal mined at the DFM used for power generation. Emission estimates for 2016 through 2053 are also provided based on the projected average coal recovery for the time period. Using information from **table 4-6**, comparisons can be made between combustion emissions from coal mined DFM and emissions from coal mined from Campbell County. Total U.S. emissions are also included in the table.

Impacts to air quality related to coal combustion under the Proposed Action would be similar to the conditions currently experienced. When compared to Campbell County emissions, direct and indirect effects would be minor (less than 2 percent of the Campbell County average emissions) but they would be extended by approximately 5.3 years.

Hg is a heavy metal that is a known persistent, bioaccumulative and toxic (PBT) substance that occurs naturally in coal. Air releases of Hg are associated with a variety of important environmental and human health consequences (CEC 2011). The DFM provides all of the coal utilized at the DFS. Power plants can release trace metals, such as Hg, during the combustion of coal to generate electricity. The Hg emissions from DFS coal-fired power plants are indicated in **table 4-6**.

**Table 4-6. Estimated Annual $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_X$, Hg, and CO Contributions from Combustion of Coal Mined at the DFM for 2011-2016 and 2017-2053, Compared to Campbell County and U.S. Total Emissions**

| Year | Coal Recovered (Mt) | $PM_{10}$ (Tons) | $PM_{2.5}$ (Tons) | $SO_2$ Emissions (Tons) | $NO_2$ Emissions (Tons) | Hg Emissions (Tons) | CO Emissions (Tons) |
|---|---|---|---|---|---|---|---|
| 2011 | 5.8 | 4,009.9 | 1,223.0 | 50,495.9 | 20,775.5 | 0.2 | 1,442.7 |
| 2012 | 6.0 | 4,173.7 | 1,273.0 | 52,559.4 | 21,624.4 | 0.2 | 1,501.7 |
| 2013 | 5.4 | 3,775.7 | 1,151.6 | 47,546.9 | 19,562.2 | 0.2 | 1,358.5 |
| 2014 | 5.4 | 3,734.0 | 1,138.9 | 47,022.3 | 19,346.3 | 0.2 | 1,343.5 |
| 2015 | 6.4 | 4,425.5 | 1,349.8 | 55,730.6 | 22,929.1 | 0.3 | 1,592.3 |
| 2016 | 6.1 | 4,263.2 | 1,300.3 | 53,686.0 | 22,088.0 | 0.3 | 1,533.9 |
| 2017-2027 Annual Average | 6.0 | 4,169.0 | 1,271.5 | 52,500.0 | 21,600.0 | 0.2 | 1,500.0 |
| Total Campbell County[1] | 369.7 | 256,893.4 | 78,352.5 | 3,235,037.5 | 1,330,986.8 | 15.3 | 92,429.6 |
| 2017-2053 Annual Average Percent of Campbell Co. | -- | 1.62% | 1.62% | 1.62% | 1.62% | 1.62% | 1.62% |
| Total U.S. Emissions (2015) | 824.8 | 573,077.7 | 174,788.7 | 7,216,720.0 | 2,969,164.8 | 34.2 | 206,192.0 |
| 2017-2053 Annual Average Percent of U.S. | -- | 0.73% | 0.73% | 0.73% | 0.73% | 0.73% | 0.73% |

[1] Based on an estimated production of 386.2 Mt (average of 2011 through 2016 production)
Source: WWC completed calculations, which are provided in **appendix C**

Based on an average of 2.0 Mtpy, the estimated Hg emissions resulting from the proposed action would contribute approximately 0.032 ton of Hg emissions per year for an additional 5.3 years (WWC 2016). Therefore, the Proposed Action would not increase Hg emissions but would extend the emissions by approximately 5.3 years.

#### 4.4.5.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Impacts to the air quality have resulted from current mining activity and therefore under this alternative, impacts to air quality from combustion would be similar to those under the Proposed Action but would not be extended by approximately 5.3 years.

### *4.4.5.2 Cumulative Effects*

In 2015, approximately 98 percent of coal mined at the DFM was burned in Wyoming power plants (WFW 2016a). Therefore, the cumulative effects area related to coal combustion would include the state of Wyoming. The Hg emissions from seven Wyoming coal-fired power plants are indicated in **table 4-7**. Hg emissions from the Wygen Station were not available.

The Proposed Action would not increase cumulative Hg emissions but would extend the emissions from coal-fired power plants by approximately 5.3 years. When compared to emissions from these Wyoming power plants, cumulative effects from the Proposed Action would be minor (approximately 3 percent of the Wyoming average emissions) but they would be extended by approximately 5.3 years.

**Table 4-7. Mercury Emissions (in Tons) from Seven Wyoming Coal Fired Power Plants, 2011-2015**

| | 2011 | 2012 | 2013[1] | 2014 | 2015 | 2011-2015 Average |
|---|---|---|---|---|---|---|
| Wyodak Plant | 0.099 | 0.213 | 0.169 | 0.174 | 0.160 | 0.163 |
| Dry Fork Station | 0.036 | 0.042 | 0.043 | 0.035 | 0.033 | 0.038 |
| Neil Simpson Complex | 0.289 | 0.341 | (6.543) | 0.327 | 0.356 | 1.571 |
| Dave Johnston Plant | 0.220 | 0.207 | 0.206 | 0.134 | 0.251 | 0.204 |
| Jim Bridger Plant | 0.246 | 0.271 | 0.276 | 0.261 | 0.097 | 0.230 |
| Laramie River Station | 0.211 | 0.302 | 0.331 | 0.149 | 0.128 | 0.224 |
| Naughton Plant | 0.054 | 0.063 | 0.046 | 0.063 | 0.045 | 0.054 |
| Power Plant Cumulative Total | 1.155 | 1.439 | 7.614 | 1.143 | 1.07 | 2.484 |
| Percent of Hg Emissions from DFM | 3.12% | 2.92% | -- | 3.06% | 3.08% | 3.05% |

[1] 2013 Neil Simpson value on website appears to be incorrect given the significantly lower values in 2011, 2012, 2014, and 2015 so 2013 calculations are highlighted

Source: EPA 2017a

## 4.4.6 Greenhouse Gas Emissions

### *4.4.6.1 Direct and Indirect Effects of the Proposed Action*

#### 4.4.6.1.1 Proposed Action

Each GHG has a different lifetime in the atmosphere and a different ability to trap heat in the atmosphere. To allow different gases to be compared and added together, emissions can be converted into $CO_2$e emissions. DFM estimated emissions from combined sources based on annual coal recovered from 2011 through 2016 and known production and variables used to calculate $CO_2$e emissions, and for the 2017-2053-time period using estimated production and estimated variables (**table 4-8**). $CO_2$e emissions are projected to remain constant at the DFM for the LOM. The Proposed Action would not increase annual production but would extend the life of the mine by approximately 5.3 years. The direct and indirect effects from GHG emissions at the mine resulting from the Proposed Action are expected to be minor but they would be extended by approximately 5.3 years. Because emissions would remain constant and because 2017-2053 emissions are estimated to represent only 0.54 percent of the projected 2020 U.S. $CO_2$ emission, impacts would be potentially detectable but slight, meeting the definition of "minor" as described in the EA.

As presented in **table 4-8**, the transportation and combustion of the coal are the primary contributing factors related to $CO_2$e emissions from the Proposed Action, accounting for approximately 99.6 percent of the emissions. Based on estimated average annual $CO_2$e emissions of 10,137,357 metric tons (10.1 million metric tons) from coal mined from 2017 through 2053, the total estimated $CO_2$e emissions from coal mined at the DFM (including rail transport and coal combustion) resulting from the Proposed Action would increase by 53,727,992 metric tons (53.7 million metric tons) for the LOM. The direct and indirect effects from GHG emissions, including rail transport to final destinations at power plants and loading terminals and coal combustion, are expected to be moderate and they would be extended by approximately 5.3 years.

While annual $CO_2$e emissions would remain the same as the No Action Alternative for approximately 31 years, the LOM $CO_2$e emissions would increase by approximately 16 percent over the No Action Alternative, based on 5.3-additional years of combustion of DFM coal.

**Table 4-8. Estimated Annual Equivalent $CO_2$ ($CO_2e$) Emissions[1] for the Proposed Action from Coal Mined at the DFM (2011 through 2016, and 2017-2053 Average)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017-2053 Average |
|---|---|---|---|---|---|---|---|
| **General** | | | | | | | |
| Mt of Coal Recovered | 5.77 | 6.01 | 5.43 | 5.37 | 6.37 | 6.14 | 6.00 |
| Mt of Coal Shipped by Conveyor (All to DFS) | 1.01 | 2.03 | 1.99 | 2.14 | 2.10 | 1.83 | 2.00 |
| Mt of Coal Shipped by Rail | 4.76 | 3.98 | 3.44 | 3.24 | 4.27 | 4.30 | 4.00 |
| Average Transport Miles (One Way) | 365 | 192 | 250 | 142 | 132 | 141 | 216 |
| Number of Train Trips (One Way) | 308 | 257 | 222 | 209 | 276 | 278 | 302 |
| **Direct Emissions Sources** | | | | | | | |
| Fuel | 18,853 | 19,624 | 19,624 | 17,556 | 20,808 | 20,026 | 19,601 |
| Electricity Consumed in Mining Process | 15,409 | 16,039 | 16,039 | 14,349 | 17,006 | 16,368 | 16,021 |
| Mining Process | 6,623 | 6,894 | 6,894 | 6,168 | 7,310 | 7,035 | 6,886 |
| **Total Direct Emissions** | **40,886** | **42,556** | **42,556** | **38,073** | **45,124** | **43,429** | **42,508** |
| **Indirect Emissions Sources** | | | | | | | |
| Rail Transport[2] | 60,693 | 26,675 | 30,030 | 16,044 | 19,687 | 21,199 | 52,981 |
| From Coal Combustion[3] | 9,666,365 | 10,061,368 | 9,101,843 | 9,001,405 | 10,668,420 | 10,277,040 | 10,050,000 |
| **Total Indirect Emissions** | **9,727,058** | **10,088,043** | **9,131,873** | **9,017,448** | **10,688,107** | **10,298,239** | **10,102,981** |
| **Total Estimated $CO_2e$ Emissions** | **9,767,943** | **10,130,599** | **9,174,429** | **9,055,521** | **10,733,231** | **10,341,668** | **10,137,357** |

1 Based on 1.683 metric tons $CO_2e$ per ton of coal burned for electrical generation (EPA 2008) and calculated by WWC (2017)
2 Coal haulage emissions based on train trips per year; 452.7 kg $CO_2e$ per mile per loaded train, 87.2 Kg $CO_2e$ per mile per empty train; and round-trip mileage to power plants. Coal haulage emissions calculations includes a loaded train and a returning empty train, per train trip
3 2017-2053 Rail distance calculated as the average 2011-2016 rail miles
Source: WWC (2017), calculations are provided in **appendix C**

#### 4.4.6.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. The impacts directly resulting from GHG emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended by approximately 5.3 years. While annual $CO_2e$ emissions would remain the same as the Proposed Action for approximately 31 years, the LOM $CO_2e$ emissions would decrease by approximately 16 percent as a result of the No Action Alternative, based on 5.3-fewer years of combustion of DFM coal. 4.4.5.2 Cumulative Effects

#### *4.4.6.3 Cumulative Effects*

The analyses provided above include direct and indirect effects analysis for GHG emissions. Due to the global nature of climate change, and the difficulty therefore of predicting climate change impacts caused by an incremental increase in GHG emissions from specific actions separately or together, a separate cumulative impacts analysis for GHG emissions is not appropriate.

#### *4.4.6.4 Mitigation Measures*

A majority (approximately 99 percent) of the GHG emitted identified in the EA are from non-mining activities. Therefore, no mitigation measures beyond those required by the DFM air quality permit would be implemented to mitigate GHG effects.

### 4.4.7 Climate Change Cause and Effect

#### *4.4.7.1 Proposed Action/No Action Alternative*

It is now well established that rising global atmospheric GHG emissions concentrationsare significantly affecting the Earth's climate. Climate change results from millions of individual sources which collectively have a large impact on a global scale. Although we can calculate direct and indirect GHG emissions (see section x) associated with the proposed action it is currently not feasible to determine how these emissions would affect global climate change, we can only say that they would contribute to the problem. Therefore the emissions are calculated as a relative indicator to allow comparison of each alternative based on their potential contribution to climate change.

Historically, the coal mined in the PRB has been used as one of the sources of fuel to generate electricity in power plants located throughout the U.S. Coal-fired power plant emissions include $CO_2$, which has been identified as a principal anthropogenic greenhouse gas. According to the EPA (2016) in 2014 (the most recent year of available $CO_2$ data at this time):

1. $CO_2$ emissions represent approximately 81 percent of the total 2014 U.S. greenhouse gas emissions.
2. Estimated $CO_2$ emissions in the U.S. totaled 6,870.5 million metric tons in 2014, which was a 7.7 percent decrease from the estimated high emissions in 2007.
3. Estimated $CO_2e$ emissions from energy-related consumption in the U.S. totaled 5,556 million metric tons in 2014.
4. Estimated $CO_2$ emissions from the electric power sector totaled 2,080.7 million metric tons, or approximately 37 percent of total U.S. energy-related $CO_2$ emissions in 2014.
5. Estimated $CO_2$ emissions from fossil fuel electric power generation totaled 2,039.3 million metric tons, or about 36.7 percent of total U.S. energy-related $CO_2$ emissions in 2014.

Approximately 824.8 Mt of coal were used to generate electricity in the U.S. in 2014, of which approximately 387.1 Mt was produced in Wyoming (USEIA 2016b). Approximately 96 percent of the coal mined in Wyoming in 2014 came from the PRB (WDWS 2014) was used to generate electricity in 2014. Therefore, coal production from the Wyoming PRB coal represented approximately 45.1 percent of the coal used for power generation in 2014. Applying this percentage to the estimated 2,039.3 million metric tons of total U.S. $CO_2$ emissions from fossil fuel electric power generation, Wyoming PRB surface coal mines were responsible for approximately 918.8 million metric tons $CO_2$ emissions from coal power generation in 2014. The DFM produced 5.4 Mt of coal in 2014, which represents approximately 1.4 percent of the coal produced in Wyoming in 2014, or about 12.9 million metric tons of $CO_2$ emissions from coal power generation. In 2015, approximately 98 percent of coal mined at the DFM was burned in Wyoming power plants (WFW 2016a).

An approach to analyze possible climate change impacts is to calculate the so-called "social cost of carbon". The social cost of carbon protocol was developed for use in cost-benefit analyses for proposed regulations that could impact cumulative global GHG emissions (EPA 2015b). The social cost of carbon estimates economic damages associated with increases in carbon emissions and includes, but is not limited to changes in net agricultural productivity, human health, and property damages associated with increased flood risks.

The social cost of carbon is typically expressed as the cost in dollars per Mt of emissions and there is a wide range of costs, with the greatest influence on costs caused by the discount rate. The discount rate is a measure to estimate the present value for costs/damages that may occur far out into the future. For 2020 emissions, the range in social cost of carbon presented by the EPA is $12/Mt to $123/Mt, represented as 2007 dollars (EPA 2015b).

OSMRE has elected not to specifically quantify the social cost of carbon. First, the GHG emissions associated with the project are mostly from the indirect effects of coal combustion, and there is no consensus on the appropriate fraction of social cost of carbon tied to electricity generation that should be assigned to the coal producer. In addition, there is no certainty that GHG emissions at power plants would actually be reduced if the federal coal associated with the Proposed Action was not mined, given that the power plants supplied by WFW have alternative sources for coal, and the DFM also has non-federal coal reserves that could be mined (see **section 2.0**). Also, to provide any meaningful insight, the projected social cost of carbon would need to be viewed in context with other costs and benefits associated with the Proposed Action. Given the uncertainties associated with assigning a specific and accurate social cost of carbon to the Proposed Action and the uncertainties that indirect GHG emissions would actually be reduced under any reasonable Project alternatives, OSMRE has elected to quantify direct and indirect GHG emissions and evaluated these emissions in the context of Wyoming and national GHG emission inventories.

Under the Proposed Action, WFW anticipates producing the coal included in the A2Tr1 tract at 6 Mtpy levels, using existing production and transportation facilities. This would extend the mine's current GHG emissions by approximately 5.3 years and combustion of A2Tr1 tract federal coal in coal-fired power plants would also continue for approximately 5.3 additional years. Climate impacts associated with direct/indirect emissions from A2Tr1 from mining, transportation, and combustion would be moderate but short term (5.3 years). The impacts would diminish after the life of the mine.

#### *4.4.7.2 Cumulative Effects*

Global climate change is recognized as a significant environmental issue. Due to the global nature of climate change, and the fact that climate change results from the incremental addition of GHG emissions from millions of individual sources around the world, it is not feasible to conduct a traditional cumulative impacts analysis for the proposed action's contribution to global climate change. The spatial boundary for the analysis would be the entire world. As a result every action, no matter how small the incremental contribution, would have a significant impact. Therefore a separate cumulative impacts analysis for climate change is not appropriate. Instead the analysis above uses appropriate tools and methodologies to quantify GHGs directly produced by the proposed action and those indirectly produced through coal combustion to allow comparison of the climate change potential of the alternatives. It also discusses predictions for climate change induced effects in the area of the proposed action.

#### *4.4.7.3 Direct and Indirect Effects on the Proposed Action/No Action Alternative*

USGS predicted GHG potential impacts between 2025 and 2049 using the conservative climate change scenario (RCP8.5), which assumes no new climate change regulations or reductions would be implemented (USGS 2016). According to the USGS National Climate Change Viewer (USGS 2016), potential climate change impacts in Campbell County, Wyoming could include:

1. annual mean temperature increases of up to 3.8 degrees Fahrenheit,
2. annual mean precipitation increases of up to 0.4 inch per day,
3. annual mean snowfall decrease of up to 0.1 inch per year,
4. annual mean soil water storage decrease of up to 0.1 inch per year,
5. annual mean evaporation deficit increase of up to 0.2 inch per month, and
6. annual mean runoff increases up to 0.1 inch per month.

For analysis purposes, the EA assumes that the maximum annual mean values would be realized during the life of the mine.

<u>Hydrology</u>

The potential changes to the annual snowfall, precipitation levels, and streamflow could impact area surface water body levels, groundwater recharge, and soil erosion. During the anticipated 5.3-year life of the project, natural variations results in dryer or wetter years. Considering the overall climate change timeframe of centuries, it is possible that decreased snowpack may be observable locally, or may not during the project timeframe. Likewise, decreases in streamflow may be observed, but during the mining dewatering timeframe of 5.3 years, mine dewatering may compensate for climate change related stream flow reduction, or may have no additional influence on streamflow. Therefore, there will be no climate change impacts on streamflows where project impacts occur or they may be negligible during the project timeframe. The Proposed Action would have moderate, short-term impacts to surface water bodies and groundwater, however, the impact from changes to these resources based on climate change would be negligible and long-term.

<u>Soils</u>

The Proposed Action would involve new surface disturbance of approximately 155.4 acres. As described in **section 4.8.1.1**, the direct and indirect effects related to the Proposed Action to soils would be moderate and they would be extended by approximately 5.3 years on the tract.

However, the USGS climate viewer does not predict any significant annual mean changes to runoff so there would be negligible impacts from climate change on soils.

Sage Grouse

The Proposed Action is consistent with Executive Order 2015-4 guidance (Office of the Governor 2015) and BLM's Approved Resource Management Plan (BLM 2015b), which take into account potential climate change. Impacts from climate change on the greater sage-grouse during the life of the project are anticipated to be negligible.

Reclamation

The post-reclamation land use would be wildlife habitat and grazing, consisting of vegetation cover of grasses and shrubs. Potential changes to the natural environment, as listed above, could result in the need to consider different plant species during reclamation to account for the higher temperatures and increased precipitation levels. WDEQ-LQD regulates surface coal mining operations and the surface effects of underground coal mining on federal lands within the state of Wyoming. Federal coal leaseholders in Wyoming must submit a permit application package to OSMRE and WDEQ-LQD for any proposed revisions to reclamation operations on federal lands in the state. Therefore, any change to reclamation practices (i.e., seed mix) at the DFM would require the approval of WDEQ. Climate change impacts on reclamation during the life of the project would be negligible. Reestablishment of wildlife and vegetation in areas that have been disturbed is reliant on the reclamation process which would be negligibly impacted by climate change; therefore, climate change impacts to wildlife and vegetation in reclaimed areas would be negligible and long-term.

## 4.5 Water Resources

### 4.5.1 Surface Water

#### *4.5.1.1 Direct and Indirect Effects*

##### 4.5.1.1.1 Proposed Action

Discussions regarding surface water can be found in **section 3.5.1** and in Appendix D-6 (Hydrology) of the DFM Permit No. PT0599 (WFW 2011) and in the DFM, Permit 0599 CHIA (WDEQ-LQD/Lidstone 2013). The 2013 CHIA analyzed the impact of the amendment along with existing coal mining at the Buckskin, Rawhide, Eagle Butte, Dry Fork, Synthetic Fuels, and Wyodak mines to determine whether mining would result in material damage to surface and groundwater resources outside of the mine permit areas (WDEQ-LQD/Lidstone 2013). Changes in surface runoff characteristics and sediment discharges would occur during mining on A2Tr1 tract because of the mining and reconstruction of drainage channels as mining progresses and because of the use of sediment control structures to manage discharges of surface water from the mine permit areas. According to WDEQ-LQD Rules and Regulations, proposed mining operations must be designed and conducted "to minimize disturbance of the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area, to assure the protection or replacement of water rights, and to support approved post-mining land uses in accordance with the terms and conditions of the approved permit and the performance standards" of Chapter 4, Environmental Protection Performance Standards (WDEQ-LQD 2012). Because the A2Tr1 tract would be mined as extension of the existing DFM, there would not be a significant increase in the size of the area that is disturbed at any given time. Reclamation would be ongoing and concurrent with mining.

As stated in the Addendum MP-T of the DFM Permit No. PT0599 (Permit Application for Industrial Solid Waste Landfill) (WFW 2011), the CCB the facility (discussed in **section 3.15**) is not expected to have a detrimental effect on surface water quality. There are no surface water intake structures located within 1,000 feet of the facility. The potential impacts to local surface water systems will be minimized through proper engineering design of the landfill and associated storm water controls, as discussed in Addendum MP-T (WFW 2011).

Effects from air deposition of pollutants for coal combustion are discussed in **section 4.4.3**.

The overall results of the 2013 CHIA stated that material damage has not occurred to surface water quality outside the mine permit areas. The additional mining proposed by Amendment 2 is not expected to change the potential for material damage to surface water quality (WDEQ-LQD/Lidstone 2013). Therefore, the direct and indirect effects to surface water would not be significantly different than those described in the existing DFM federal mining plan and are expected to be moderate and they would be extended by approximately 5.3 years.

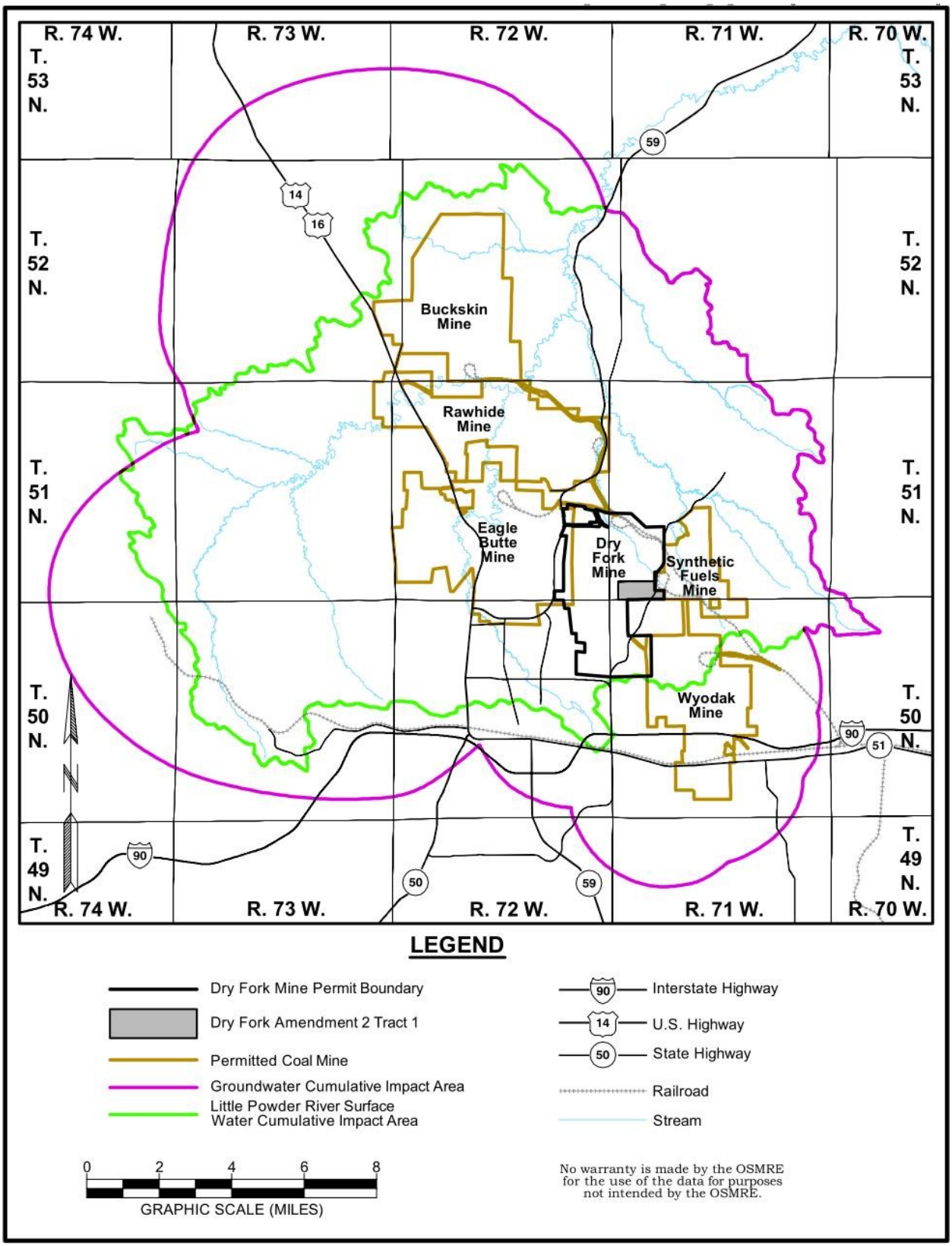
#### 4.5.1.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. The impacts to surface water (mining and reconstruction of drainage channels) under the No Action Alternative would be similar to those under the Proposed Action but the extent of surface water feature removal would be reduced by approximately 151 acres. Impacts to surface water features have already occurred within the tract related to coal recovery on adjacent federal coal leases, as approved by WFW's WDEQ-LQD Permit No. PT0599 and OSMRE's 1985 and 1989 federal MPDDs. In addition, currently approved state and federal mining plans include disturbance of approximately 155.4 acres within the A2Tr1 tract. Therefore, implementation of the No Action Alternative would have negligible effect on reducing the extent of these impacts.

### *4.5.1.2 Cumulative Effects*

The cumulative impact area for potential surface water impacts includes proposed LOM disturbance areas for the adjacent northern group of mines within local drainage basins (**map 4-2**). Pre-mine stream morphology measurements have been used to design and evaluate reconstructed stream channels. Runoff modeling is used to evaluate hydraulic suitability and predict post-mine discharges in reconstructed channels for varied recurrence intervals. The reclaimed topography includes the reconstruction of portions of several of the main channels associated with the DFM and adjacent mines, including the main stem of Rawhide Creek, Little Rawhide Creek, Hay Creek, and the Dry Fork LPR. Cumulative mining related impacts to surface water resources associated within the LPR cumulative impacts area (CIA) were analyzed in the 2013 CHIA (WDEQ-LQD/Lidstone 2013). As described in the 2013 CHIA, some bed and bank erosion is likely to occur, but the channel slope and cross-sectional dimensions should not change substantially during the design discharge event. Post-mine channels are generally wider, often having shallower gradients than corresponding pre-mine channels. These post-mine channels often have greater cross-sectional areas that result in flow resistance and lower velocities that can enhance erosional stability of the drainages (WDEQ-LQD/Lidstone 2013).

According to the 2013 CHIA, the post-mining water quality in the LPR CIA should be similar to pre-mine water quality (WDEQ-LQD/Lidstone 2013). The number of lower gradient slopes (0 to 10 percent) is generally increased at each mine, which decreases the production and delivery of sediment to streams, assuming the post-mine hydrologic and geomorphic conditions approximate pre-mine conditions following reclamation.




**Map 4-2. Cumulative Impact Area for Potential Surface and Groundwater Impacts**

Mining related cumulative impacts to surface water are expected to be measureable in the short term within and below mined area drainages, but would diminish with reclamation and distance downstream.

*4.5.1.3 Mitigation Measures*

The WDEQ-LQD Rules and Regulations require surface coal mine permittees to enhance or restore the hydrologic conditions of disturbed land surfaces and minimize adverse impacts to the hydrologic balance (WDEQ-LQD 2012). And, as stated above, proposed mining operations must be designed and conducted in a way to prevent material damage to the hydrologic balance outside the permit area (WDEQ-LQD 2012).

### 4.5.2 Groundwater

*4.5.2.1 Direct and Indirect Effects*

4.5.2.1.1 Proposed Action

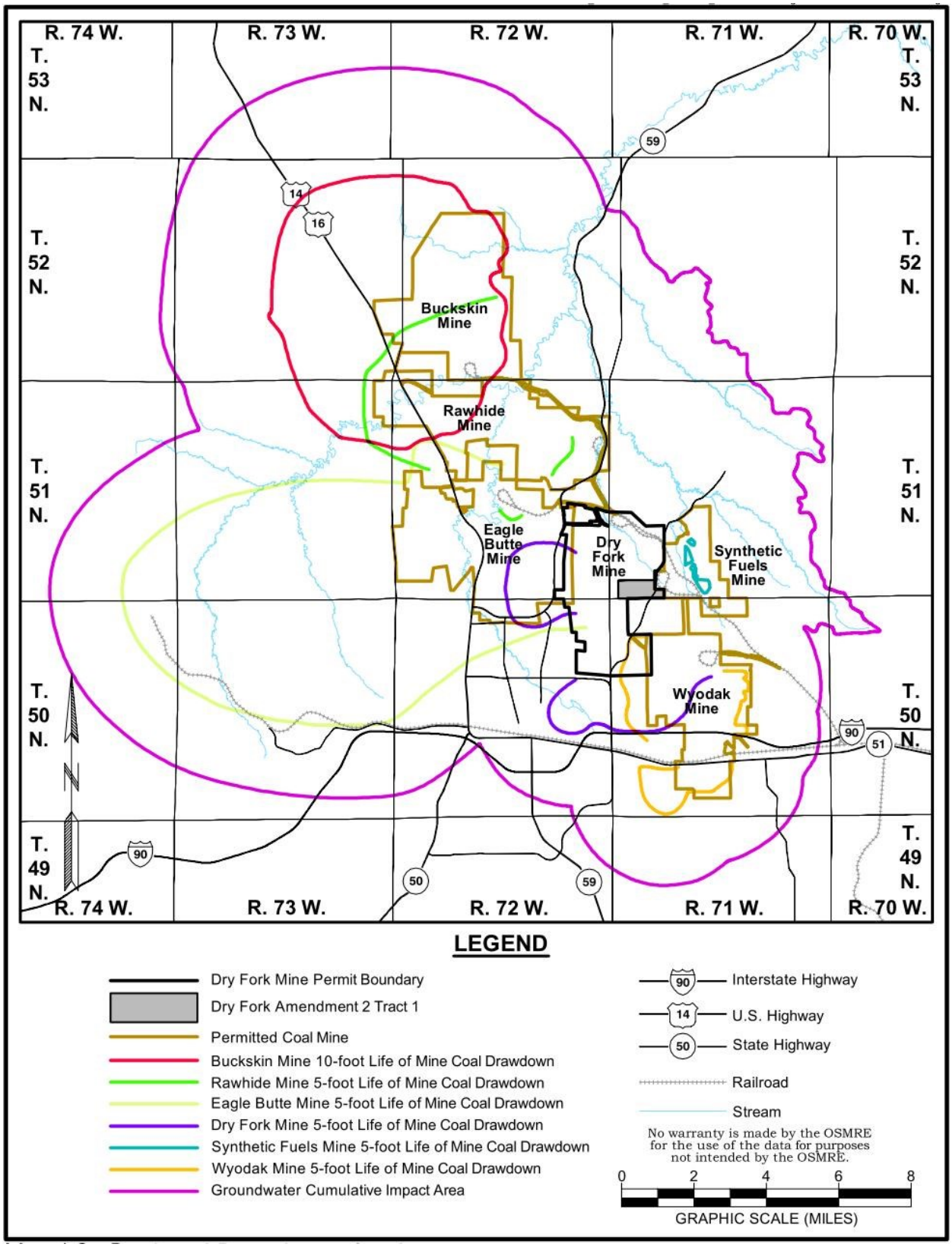
Discussions regarding groundwater can be found in **section 3.5.2**, in Appendix D-6 (Hydrology) of the DFM Permit No. PT0599 (WFW 2011), and in the 2013 CHIA (WDEQ-LQD/Lidstone 2013). The existing federal leases at the DFM include approximately 5,541.5 acres, including 155.4 acres within the A2Tr1 tract that are currently approved for disturbance (unrelated to recovery of federal coal within the tract) by WDEQ-LQD. Under the Proposed Action, disturbance within the A2Tr1 tract would extend the area of federal coal removal included in the federal mining plan onto 151 additional acres.

The general impacts to groundwater as a result of surface coal mining include the following:

1. The removal of the coal aquifer and any overburden and alluvial aquifers within the areas that are mined would continue, as would the replacement of these aquifers with backfilled overburden material. Should any overburden or alluvial aquifer be critical to the area's hydrologic balance, and restoration of the essential hydrologic functions can only be achieved by reestablishment of the aquifer, these materials may be selectively salvaged and replaced.
2. A lowering of static water levels in the coal and overburden aquifers around the mine would continue due to dewatering associated with removal of these aquifers within the mine boundaries. This reduction in static water levels would not be permanent, and recharge to the backfill and adjacent undisturbed aquifers would occur as mined areas are reclaimed.

Other groundwater impacts may or may not occur, or may occur only at specific locations, include changes in water quality (usually deterioration) outside the area that is mined and reclaimed. This would result from communication between the reclaimed aquifer and the unmined aquifer, and changes in recharge-discharge conditions and/or groundwater flow patterns.

Additional alluvial, overburden, and Wyodak-Anderson coal aquifers would be removed in the A2Tr1 tract during the mining process. These aquifers would be replaced with backfilled overburden and interburden materials. The physical characteristics of the reclaimed backfill material are dependent upon mining methods and premining overburden lithology. Overall, the permeability and porosity of the spoils within the tract are expected to be greater than the original material. The reclaimed spoil aquifer could provide adequate water quantity for stock wells. Predicted drawdowns for the Wyodak-Anderson coal seam is presented on **map 4-3**.




**Map 4-3. Predicted Drawdowns for the Wyodak-Anderson Coal Seam**

According to the 2013 CHIA, the groundwater migrating from the backfill aquifer in the future is not expected to cause material damage to the coal aquifer. The additional mining proposed by the Dry Fork Amendment 2 is not expected to change the potential for material damage to groundwater quality.

As stated in the Addendum MP-T (Permit Application for Industrial Solid Waste Landfill) of the DFM Permit No. PT0599 (WFW 2011), the CCB from the facility is not expected to have a detrimental effect on groundwater quality. There are no permitted domestic wells and only one stock watering well within 0.5 mile of the facility. The single stock watering well is permitted by WFW. The potential impacts to local groundwater systems will be minimized through proper engineering design of the landfill and associated storm water controls, as discussed in Addendum MP-T (WFW 2011).

Effects from air deposition of pollutants for coal combustion are discussed in **section 4.4.3**.

Overall, evaluation of the three material damage indicators (physical characteristics, water level recovery, and water quality of the backfill aquifer) suggests that there is limited potential for the A2Tr1 tract development at the Dry Fork Mine to cause material damage to the native aquifers outside the coal mine permit boundaries (WDEQ-LQD/Lidstone 2013). Therefore, the direct and indirect effects to groundwater resources resulting from the Proposed Action are expected to be moderate and they would be extended by approximately 5.3 years on the tract due to aquifer removal.

#### 4.5.2.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. The impacts to groundwater under the No Action Alternative would be similar to those under the Proposed Action but the extent of groundwater aquifers removal would be reduced by approximately 151 acres. Impacts to groundwater aquifers have already occurred within the tract related to coal recovery on adjacent federal coal leases, as approved by WFW's WDEQ-LQD Permit No. PT0599 and OSMRE's 1985 and 1989 federal MPDDs. In addition, currently approved state and federal mining plans include disturbance of approximately 155.4 acres within the A2Tr1 tract. Therefore, implementation of the No Action Alternative would have negligible effect on reducing the extent of these impacts.

### *4.5.2.2 Cumulative Effects*

The effects of removal of the coal and overburden aquifers and replacing them with backfilled overburden are the foremost groundwater concerns regarding cumulative effects. Continued mining of the A2Tr1 tract would increase the cumulative size of the backfill area in the northern group of mines in the PRB. The extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines also would be expected to increase slightly as a result of continued mining in the tract and from dewatering the active mine pits. Where the effects of pumping from Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines overlap, additional water level declines result from concurrent operations.

As described in the 2013 CHIA, CBNG dewatering in the CIA has caused drawdown of water levels in the Wyodak-Anderson coal aquifer within the CIA, making it difficult to accurately distinguish the impacts caused by mining and to estimate groundwater recovery rates. However,

the saturated thickness of the coal seams increases to the west as the coal seams dip below the water table. Therefore, the effect of this predicted mining induced drawdown on the Wyodak-Anderson coal seam is likely minimal. The coal aquifer is expected to begin to recover as soon as the mining stops by 2065 and would be on a recovery trend when reclamation is completed by approximately 2080 (WDEQ-LQD/Lidstone 2013).

The cumulative effects to groundwater resources resulting from the Proposed Action are expected to be moderate and they would be extended by approximately 5.3 years on the tract due to aquifer removal.

*4.5.2.3 Mitigation Measures*

WDEQ-LQD Rules and Regulations require surface coal mine permittees to replace any domestic, agricultural, industrial, or any other legitimate use groundwater supplies if, as a result of mining, a supply is diminished, interrupted, or contaminated, to the extent of precluding use of the water. The WDEQ-LQD Rules and Regulations also require surface coal mine permittees to enhance or restore the hydrologic conditions of disturbed land surfaces and minimize adverse impacts to the hydrologic balance. The recharge capacity of the reclaimed lands will be restored to a condition which minimizes disturbance to prevailing hydrologic balance in the permit area and in adjacent areas (WDEQ-LQD 2012).

Surface water control structures associated with the CCB facility will be used to divert surface water flows around active landfill areas (run-on control), and to collect and contain surface water run-off from active landfill areas (run-off control).

### 4.5.3 Water Rights

*4.5.3.1 Direct and Indirect Effects*

4.5.3.1.1 Proposed Action

Prior to energy development in the area, water appropriations (both groundwater and surface water) were typically for livestock use. Currently, mining companies hold the majority of the water rights in the vicinity of the EA project area. According to Wyoming Rules and Regulations, proposed mining operations must be designed and conducted in a way to prevent material damage to the hydrologic balance outside the permit area (WDEQ-LQD 2012). According to Wyoming Statue (W.S.) 35-11-415(b) (xii), the Dry Fork Mine must replace, in accordance with state law, the water supply of an owner of interest in real property, who obtains all or part of his supply of water for domestic, agricultural, industrial or any other legitimate use from an underground or surface source where the supply has been affected by contamination, diminution or interruption resulting from the surface coal mine operation.

Monitoring wells are placed between mine operations and nearby private wells to monitor for water level and water quality changes to anticipate any downgradient impacts. Currently, CBNG production has exceeded the amount of drawdown predicted to result from mining. Therefore, potential impacts from mining to stock and domestic wells in the area have become largely irrelevant.

Numerous livestock water wells have been removed over the years to facilitate mining operations but no effects to domestic supplies have been reported. No material damage has been identified outside the permit boundaries of the DFM, and based on hydrologic analyses, no material damage to water rights is anticipated (WDEQ-LQD/Lidstone 2013).

In general, the proposed federal mining plan amendment would contribute to additional, more extensive mining disturbance that may impact groundwater and surface-water rights in the DFM area. As stated in **section 3.5.2**, current groundwater conditions have already changed in the DFM area as a result of CBNG development and ongoing mining operations at the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. Therefore, the Proposed Action would not result in substantial declines in the groundwater availability, due to reduced groundwater quantity and quality, over what is currently being experienced. In addition, only a slight reduction in streamflow downstream of the DFM during mining is expected because runoff is currently being controlled within the DFM as a result of mining unrelated to the Proposed Action. Therefore, impacts to groundwater or surface-water rights have already occurred from mining within the DFM and from CBNG development and implementation of the Proposed Action would have negligible effect on increasing the extent of impacts.

##### 4.5.3.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. The impacts to surface and groundwater rights under the No Action Alternative would be similar to those under the Proposed Action but the extent of surface water feature and groundwater aquifers removal would be reduced by approximately 151 acres. Impacts to water rights have already occurred within the tract related to coal recovery on adjacent federal coal leases, as approved by WFW's WDEQ-LQD Permit No. PT0599 and OSMRE's 1985 and 1989 federal MPDDs. In addition, currently approved state and federal mining plans include disturbance of approximately 155.4 acres within the A2Tr1 tract. Therefore, implementation of the No Action Alternative would have negligible effect on reducing the extent of these impacts.

#### *4.5.3.2 Cumulative Effects*

While the approval of the federal mining plan modification request would contribute to additional mining disturbance to 151 acres in the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mine areas, there would be minor additional cumulative water rights impacts because groundwater systems have already been affected by CBNG removal and ongoing mining and because runoff is currently being controlled within the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines.

#### *4.5.3.3 Mitigation Measures*

WDEQ-LQD Rules and Regulations require surface coal mine permittees to replace any domestic, agricultural, industrial, or any other legitimate use groundwater supplies if such supplies are diminished, interrupted, or contaminated, to the extent of precluding use of the water as a result of mining. The regulations also require restoration of the essential hydrologic function of disturbed land surfaces. Therefore, no additional mitigation measures are required to protect water rights.

## 4.6 Alluvial Valley Floors

### 4.6.1 Direct and Indirect Effects

#### *4.6.1.1 Proposed Action*

The direct and indirect effects to alluvial AVF would not be significantly different than those described in the existing DFM federal mining plan. According to Appendix D11 (Alluvial Valley Floor Assessment of the DFM Permit No. PT0599), while there is approximately 0.65 mile of

unconsolidated stream-laid deposits along an ephemeral drainage within the tract, no AVFs have been delineated within the A2Tr1 tract (WFW 2011). The nearest AVF is located along Dry Fork LPR, approximately 2 miles from the A2Tr1 tract. This ephemeral drainage contributes an insignificant amount of runoff to this section of Dry Fork LPR, so there would be no direct or indirect effects to AVFs from the Proposed Action.

*4.6.1.2 No Action Alternative*

Because no AVFs have been delineated within the tract, impacts to alluvial valley floors in the area under the No Action Alternative would remain as described in **section 4.6.1.1**.

### 4.6.2 Cumulative Effects

The identified AVFs for all coal mines in the PRB Coal Review study area are described in the updated 2012 Task 1D Report (BLM 2014), and are based on individual mine state decision documents. Regulatory determinations of AVF occurrence and location are completed as part of the permitting process for coal mining operations because their presence can restrict mining activities under SMCRA and Wyoming laws. The WDEQ administers the AVF regulations for coal mining activities in Wyoming. Coal-mine-related impacts on designated AVFs generally are not permitted if the AVF is determined to be significant to agriculture. If an AVF is determined not to be significant to agriculture or if the permit to affect the AVF was approved prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored to essential hydrologic function during reclamation.

The formal AVF designation and related regulatory programs described above are specific to coal mining operations; however, other development-related activities in the study area would potentially impact AVF resources. The portions of the PRB Coal Review study area that lie outside of the mine permit areas have generally not been surveyed for the presence of AVFs; therefore, the locations and extent of the AVFs outside of the mine permit areas have not been determined. No AVFs are present in the A2Tr1 tract and the Proposed Action would not contribute to the cumulative effects to area AVFs.

### 4.6.3 Mitigation Measures

No mitigation measures would be necessary for AVFs.

## 4.7 Wetlands/Aquatic Resources

### 4.7.1 Direct and Indirect Effects

*4.7.1.1 Proposed Action*

No wetlands or aquatic resources, including jurisdictional wetlands, are present within the A2Tr1 tract so there would be no direct or indirect effects to wetlands or aquatic resources from the Proposed Action.

*4.7.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Since no wetlands (including jurisdictional wetlands) have been delineated within the tract, impacts to wetlands would be similar to those under the Proposed Action. There would be no direct or indirect effects to wetlands from the No Action Alternative.

### 4.7.2 Cumulative Effects

The cumulative effects on wetlands/aquatic resources would occur primarily from livestock grazing, agricultural water withdrawals, and coal mining operations at the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. CBNG activities and associated discharge of produced water have declined significantly so effects from these activities has also declined. Any artificially created wetlands resulting from CBNG and mining water discharges would likely return to an upland ecosystem following cessation of discharges. Wetlands disturbance within the DFM permit boundary are under the jurisdiction of the USACE and WDEQ-LQD requires postmine reclamation plans that restore wetlands (WDEQ-LQD 2012). No wetlands have been delineated within the A2Tr1 tract and the Proposed Action would not contribute to the cumulative effects to area wetlands.

### 4.7.3 Mitigation Measures

No mitigation measures would be necessary for wetlands or aquatic resources.

## 4.8 Soil

### 4.8.1 Direct and Indirect Effects

#### *4.8.1.1 Proposed Action*

Topsoil, like the overburden, is removed and replaced during mining and reclamation process. This process results in differences between premining and postmining soils. Premining soils occur as soil series and are often combined into mappable units, which are distinguishable, by their physical and chemical characteristics, depths, locations in the landscape, and other factors. The postmining topsoil is a composite of premining soils resulting in more uniform soil chemistry and nutrient distribution. Prior to mining, the operator is required to map the soils, test them for physical and chemical suitability to support plant growth, and provide a plan for their salvage and replacement. Soil material determined to be unsuitable due to physical or chemical characteristics is not salvaged or replaced.

Direct impacts to soil resources as a result of mining include potential changes in soil structure, texture, organic matter content, infiltration rate, permeability, water-holding capacity, soil plant nutrient level, soil microbial composition and activity, and soil fertility. Mining exposes lower soils or overburden material that could contain chemical constituents at levels that could be harmful to plants and animals. Regarding soil fertility, stockpiling soil material for several years before it is redistributed potentially degrades biological, chemical, and physical properties. Stockpiling could lower the organic matter content, microbial activity and viability of plant seeds, disrupt nutrient cycles, upset the carbon-nitrogen ratio, and increase near-surface bulk density. Live handling (direct placement) of topsoil would enhance revegetation success due to using topsoil that has not been stored in topsoil piles for an extended period of time. The exposure, compaction, and stockpiling of salvaged soil material can increase potential for soil loss from both wind erosion and water erosion until the soil is revegetated. Reclamation measures currently implemented during mining would reduce the effects of increased erosion potential. Currently approved and proposed disturbance would be progressively reclaimed, according to contemporaneous reclamation requirements, by planting appropriate vegetation species to restore soil productivity and prevent soil erosion.

An indirect effect of the Proposed Action on soils would be impacts from acid deposition resulting from coal combustion (see **section 3.4.7.3.3**).

No "prime" or "unique" farmland exists within the proposed A2Tr1 tract so none would be disturbed. Drainage features would be reconstructed on the area similar to reclamation techniques used at the DFM. Therefore, special handling techniques would not be required for soils within the tract.

Disturbance has been approved on approximately 155.4 acres so approximately 151 additional acres of soil resources within the tract would be altered under the Proposed Action. As stated above, areas within the tract would be progressively disturbed and progressively reclaimed by planting appropriate vegetation species to restore soil productivity and prevent soil erosion. This sequence of disturbance/reclamation would maintain a relatively constant amount of disturbance, over time. Under the Proposed Action, surface coal mining in the proposed tract and mine-related activities in the support area would have a moderate, long-term impact on bulk density and infiltration rates in soils. However, reclamation in these areas following mining could be enhanced by increasing topsoil thickness in some instances and by decreasing surface runoff due to seedbed preparations (soil laydown and ripping prior to seeding). Spoil sampling prior to topsoil laydown would ensure the spoil within the rooting zone is not toxic to vegetation. The Proposed Action would have a moderate, short- to long-term impact on biological properties in soils that are stockpiled before reclamation.

#### *4.8.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to the soils within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to soils in the area would remain as described in **section 4.8.1.1**, but to a lesser extent (151 acres).

### 4.8.2 Cumulative Effects

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). Following reclamation, the replaced topsoil should support a stable and productive native vegetation community adequate in quantity and quality to support planned post-mining land uses (i.e., rangeland and wildlife habitat). Areas within active mines are progressively disturbed and are progressively reclaimed. This sequence of disturbance/reclamation would maintain a relatively constant amount of disturbance, over time. The cumulative effects related to soils would be moderate and they would be extended by approximately 5.3 years.

### 4.8.3 Mitigation Measures

Sediment control structures would be built to trap eroded soil and revegetation would reduce wind erosion. Topsoil will also be protected from acid or toxic materials and will be preserved in a usable condition for sustaining vegetation when placed over affected land (WDEQ-LQD 2012). These measures are required by state regulations and are therefore considered part of the Proposed Action.

# 4.9 Vegetation

## 4.9.1 Direct and Indirect Effects

### *4.9.1.1 Proposed Action*

The direct and indirect effects to vegetation would not be significantly different than those described in the existing DFM federal mining plan. Short-term impacts associated with the removal of vegetation from the A2Tr1 tract would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts on reclaimed lands include loss of habitat or loss of habitat carrying capacity for some wildlife species as a result of reduced plant species diversity or plant density, particularly big sagebrush. However, livestock and grassland-dependent wildlife species would benefit from the increased grass cover and production.

Reclamation of disturbed lands within the DFM permit boundary is performed according to WDEQ-LQD Rules and Regulations (WDEQ-LQD 2012). Reclamation would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. In an effort to approximate premining conditions, WFW would plan to reestablish vegetation types during the reclamation operation that are similar to the premine types. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The reclamation plan for the DFM includes steps to control invasion by weedy (invasive nonnative) plant species. Approximately 554.2 acres within the A2Tr1 tract have been disturbed as approved by WFW's WDEQ-LQD Permit No. PT0599 and OSMRE's 1985 and 1989 federal MPDDs. The direct and indirect effects related to the Proposed Action on vegetation would be moderate and they would be extended by approximately 5.3 years.

### *4.9.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to vegetation within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to vegetation in the area would remain as described in **section 4.9.1.1** but disturbance would be reduced by approximately 151 acres.

## 4.9.2 Cumulative Effects

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). The overall contribution to cumulative impacts to vegetation under Proposed Action would be minor due to the localized effects and the improved productivity on mined lands that have been reclaimed.

## 4.9.3 Mitigation Measures

No mitigation measures would be necessary for vegetation resources.

# 4.10 Wildlife

If the MLA mining plan modification for the DFM is approved to include recovering coal within the A2Tr1 tract, disturbance would continue on the A2Tr1 tract. Mining would be extended by

approximately 5.3 years at the DFM. Impacts to wildlife that would be caused by mining the tract have been addressed by the WGFD and WDEQ when the mining and reclamation permits were amended to include the tract.

Mining directly and indirectly impacts local wildlife populations. These impacts are both short term (until successful reclamation is achieved) and long term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles, and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. If the proposed federal mining plan modification is approved, the moderate impacts to wildlife related to mine operations would be extended by approximately 5.3 years.

The indirect impacts are longer term. After the tract is mined and reclaimed, alterations in the topography and vegetative cover and diversity, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity for some species. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent. Microhabitats may be reduced on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

The environmental consequences related to mining the A2Tr1 tract for other mammals; upland game birds (excluding the GRSG); other birds; and amphibians, reptiles, and aquatic species are not significantly different than those presented in existing DFM federal mining plan and are not presented herein. Updated discussions for big game, raptors, GRSG, T&E species, and other SOSI are included below.

### 4.10.1 Big Game

#### *4.10.1.1 Direct and Indirect Effects*

##### 4.10.1.1.1 Proposed Action

Under the Proposed Action, big game would be displaced from portions of the tract to adjacent ranges during mining. The permit area is in winter/yearlong mule deer range, as classified by the WGFD in the 2015 Sheridan Region Job Completion Report (WGFD 2015). The Dry Fork Mine permit area is generally considered out of normal pronghorn and white-tailed deer ranges (WGFD 2015). Through September 12, 2016, approximately 2,103 acres, of these big game ranges have been disturbed and about 588 acres have been permanently reclaimed to primarily mixed-grass-shrub habitats.

DFM would be required to reclaim disturbed habitats within the area back to wildlife habitat, as outlined in the reclamation requirements of revised state and federal mine permits. After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the tract. Sagebrush would gradually become re-established on the reclaimed land, but the topographic changes would be permanent. The direct and indirect effects related to the Proposed Action on big game would be moderate and they would be extended by approximately 5.3 years.

#### 4.10.1.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to big game within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to big game species in the area would remain as described in **section 4.10.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

#### *4.10.1.2 Cumulative Effects*

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). The overall contribution to cumulative impacts to big game species under Proposed Action would be moderate due to the localized effects and the improved productivity on mined lands that have been reclaimed. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game species have been noted on the DFM. The cumulative effects on regional big game populations would be moderate and they would be extended by approximately 5.3 years.

#### *4.10.1.3 Mitigation Measures*

No mitigation measures specific to big game are necessary. General reclamation practices for establishing or enhancing post-mine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place.

### 4.10.2 Raptors

#### *4.10.2.1 Direct and Indirect Effects*

#### 4.10.2.1.1 Proposed Action

Two intact raptor nests are located within the A2Tr1 tract boundaries and both nests are within the proposed disturbance boundary for the tract. Nest SH-4a was last active in 2007, producing one young. SH-4c/RTH-18 was successful in 2015 when two red-tailed hawks fledge from the nest. Both nests are located in trees associated with a ranch facility and home site (WFW 2016b).

WFW has an approved Raptor Management Plan in place to minimize impacts to nesting raptors and ensure proper reclamation techniques are implemented to enhance habitat in the post-mine landscape for both raptors and their primary prey species. Inactive, non-eagle raptor nests may be removed from areas likely to be impacted in potential disturbance areas to discourage nesting of raptors and other migratory birds, in accordance with USFWS guidance provided in the *Migratory Bird Permit Memorandum* (USFWS 2003). Decisions as to whether nest removal or relocation is the most appropriate approach would be based on the long-term history of the nest site, including historic and recent raptor use; presence/absence, location, and potential vulnerability of alternate nests within the territory; number, proximity, and/or orientation of conspecific territories; historical use of artificial nest structures, if any; timing, duration (e.g., continuous and ongoing or short-term); proximity, and visibility of potentially disturbing mine activities; and other pertinent factors. Various species of trees (plains cottonwood [*Populus sargentii*] peachleaf willow [*Salix*

*amygdaloides*], and Rocky Mountain juniper [*Juniperus scopulorum*]) will be planted to provide potential nesting habitat.

Based on the limited number of nesting raptors within the tract (only two known intact nest) and the WFW's approved plans and procedures in place to reduce impacts to raptors, the direct and indirect effects related to the Proposed Action on site-specific raptors would be moderate and they would be extended by approximately 5.3 years.

4.10.2.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to raptors within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to raptors in the area would remain as described in **section 4.10.2.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

*4.10.2.2 Cumulative Effects*

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). The overall contribution to cumulative impacts to raptors under Proposed Action would be moderate due to the localized effects and the improved productivity on mined lands that have been reclaimed. The cumulative effects on regional raptor populations would be moderate and they would be extended by approximately 5.3 years.

*4.10.2.3 Mitigation Measures*

No mitigation measures specific to raptors are necessary. The approved Raptor Management Plan and general reclamation practices for establishing or enhancing post-mine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place. WFW also has developed plans and procedures to minimize impacts to nesting raptors and ensure proper reclamation techniques are implemented to enhance habitat in the post-mine landscape for raptors and their primary prey species.

### 4.10.3 Greater Sage-Grouse

*4.10.3.1 Direct and Indirect Effects*

4.10.3.1.1 Proposed Action

Five historical GRSG lek sites have been documented within 3 miles of the A2Tr1 tract (**map 3-7**). Three leks (Dry Fork IIA, Schiemiester, and Eagle Butte) are intact and two leks (Dry Fork I and Dry Fork II) have been destroyed by mining. The WGFD currently classifies the Dry Fork IIA and Schiemiester leks as occupied and the Eagle Butte Lek as unoccupied (WGFD 2015). The Dry Fork IIA Lek is approximately 0.39 mile north of the A2Tr1 tract and the Schiemiester Lek is approximately 2.14 miles west the tract. The Dry Fork IIA Lek is within the existing permit area and is already subject to disturbance from previously permitted activities. This lek has not been attended by male GRSG since 2011. Long-term results from annual lek monitoring suggest that

GRSG populations in the DFM annual monitoring area are cyclic, with periodic peaks and declines (WFW 2016b). These data suggest that the DFM area may only support larger groups of GRSG when regional populations are especially high (WFW 2016b).

Using mapping included in the Executive Order, it has been determined that the closest core area to the A2Tr1 tract is over 10 miles distant.

WDEQ-LQD Permit No. PT0599 currently contains multiple monitoring and protection plans that include numerous specific measures for GRSG and their habitats, including those mentioned above. The WDEQ has strict bonding, reclamation, and bond-release requirements for all surface coal mines in Wyoming, including detailed reclamation plans and post-reclamation monitoring requirements that extend 10 years or more to ensure that all reclamation standards have successfully been met prior to full bond release.

Potential impacts to GRSG would likely be limited primarily to indirect influences resulting from habitat disturbance, though loss of individual birds may occur at times. Ongoing DFM operations may adversely impact individual GRSG but are not likely to result in a loss of population viability in the wildlife monitoring area or cause a trend toward federal listing. The use of appropriate timing and spatial buffers, timely implementation of reclamation, and application of targeted conservation measures in suitable habitats both on- and off-property throughout the region are expected to sufficiently reduce overall impacts to maintain a viable population within the area. The direct and indirect effects related to the Proposed Action on GRSG would be moderate and long term.

According to Executive Order No. 12-2015, existing land uses and activities (including those authorized by existing permit but not yet conducted) would be recognized and respected by state agencies, and those uses and activities that exist at the time the Program becomes effective would not be managed under the stipulations included in Executive Order No. 12-2015. Because the tract evaluated under the Proposed Action is entirely within the DFM's currently approved WDEQ-LQD Permit No. PT0599 permit boundary, these activities would not be managed according to the executive order.

#### 4.10.3.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to GRSG within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to GRSG in the area would remain as described in **section 4.10.3.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

### *4.10.3.2 Cumulative Effects*

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. As described in the updated 2012 Task 1D Report (BLM 2012), substantial areas of GRSG habitats have been altered from their natural conditions as a result of past and on-going human activities in the Wyoming PRB study area. Human disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential temporary impacts arise from habitat removal and disturbance associated with a project's

development and operation (e.g., coal mines, CBNG wells, etc.) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of permanent loss of habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities, rail lines, etc.) (BLM 2012). The severity of both temporary and long-term impacts to GRSG would depend on factors such as seasonal use patterns, type and timing of a project's activities, and physical parameters (e.g., topography, cover, forage, and climate).

The GRSG population in the WGFD Sheridan Region (including the A2Tr1 tract) appears to follow a 10-year cycle (BLM 2012). WGFD information indicated that over 42,300 male sage grouse were recorded 2016 in Wyoming. The average number of male grouse per lek was up 16 percent in 2016 compared to 2015, which was 66 percent higher than 2014 (WGFD 2016).

The cumulative effects related to the Proposed Action on regional GRSG populations would be moderate and long term.

#### *4.10.3.3 Mitigation Measures*

No mitigation measures specific to GRSG are necessary. The general reclamation practices for establishing or enhancing postmine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place. Shrub seedlings will be planted in shrub pockets in order to improve the beneficial effects of the shrubs for wildlife.

### 4.10.4 Threatened, Endangered, and Candidate Species and Other Species of Special Interest

#### *4.10.4.1 Direct and Indirect Effects*

##### 4.10.4.1.1 Proposed Action

The USFWS maintains a list of T&E species, and designated critical habitats on their official website for each county in Wyoming (USFWS 2016a). The USFWS also provides the IPaC system to evaluate the potential of encountering USFWS trust resources, including T&E species, related to a specific project area. The USFWS list of wildlife species includes the black-footed ferrets, which is listed as experimental, non-essential, and the northern long-eared bat, which is listed as threatened. The analysis area for most T&E species includes the DFM permit boundary. The analysis area for the northern long-eared bat includes the Campbell County boundary to consider Hg deposition from mining and coal combustion. There are no critical habitats for these T&E species within the A2Tr1 tract or within Campbell County.

According to information in Yates et al. (2014), bats, including long-eared bat, captured near Hg point sources have a higher Hg concentration in tissue samples compared to bats captured in nonpoint source areas. This indicates that long-eared bats near the four coal fired power plants may have higher Hg concentrations in tissue. According to the USFWS, the primary threat to the northern long-eared bat is white-nose syndrome (WNS), a disease caused by the cold-loving fungus, (*Pseudogymnoascus destructans*) (USFWS 2016d). The northern long-eared bat is also threatened by the loss and degradation of summer habitat, by collision with or barotrauma (injury to the lungs due to a change in air pressure) caused by wind turbines, and mine closures and vandalism of winter roosts and hibernacula. Due to the relatively low Hg emissions that would result from the Proposed Action (**tables 4-3** and **4-5**), and the fact that Hg emissions would not increase over current rates, the direct and indirect effects of the Proposed Action are expected

to be minor but they would be extended by approximately 5.3 years. The USFWS has established an area of influence (AOI) for the Northern long-eared bat. Any projects that would occur within the AOI are anticipated to have impacts on Northern long-eared bat. USFWS has a 4(d) rule for this species, which provides flexibility to landowners, land managers, government agencies and others as they conduct activities in areas that could be northern long-eared bat habitat. In areas of the northern long-eared bat's range that have not yet been affected by WNS, defined as outside the WNS zone in the final 4(d) rule, such as in Wyoming, incidental take (unintentional harm to bats incidental to otherwise lawful activities) is not prohibited. Even though the final 4(d) rule excepts incidental take, federal agencies still have an obligation to consult on "may affect" determinations. This obligation is addressed if the federal agency complies with measures outlined in the framework for the USFWS's January 5, 2016, programmatic biological opinion (BO) on the final 4(d) rule.

A portion of the proposed project as defined in this EA falls within the AOI; therefore, OSMRE has complied with the programmatic BO and fulfilled the Section 7 consultation requirements under the Endangered Species Act through submission of the Northern Long Eared Bat 4(d) rule streamlined consultation form to the Wyoming Ecological Field Services Office.

The most current list of birds of conservation concern presented in **appendix E** indicates that 23 birds of conservation concern occur in the DFM area. The bald eagle is present on the study area as a migrant and winter resident as discussed previously. The Brewer's sparrow is common during the spring and summer as a breeder. The ferruginous hawk nested on the DFM raptor study area in 2015. The golden eagle is a yearlong resident and was observed on the DFM raptor study area in 2015 but active nests were not found. The prairie falcon was observed as a transient however suitable nesting habitat is not present on the site for this species. The Swainson's hawk was present as a spring and summer breeder and, as discussed above, nested within the A2Tr1 tract in 2015. The grasshopper sparrow, loggerhead shrike, sage thrasher, short-eared owl, burrowing owl, GRSG, long-billed curlew, McCown's longspur, and upland sandpiper have been recorded on the DFM wildlife study area. The American bittern, Cassin's finch, dickcissel, Lewis woodpecker, mountain plover, pinyon jay, red-headed woodpecker, western grebe, and Sprague's pipit have not been recorded on the study area, as habitat for most of these species does not occur on the study area.

If present, these species would be temporarily displaced, but current reclamation practices in-place at the DFM would promote the return of these species once reclamation has been completed. The direct and indirect effects related to the Proposed Action on species of special interest would be moderate and they would be extended by approximately 5.3 years.

#### 4.10.4.1.2 No Action Alternative

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to T&E species and other species of special interest within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts to these species of special interest in the area would remain as described in **section 4.10.4.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

#### *4.10.4.2 Cumulative Effects*

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. According to the 2013 CHIA, approximately 31,606 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2013). The overall contribution to cumulative impacts to T&E species and other species of special interest under Proposed Action would be moderate due to the localized effects and the improved productivity on mined lands that have been reclaimed. The cumulative effects on regional T&E species and other species of special interest populations would be moderate and they would be extended by approximately 5.3 years.

#### *4.10.4.3 Mitigation Measures*

No mitigation measures specific to T&E species and other species of special interest are necessary. General reclamation practices for establishing or enhancing post-mine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place.

## 4.11 Ownership and Use of Land

### 4.11.1 Direct and Indirect Effects

#### *4.11.1.1 Proposed Action*

Surface ownership in the area includes federal, state, and private lands and the proposed coal removal area is managed by the BLM, the State of Wyoming, and WFW. The primary adverse environmental consequences of mining the A2Tr1 tract on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of other mineral development on about 151 additional acres during active mining. Disturbance has been approved on approximately 155.4 acres. Wildlife (particularly big game) use would be displaced while the tract is being mined and reclaimed. Livestock grazing has already been prohibited due to the tract being inside the permit boundary and adjacent to active mine areas. Hunting on the tract is currently not allowed because they are within the mine permit boundary and would continue to be disallowed during mining and reclamation. Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. The direct and indirect effects related to the ownership and use of the land would be moderate and they would be extended by approximately 5.3 years.

#### *4.11.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to ownership and use of the land within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts would remain as described in **section 4.11.1.1** but disturbance would be reduced by approximately 151 acres.

### 4.11.2 Cumulative Effects

The cumulative impacts on ownership and use of the land would be similar to the direct and indirect impacts, discussed above.

### 4.11.3 Mitigation Measures

No mitigation measures specific to ownership and use of the land are necessary.

## 4.12 Cultural Resources

### 4.12.1 Direct and Indirect Effects

#### *4.12.1.1 Proposed Action*

Information regarding background cultural resources within the current DFM WDEQ-LQD PT0599 permit boundary was summarized from Appendices D-2.2 (Historic Cultural Resources Inventory, Amendment 2 Area) and D-3.2 (Prehistoric and Paleontological Resources Inventory, Amendment 2 Area) of the DFM Permit No. PT0599 (WFW 2011). According to information provided in these appendices, two cultural resources sites have been identified within the A2Tr1 tract. Both sites are associated with historic activity (post-1920 era) and both sites are ineligible for listing on the NRHP (OSMRE 2011). The direct and indirect effects on cultural resource from the Proposed Action would be negligible but long term.

As stated in **section 3.11**, 30 Native American tribes/tribal representatives were consulted during the scoping process and no tribes responded to the consultation request. Since tribes did not respond, it is assumed that no known Traditional Cultural Properties are present and that the Proposed Action would have negligible impacts on Traditional Cultural Properties.

#### *4.12.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to cultural resources within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts would remain as described in **section 4.12.1.1** but disturbance would be reduced by approximately 151 acres.

### 4.12.2 Cumulative Effects

The individual evaluation of cultural resource sites in the WFW study area suggests that through avoidance of sensitive site types and mitigation through data recovery for all unavoidable disturbance to NRHP eligible sites, the cumulative effects to cultural resources have been minor. The cumulative impacts on cultural resource would be negligible but long term.

### 4.12.3 Mitigation Measures

No mitigation measures specific to cultural resources are necessary.

### 4.12.4 Unanticipated Discoveries

If a previously unidentified cultural resource is discovered in the Project Area, WFW would take measures to protect the find locality and provide written notice to WDEQ and the OSMRE within 48 hours of the discovery. A Wyoming-permitted archaeologist meeting the Secretary of the Interior's Professional Qualification Standards would, as soon as possible, evaluate the discovery, make a recommendation as to the NRHP eligibility of the resource, and provide written notice to WDEQ and the OSMRE within 48 hours. The WDEQ-LQD and OSMRE would then consult with the Tribal Historic Preservation Office (THPO), SHPO, and the BLM (for federally managed sites)

on the NRHP eligibility determination(s) and develop appropriate measures necessary to mitigate any adverse effects through the development of a treatment plan.

Should the discovery involve a burial or a resource thought to have potential religious and cultural significance, the tribe(s) with an interest would be notified and consulted as appropriate. When agreement is reached among all of the involved parties, the appropriate mitigation, if necessary, would be implemented. The tribes, OSMRE, WDEQ-LQD, SHPO, and the surface landowner must agree to any proposed treatment measures.

## 4.13 Noise

### 4.13.1 Direct and Indirect Effects

#### *4.13.1.1 Proposed Action*

Existing noise sources in the A2Tr1 tract area includes coal mining activities, rail traffic, traffic on nearby federal and state highways, county and access roads, natural gas compressor stations, and wind. The nearest residence is approximately 1,900 feet from the A2Tr1 tract and the Garner Lake Road passes through the A2Tr1 tract and is immediately adjacent to the disturbance limit proposed to recover the coal within the tract. Noise levels in wildlife habitat adjacent to the expansion area might increase, but anecdotal observations indicate wildlife can adapt to mine noise, especially since similar mining operations have been conducted in the area for many years. No increase in average daily railroad traffic or railroad noise would occur under any of the alternatives analyzed.

Given the proposed distance from active mining, direct and indirect effects to residences would be moderate and short term. Impacts to people using the Garner Lake Road would increase over current conditions but would be minor considering the short duration of noise exposure.

#### *4.13.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts from noise within the tract have already resulted from current mining activity. Distance to disturbance would be less than the Proposed Action. Therefore, under this alternative, noise impacts would remain as described in **section 4.13.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

### 4.13.2 Cumulative Effects

Cumulative effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. Potential sources of noise disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential impacts would cease upon project completion and successful reclamation in a given area.

Recreational users, local residents and grazing lessees using lands surrounding active mining areas do hear mining-related noise, but this has not been reported to cause a substantial impact. Wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at the DFM indicate that wildlife generally adapt to noise conditions associated with active coal mining. The cumulative impacts related to noise as discerned by the public would be moderate but short term (5.3 years).

### 4.13.3 Mitigation Measures

No mitigation measures specific to noise impacts are necessary.

## 4.14 Visual Resources

### 4.14.1 Direct and Indirect Effects

#### *4.14.1.1 Proposed Action*

Mining would affect landscapes classified by the BLM as visual resource management Class IV; the overall natural scenic quality of that class rating is considered relatively low. Impacts of coal mining on visibility in the general analysis area would be minor and short-term. Mining activities would be visible from State Highway 59 and the Garner Lake Road (County Road 38N), though the extent and duration of visibility would vary under each action alternative. No unique visual resources have been identified in or near the general analysis area, and the landscape character would not be significantly changed following reclamation. Current mining activities (blasting procedures and sizes, coal haul rates and distances, dust suppression, etc.) at the DFM would not change if the federal mining plan modification is approved. Current best available control technology measures for particulates that could contribute to impaired visibility would continue to be employed. The direct and indirect effects related to the visual resources would be moderate but long term.

#### *4.14.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. However, approximately 155.4 acres within the tract have been approved for disturbance related to recovery of coal outside of the A2Tr1 tract under OSMRE's 1985 and 1989 federal MPDDs and impacts to visual resources within the tract have already resulted from current mining activity. Therefore, under this alternative, disturbance related impacts would remain as described in **section 4.14.1.1** but the extent of the impacts would be reduced by approximately 151 acres and the duration of the impacts would be reduced by approximately 5.3 years.

### 4.14.2 Cumulative Effects

Cumulative visual resources effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. Human disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential temporary impacts arise from disturbance associated with a project's development and operation (e.g., coal mines, CBNG wells, etc.) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of permanent changes to existing topography and the vegetative component of the area, irrespective of reclamation success. The cumulative effects related to the visual resources would be moderate but long term.

### 4.14.3 Mitigation Measures

No mitigation measures specific to visual resources are necessary.

# 4.15 Transportation Facilities

## 4.15.1 Direct and Indirect Effects

### *4.15.1.1 Proposed Action*

Major roads and railroads in the general area of the A2Tr1 tract are presented on **map 1-1**. Existing transportation facilities, including roads, railroads, coal conveyors, and overhead electrical transmission lines associated with the A2Tr1 tract (**map 3-11**) would continue to be used under the Proposed Action. A majority of the coal mined at the DFM is transported by rail (BNSF trackage), with approximately 33 percent transported to the adjacent DFS via an overland conveyor system. Based on an estimated annual production rate of 4 Mt of coal shipped by rail and an estimated 15,470 tons of coal per train, the Proposed Action would result in approximately 260 train trips per year (one way). Employees and vendors travel the Garner Lake Road to access the mine. No traffic count data are available for the road but the Proposed Action will not result in increased mine related traffic. Therefore, mining the A2Tr1 tract would not increase the current level of impact on the Garner Lake Road or the BNSF railroad.

As discussed in **section 3.4.7.4**, the potential for emissions of dust from the large volumes of coal transported to large generating stations can be an environmental concern (Ramboll Environ 2016). Coal dust and fines blowing or sifting from moving, loaded rail cars has been linked to railroad track stability problems resulting in train derailments and to rangeland fires caused by spontaneous combustion of accumulated coal dust (BLM 2009). In response to suits brought on by environmental groups alleging that coal spilled from trains pollutes waterways, BNSF Railway has agreed to study the use of physical covers for coal trains to reduce the effects of blowing coal particles (Seattle Times 2016). BNSF has cited studies and experience to demonstrate that shippers can take steps in the loading of coal cars using existing, cost-effective technology that will substantially reduce coal dusting events. BNSF has a Coal Loading Rule, in effect since October 2011, specifically requiring all shippers loading coal at any Montana or Wyoming mine to take measures to load cars in such a way that ensures coal dust losses in transit are reduced by at least 85% compared to cars where no remedial measures have been taken (BNSF 2016).

Two recent Australian studies involved measuring particle concentrations in the air near a coal haul transport corridor to assess whether coal dust was being emitted from the railcars and whether any such emissions would result in particulate matter concentrations that would be considered potentially harmful to human health. The two reports presented strong evidence that, while particulate levels were elevated for the several minutes during and after trains passed the monitoring station, coal trains did not result in any more emissions than any other freight-hauling trains (Ramboll Environ 2016). Rail traffic to and from the mines would continue at existing levels for an additional 5.3 years since coal recovery would continue at an estimated annual rate that is consistent with the 2009 through 2016 average annual recovery rate.

The continuation of mining on tract analyzed in this EA would extend the time period over which WFW would produce coal, which would extend the period of time coal would be transported from the mine. The added direct and indirect effects of the Proposed Action on transportation would be minor but they would be extended by approximately 5.3 years.

#### *4.15.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Indirect impacts on transportation have resulted from current mining activity. Therefore, under this alternative, transportation impacts in the area would remain as described in **section 4.15.1.1** but the duration of the impacts would be reduced by approximately 5.3 years.

### 4.15.2 Cumulative Effects

Cumulative impacts to transportation are related to coal production levels. If coal production levels increase, cumulative impacts to transportation would increase. Highway traffic accidents and delays at grade crossings could result from train traffic. The transportation facilities for the northern group of mines are already in place, and coal production and employment levels would not change with the Proposed Action. The Proposed Action would extend the duration of mining by approximately 5.3 years at the DFM, and thus the length of employment and associated transportation utilization would be extended.

Coal extracted from the existing surface coal mines in the Wyoming PRB is transported in rail cars along the BNSF and UP rail lines. The coal mines north of Gillette, including the DFM, ship most of their coal via the east-west BNSF rail line that runs through Gillette for destinations in the Midwest. The coal mines south of Gillette ship most of their coal via the Gillette to Douglas BNSF and UP joint trackage that runs south through Campbell and Converse Counties and then east over separate BNSF and UP mainlines for destinations in the Midwest. The Proposed Action would extend the duration of mining by approximately 5.3 years at the DFM, and thus the duration of utilization of BNSF and UP rail lines would be extended by that amount.

The added cumulative impacts related to transportation would be minor but they would be extended by approximately 5.3 years.

### 4.15.3 Mitigation Measures

No mitigation measures specific to transportation are necessary.

## 4.16 Hazardous and Solid Waste

### 4.16.1 Direct and Indirect Effects

#### *4.16.1.1 Proposed Action*

Wastes classified as non-hazardous, hazardous, and universal are generated during mining operations at the DFM. DFM does not have an on-site solid waste landfill. Most waste generated at the mine is disposed of offsite at the Campbell County Municipal Landfill. General mining wastes are disposed in the municipal landfill only if generated on site, and only if non-hazardous per regulation under RCRA. No hazardous wastes are transported to the municipal landfill or any on-site solid waste pits. Scrap metal, tires, batteries, used filters, computers, and most wood pallets are recycled. Used filters are drained, crushed and recycled. Fifty-five-gallon drums and totes are properly emptied, cleaned and are then are recycled. Spent lead acid batteries and fluorescent lamps are stored in designated areas with secondary containment for periodic shipment to an approved recycling vendor. The DFM mine operates an onsite landfarm for treatment of oil or glycol contaminated soils. Disposal sites will be located at least 25 feet away from the edges of reclaimed stream channels. Wastes will be covered to a depth of at least 4 feet below the backfill surface prior to applying topsoil (WFW 2011). While coal mining and associated coal processing associated with the Proposed Action would yield additional coal waste, mining wastes are currently

being generated on site and are handled according to WDEQ-LQD rules and regulations. No increase in direct or indirect effects from hazardous and solid waste are anticipated as a result of the Proposed Action. The added direct and indirect effects of the Proposed Action from hazardous wastes would be minor but they would be extended by approximately 5.3 years.

#### *4.16.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. Hazardous and solid wastes are currently being generated at the DFM. Therefore, under this alternative, impacts from hazardous and solid wastes in the area would remain as described in **section 4.16.1.1** but the duration of the impacts would be reduced by approximately 5.3 years.

### 4.16.2 Cumulative Effects

Cumulative hazardous and solid wastes effects would be related to disturbance at Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines. The Proposed Action would extend the duration of mining by approximately 5.3 years at the DFM and, thus, the duration of effects from hazardous and solid wastes would be extended.

### 4.16.3 Mitigation Measures

No mitigation measures specific to hazardous and solid wastes are necessary.

## 4.17 Socioeconomics

### 4.17.1 Direct and Indirect Effects

#### *4.17.1.1 Proposed Action*

Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties on the production of federal coal, including that at the DFM. Such revenues include lease bonus bids, ad valorem taxes, severance taxes, royalty payments, sales and use taxes on equipment and other taxable purchases, and portions of required contributions to the federal AML program and Black Lung Disability Trust Fund. A summary of federal and state revenues generated from recovery of federal coal within the DFM, including federal coal within the A2Tr1 tract, is provided in **table 4-9** and **table 4-10** provides an estimate of the revenues derived from recovering the federal coal within the A2Tr1 tract, only.

**Table 4-9. LOM Federal and State Revenues from Federal Coal Recovery within the DFM**

| Revenue Source | Total $ Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 171.5 | 85.8 | 85.8 |
| Abandoned Mine Lands Fund | 29.0 | 14.5 | 14.5 |
| Severance Tax | 70.0 | --[1] | 70.0 |
| Bonus Bid Annual Revenues[2] | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 57.0 | --[1] | 57.0 |
| Black Lung | 57.0 | 57.0 | --[1] |
| Sales and Use Tax | 8.3 | --[1] | 8.3 |
| **Totals** | **$392.8** | **$157.3** | **$235.6** |

[1] No revenues disbursed
[2] No bonus bid revenues collected after 2016
Source: WWC calculation – provided in **appendix F.**

**Table 4-10. LOM Federal and State Revenues from Federal Coal Recovery within the A2Tr1 Tract**

| Revenue Source | Total $ Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 53.6 | 26.8 | 26.8 |
| Abandoned Mine Lands Fund | 9.1 | 4.5 | 4.5 |
| Severance Tax | 20.9 | --[1] | 21.0 |
| Bonus Bid Annual Revenues[2] | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 17.8 | --[1] | 17.8 |
| Black Lung | 17.8 | 17.8 | --[1] |
| Sales and Use Tax | 2.6 | --[1] | 2.6 |
| **Totals** | **$121.8** | **$49.1** | **$72.7** |

[1] No revenues disbursed
[2] No bonus bid revenues collected after 2016
Source: WWC calculation – provided in **appendix F.**

Under the Proposed Action, LOM Wyoming revenues could be increased by approximately $72.7 million and federal revenues could be increased by $49.1 million. The primary difference between state and federal revenues is related to the fact that severance taxes are only paid to the state of Wyoming. The Proposed Action would extend the duration of the substantial economic benefits related to mining the federal coal.

Continued mining in the A2Tr1 tract would not directly create new jobs and therefore, the availability of housing units would not be impacted. No additional employees are anticipated as a result of the tract being mined, although the Proposed Action would extend the duration of employment for current employees and extend the substantial economic benefits related to mining the federal coal.

No additional changes in the current socioeconomic situation, as described in **section 3.16**, are anticipated but the positive effects would be extended by approximately 5.3 years.

#### *4.17.1.2 No Action Alternative*

Under the No Action Alternative, OSMRE would not approve the modification of the existing federal mining plan to recover the coal included in the A2Tr1 tract. In terms of coal conservation; the No Action Alternative would mean that approximately 32 Mt of federal coal within the A2Tr1 tract would not be recovered. Wyoming revenues of approximately $72.7 million and federal revenues of approximately $49.1 million related to this coal would not be realized over the LOM under the No Action Alternative. The selection of the No Action Alternative would likely not result in direct job losses. However, the No Action Alternative would reduce the LOM by approximately 5.3 years. It is also likely that state funded programs and services would be negatively affected by the loss of the revenue and fewer abandoned mine lands and black lung fees would be collected. The No Action Alternative would result in significant direct and indirect negative socioeconomic effects.

### 4.17.2 Cumulative Effects

Cumulative effects would be related to socioeconomic conditions in Campbell County. Cumulative impacts related to the Proposed Action are not significantly different than those described in **section 4.17.1.1** because Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties on the production of federal coal from Campbell

County. The cumulative effects on socioeconomics are expected to be moderate and long term on the tract.

### 4.17.3 Mitigation Measures

No mitigation measures specific to socioeconomic impacts are needed.

## 4.18 Short Term Uses and Long Term Productivity

The discussions contained within this environmental consequences chapter and in the existing DFM federal mining plan provide the analysis and relationships of shorter uses (such as mining coal) and long-term productivity (such as generating electricity for homes, schools, and industry).

## 4.19 Unavoidable Adverse Effects

Unavoidable adverse impacts are the effects on natural and human resources that would remain after mitigation measures have been applied. For the Proposed Action, details regarding these impacts are presented in the preceding resource sections and the existing DFM federal mining plan. Unavoidable adverse effects are summarized in **table 4-11**.

**Table 4-11. Unavoidable Adverse Effects of the Proposed Action**

| Resource | Unavoidable Adverse Effect |
|---|---|
| Topography and Physiography | Topographic effects of mining are unavoidable because mining activities such as blasting, excavating, loading and hauling of overburden and coal are required to recover coal in an economical manner. |
| Geology, Mineral Resources and Paleontology | Geology, mineral resources and buried paleontological resources may be permanently impacted by mining activities. Such impacts are unavoidable as the resources are not locatable and, therefore, cannot be avoided by construction. |
| Air Quality/GHGs | Emissions and associated impacts are unavoidable, but are not expected to degrade ambient air quality in the area. Mined coal is primarily used for combustion; therefore, any associated GHG emissions are unavoidable if the Proposed Action is implemented. |
| Water Resources | Impacts to water resources resulting from coal extraction are unavoidable. However, these impacts would be mitigated through replacement of groundwater or surface water supplies for domestic, agricultural, industrial, or any other legitimate use if such a supply is diminished, interrupted, or contaminated, to the extent of precluding use of the water, as a result of mining. |
| Soil | Soil in disturbance areas would exhibit more homogenous textures and may have coarser fragments near the surface following mining. Some soil loss may occur as a result of erosion, prior to stabilization. |
| Vegetation | Vegetation would be eliminated beginning with the initial disturbance and continuing until reclamation is complete, which would extend to the end of the mining term for many facilities. Noxious weeds may be introduced as a result of mining activity, potentially affecting vegetation communities and requiring implementation of control measures in the long term. |
| Wildlife | Wildlife would be temporarily affected by mine activities, which would alter habitat conditions, particularly in the vicinity of surface disturbance. These impacts would be short-term and habitats would be reclaimed following mining. |
| Cultural Resources | No sites within the A2Tr1 tract have been designated as eligible for listing on the NRHP. Undiscovered cultural resources could be impacted by surface disturbing activities. All discovered sites would be mitigated as required by Section 106 of the NHPA. |
| Visual Resources | Mining activity and associated disturbances and facilities would unavoidably alter the landscape during the mining term, affecting the aesthetic qualities. Some features would be visible from public access points, including the Garner Lake Road. The effects would be negligible following reclamation. |

## Table 4-11. Unavoidable Adverse Effects of the Proposed Action (Continued)

| Resource | Unavoidable Adverse Effect |
|---|---|
| Noise | Noise would result from mining activities similar to the existing condition. |
| Transportation Facilities | The Garner Lake Road would continue to experience mine related traffic. The effects would occur during the mining term. |
| Hazardous and Solid Waste | Coal mining and associated with coal processing would yield coal waste. |

# 5.0 Consultation and Coordination

## 5.1 Public Comment Process

OSMRE developed a project specific website that provided legal notices, outreach notice letters, mailing address, and an email address for comments to be sent. The website was activated on March 9, 2016 and was available at: http://www.wrcc.osmre.gov/initiatives/DryForkMineA2.shtm.

OSMRE published legal notices of intent (NOIs) in the Gillette News Record on March 9 and March 23, 2016. Public outreach letters describing the EA and soliciting scoping comments were mailed on March 9, 2016 to city governments, adjacent landowners, and other interested parties. The legal notices and letters invited the public to comment on issues of concern related to the EA. OSMRE also sent letters of notification to tribes/tribal representatives. These tribal notification letters were mailed on March 9, 2016.

A total of 29 comment letters were received during the public scoping period. Comment letters received during the public review period for this EA will be considered during the ASLM approval process. **Appendix B** presents a summary of the substantive EA scoping comments.

## 5.2 Preparers and Contributors

OSMRE personnel that contributed to the development of this EA are listed in **table 5-1**.

**Table 5-1. OSMRE Personnel**

| Name | Organization | Project Responsibility |
|---|---|---|
| Marcelo Calle | OSMRE | Project Lead/Project Coordination |
| Logan Sholar | OSMRE | Project Assistance |
| Lauren Mitchell | OSMRE | Project Assistance |
| Gretchen Pinkham | OSMRE | Air Quality |
| Karen Jass | OSMRE | Geology/Physiology/Topography |
| Jeremy Iliff | OSMRE | Cultural/Historical/Paleontological |
| Flynn Dickinson | OSMRE | Water |
| Jacob Mulinix | OSMRE | Soils |

Third party contractors who contributed to the development of this EA are identified in **table 5-2**.

**Table 5-2. Third Party Contractor Personnel**

| Name | Organization | Project Responsibility | Education/Experience |
|---|---|---|---|
| John Berry | WWC Engineering | Project Manager, Primary Author | B.S. Wildlife Management |
| Sarah Myers | WWC Engineering | Document Preparation | B.S. Civil Engineering, PE |
| Chris McDowell | WWC Engineering | Document Preparation, Quality Assurance/Quality Control | B.S. Geology |
| Beth Kelly | WWC Engineering | Quality Assurance/Quality Control | B.S. Chemical Engineering |

## 5.3 Distribution of the EA

This EA will be distributed to individuals who specifically request a copy of the document. It will also be made available electronically on the OSMRE website at http://www.wrcc.osmre.gov/initiatives/DryForkMineA2.shtm.

# 6.0 References and Abbreviations/Acronyms

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## 6.2 Abbreviations/Acronyms

| | |
|---|---|
| A2Tr1 | Amendment 2, Tract 1 |
| Ac-ft | acre-feet |
| AIRFA | American Indian Religious Freedom Act of 1978 |
| ANFO | Ammonium Nitrate and Fuel Oil |
| AOI | area of influence |
| AQ | air quality |
| AQI | air quality index |
| AQRVs | air quality related values |
| AQS | Air Quality System |
| ASCM | alternative sediment control measures |
| ASLM | Assistant Secretary, Land and Mineral Management (DOI) |
| AVF | alluvial valley floor |
| BACT | Best Available Control Technology |
| BFO | BLM Buffalo Field Office |
| BLM | U.S. Bureau of Land Management |
| BMP | Best management practice |
| BNSF | BNSF Railway Company |
| BOR | Bureau of Reclamation |
| BO | biological opinion |
| Btu | British thermal unit |
| CAA | Clean Air Act, as amended |
| CBNG | coal bed natural gas |
| CCB | coal combustion byproduct |
| CEQ | Council on Environmental Quality |
| CFO | BLM Casper Field Office |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| $CH_4$ | methane |
| CHIA | cumulative hydrologic impacts |
| CIA | cumulative impacts area |
| CO | carbon monoxide |
| COA | condition of approval |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | Equivalent $CO_2$ |
| CWA | Clean Water Act |
| dBA | adjusted decibels, a logarithmic unit of sound levels |
| DFCC | Dry Fork Coal Company |
| DFM | Dry Fork Mine |
| DFS | Dry Fork Station |
| DL | disturbed land |
| DOE | U.S. Department of Energy |
| DOI | U.S. Department of the Interior |
| dv | deciview |
| EA | Environmental Assessment |

| | |
|---|---|
| EGU | electric generating unit |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| EO | Executive Order |
| EOY | end of year |
| EQC | Environmental Quality Council |
| ESA | Endangered Species Act of 1973 |
| FCLAA | Federal Coal Leasing Act Amendment (1976) |
| FEIS | Final Environmental Impact Statement |
| FLPMA | Federal Land Policy Management Act of 1976 |
| FONSI | Finding of No Significant Impact |
| GDP | gross domestic product |
| GHG | Greenhouse gas |
| GPO | U.S. Government Publishing Office |
| GRSG | Greater sage-grouse |
| GWh | gigawatt hour |
| GWP | Global Warming Potential |
| ft/d | feet per day |
| H+ | hydrogen ion |
| $H_2S$ | hydrogen sulfide |
| HAP | hazardous air pollutants |
| Hg | mercury |
| IDB | internally drained basin |
| IMPROVE | Interagency Monitoring of Protected Environments |
| in. | inches |
| IPaC | Information for Planning and Conservation |
| ISCLT3 | Industrial Source Complex Long Term 3 |
| LAC | level of acceptable change |
| lb. | pounds |
| LNCM | lands necessary to conduct mining |
| LOM | life of mine |
| LPR | Little Powder River |
| LRS | Laramie River Station |
| $\mu g/m^3$ | micrograms per cubic meter |
| MATS | Mercury and Air Toxic Standards |
| MBCC | migratory birds of conservation concern |
| MBCY | million-bank cubic yards |
| MBHFI | migratory birds of high federal |
| MBTA | Migratory Bird Treaty Act of 1918, as amended |
| MFP | Management Framework Plans |
| Mg/L | milligrams per liter |
| MLA | Mineral Leasing Act (1920) |
| MMPA | Mining and Minerals Policy Act of 1970 |
| MPDD | Mining Plan Decision Document |
| MSHA | Mine Safety and Health |
| Mt | million tons |

| | |
|---|---|
| Mtpy | million tons per year |
| MW | megawatts |
| $N_2O$ | nitrous oxide |
| NAAQS | National Ambient Air Quality Standards |
| NCDC | National Climatic Data Center |
| NEPA | National Environmental Policy Act (1969) |
| NGCC | North Gillette Coal Company |
| NHPA | National Historic Preservation Act |
| NOA | Notice of Availability |
| NOAA | National Oceanic and Atmospheric Administration |
| $NO_2$ | nitrogen dioxide |
| NOI | Notice of Intent |
| $NO_X$ | oxides of nitrogen |
| NP | Not Present |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NSPS | New Source Performance Standards |
| NWI | Nation Wetlands Inventory |
| $O_3$ | ozone |
| OSLI | Wyoming Office of State Lands and Investments |
| OSMRE | Office of Surface Mining Reclamation and Enforcement |
| PAP | Permit Application Package |
| Pb | lead |
| PBT | bioaccumulative and toxic |
| PFYC | Potential Fossil Yield Classification |
| pH | power of hydrogen |
| PI | present with the potential for impact |
| $PM_{2.5}$ | fine particulates less than 2.5 microns |
| $PM_{10}$ | fine particulates less than 10 microns |
| PMT | post-mine topography |
| PRB | Wyoming Powder River Basin |
| ppb | parts per billion |
| ppm | parts per million |
| PRPA | Paleontological Resources Preservation Act of 2009 |
| PSD | Prevention of Significant Deterioration |
| PTE | potential to emit |
| R2P2 | Resource Recovery and Protection Plan |
| RCRA | Resource Conservation and Recovery Act |
| RL | reclaimed land |
| RMP | Resource Management Plan |
| ROD | Record of Decision |
| ROW | right-of-way |
| SAR | sodium adsorption rate |
| SDD | State Decision Document |
| SDWA | Safe Drinking Water Act |

| | |
|---|---|
| SH | State Highway |
| SHPO | State Historic Preservation Office |
| SIP | State Implementation Plan |
| SMCRA | Surface Mining Control and Reclamation Act (1977) |
| $SO_2$ | sulfur dioxide |
| SOSI | species of special interest |
| STP | standard temperature and pressure |
| T&E | threatened and endangered |
| TDS | total dissolved solids |
| THPO | Tribal Historic Preservation Office |
| tpy | tons per year |
| TSP | total suspended particles |
| TSS | total suspended solids |
| UP | Union Pacific |
| USACE | U.S. Army Corps of Engineers |
| USEIA | U.S. Energy Information Administration |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| VOC | volatile organic compound |
| VRM | visual resource management |
| W | water |
| WAAQS | Wyoming Ambient Air Quality Standards |
| WAQSR | Wyoming Air Quality Standards and Regulations |
| WCRC | Wyoming Coal Resources Company |
| WDEQ | Wyoming Department of Environmental Quality |
| WDEQ-AQD | Wyoming Department of Environmental Quality – Air Quality Division |
| WDEQ-LQD | Wyoming Department of Environmental Quality – Land Quality Division |
| WDEQ-SHWD | Wyoming Department of Environmental Quality – Solid and Hazardous Waste Division |
| WDEQ-WQD | Wyoming Department of Environmental Quality – Water Quality Division |
| WDH-PHD | Wyoming Department of Health, Public Health Division (WDH-PHD |
| WDOA | Wyoming Department of Agriculture |
| WDWS | Wyoming Department of Workforce Services |
| WEQA | Wyoming Environmental Quality Act of 1973 |
| WET | whole effluent toxicity |
| WFW | Western Fuels-Wyoming, Inc. |
| WGFD | Wyoming Game and Fish Department |
| WOGCC | Wyoming Oil and Gas Conservation Commission |
| WRS | Wyoming Revised Statutes |
| W.S. | Wyoming Statue |
| WYNDD | Wyoming Natural Diversity Database |
| WYPDES | Wyoming Pollutant Discharge Elimination System |

# APPENDICES

| | |
|---|---|
| Appendix A | Legal Notices for Federal Lease Modification Approval WYW-0271199, WYW-0271200 |
| Appendix B | Public Scoping Mailing Lists, Public Scoping and A2Tr1 EA Review Comments Summaries and A2Tr1 EA Review Comment Response Log |
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# APPENDIX A

LEGAL NOTICES
FOR FEDERAL LEASE MODIFICATION APPROVAL
WYW-0271199, WYW-0271200

Public Notice
Dry Fork Mine Mining Plan Modification
Environmental Assessment

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, will prepare an environmental assessment (EA) for the Dry Fork Mine (DFM) mining plan modification for federal coal leases W-0271200 and W-0271201 (the Project). On June 2, 1989, in accordance with the Mineral Leasing Act of 1920 (MLA), the operator of the DFM, Dry Fork Coal Co. (currently Western Fuels Wyoming) received federal mining plan approval from the ASLM to mine portions of federal coal leases W-0271200 and W-0271201 at the DFM, in accordance with the approved surface coal mining Permit No. 599 issued by the state regulatory authority; the Wyoming Department of Environmental, Land Quality Division (WDEQ-LQD). The DFM also has approval from WDEQ-LQD and the ASLM to mine federal coal lease W-5035 and portions of federal coal leases W-0271199 and W-0311810. On August 19, 2013, in accordance with its responsibilities under the federal Surface Mining Control and Reclamation Act of 1977, the WDEQ-LQD approved Amendment 2 (A2) for surface coal mining Permit No. 599, including the mining of portions of federal coal leases W-0271200 and W-0271201, not previously approved by the ASLM. In accordance with MLA, The ASLM must approve the mining plan modification for federal coal leases W-0271200 and W-0271201 before mining of the federal coal can occur.

OSMRE is preparing this EA to evaluate the environmental impacts resulting from the Project, pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA). The DFM is located approximately 4.5 miles north of Gillette, Wyoming. The total amount of federal coal authorized for removal at the DFM is approximately 255.1 million tons (mt) and an estimated 126.8 mt of coal remains to be mined. A2 proposes to add zero federal surface acres, approximately 268.0 federal coal acres and 33.4 mt of federal coal to the approved federal mining plan. The DFM conducts open pit surface coal mine using conventional truck and loader methods. The average production rate at the DFM is approximately 6 million tons per year (mtpy) and the maximum production rate is 15 mtpy. A2 would not change the average production rate or the maximum production rate for the life of the mining operation. This mining plan modification would extend the life of the mine by approximately 5.6 years, concluding in 2042.

The EA will disclose the potential for direct, indirect, and cumulative impacts to the environment from the Project. Through the EA, OSMRE will determine whether or not there are significant environmental impacts. If a finding of no significant impact is reached, the OSMRE Director will make a recommendation to the ASLM on the federal mining plan modification, and the ASLM will approve, approve with conditions, or disapprove the federal mining plan modification. If the EA identifies significant impacts, an environmental impact statement will be prepared.

OSMRE is soliciting public comments. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments to: ATTN: Dry Fork Mine A2 EA, C/O: Lauren Mitchell, Western Region Office, Office of Surface Mining Reclamation and Enforcement, 1999 Broadway, Suite 3320, Denver, CO 80202. Email: OSM-NEPA-WY@OSMRE.gov.

Comments should be received or postmarked no later than April 8, 2016 to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record and will be available for public inspection. Additional information regarding the project may be obtained from Lauren Mitchell, telephone number (303) 293-5028 and the project website provided below. When available, the EA and other supporting documentation will be posted at:

http://www.wrcc.osmre.gov/initiatives/DryForkMineA2.shtm

# United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT
Western Region
1999 Broadway St., Suite 3320
Denver, CO 80202-3050

March 7, 2016

Dear Stakeholders and Interested Parties,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, will prepare an environmental assessment (EA) for the Dry Fork Mine (DFM) mining plan modification for federal coal leases W-0271200 and W-0271201 (the Project). On June 2, 1989, in accordance with the Mineral Leasing Act of 1920 (MLA), the operator of the DFM, Dry Fork Coal Co. (currently Western Fuels Wyoming) received federal mining plan approval from the Assistant Secretary of Lands and Mineral Management (ASLM) to mine portions of federal coal leases W-0271200 and W-0271201 at the DFM, in accordance with the approved surface coal mining Permit No. 599 issued by the state regulatory authority; the Wyoming Department of Environmental, Land Quality Division (WDEQ-LQD). The DFM also has approval from WDEQ-LQD and the ASLM to mine federal coal lease W-5035 and portions of federal coal leases W-0271199 and W-0311810. On August 19, 2013, in accordance with its responsibilities under the federal Surface Mining Control and Reclamation Act of 1977, the WDEQ-LQD approved Amendment 2 (A2) for surface coal mining Permit No. 599, including the mining of portions of federal coal leases W-0271200 and W-0271201, not previously approved by the ASLM. In accordance with MLA, The ASLM must approve the mining plan modification for federal coal leases W-0271200 and W-0271201 before mining of the federal coal can occur.

OSMRE is preparing this EA to evaluate the environmental impacts resulting from the Project, pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA). The DFM is located approximately 4.5 miles north of Gillette, Wyoming. The total amount of federal coal authorized for removal at the DFM is approximately 255.1 million tons (mt) and an estimated 126.8 mt of coal remains to be mined. A2 proposes to add zero federal surface acres, approximately 268.0 federal coal acres and 33.4 mt of federal coal to the approved federal mining plan. The DFM conducts open pit surface coal mine using conventional truck and loader methods. The average production rate at the DFM is approximately 6 million tons per year (mtpy) and the maximum production rate is 15 mtpy. A2 would not change the average production rate or the maximum production rate for the life of the mining operation. This mining plan modification would extend the life of the mine by approximately 5.6 years, concluding in 2042.

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1

recommendation to the ASLM on the federal mining plan modification, and the ASLM will approve, approve with conditions, or disapprove the federal mining plan modification. If the EA identifies significant impacts, an environmental impact statement will be prepared.

OSMRE is soliciting public comments on the Project. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments to:

ATTN: Dry Fork Mine A2 EA
C/O: Lauren Mitchell,
OSMRE Western Region
1999 Broadway, Suite 3320,
Denver, CO 80202-3050
Email: OSM-NEPA-WY@OSMRE.gov.

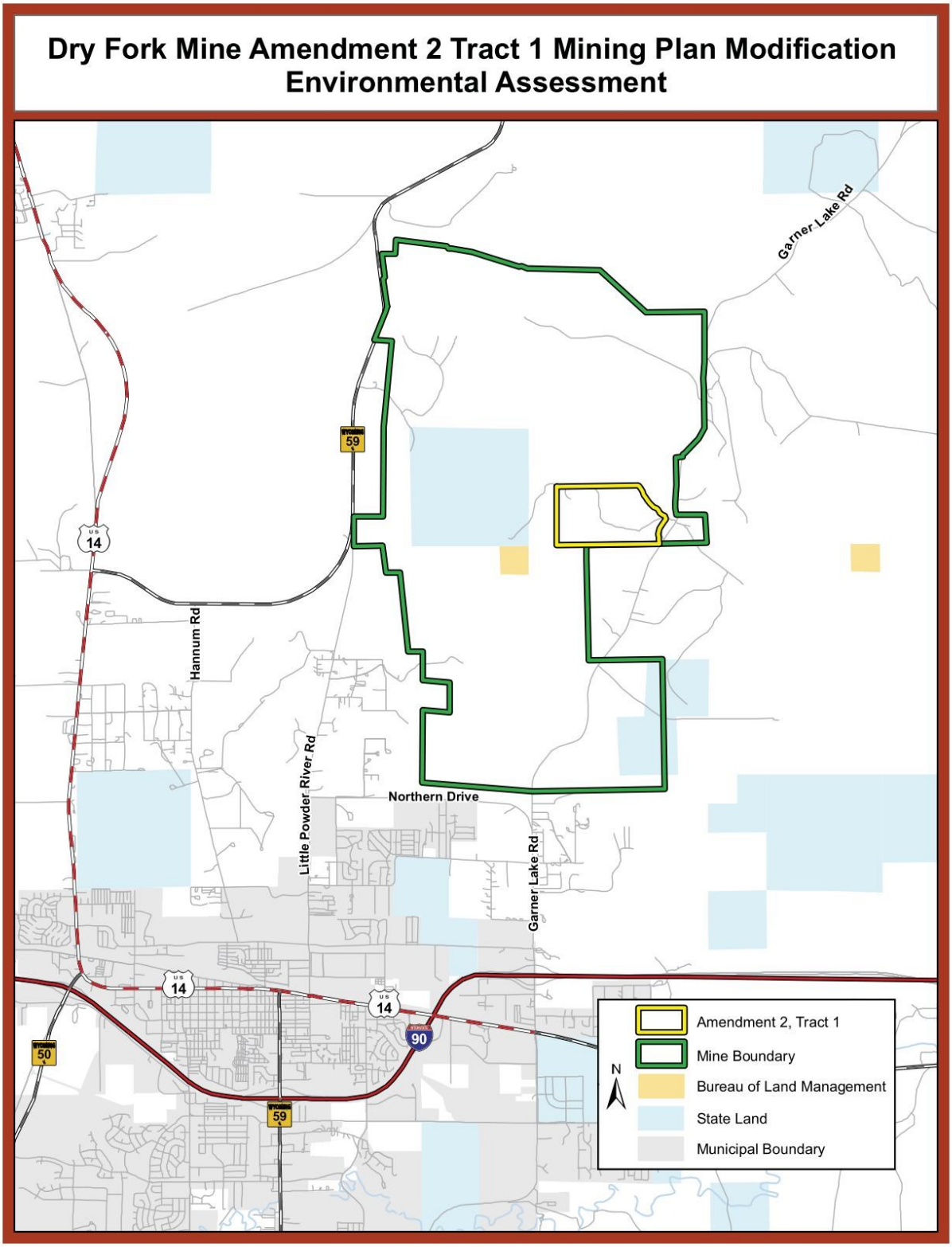
Comments should be received or postmarked no later than April 8, 2016 to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record and will be available for public inspection. Additional information regarding the project may be obtained from Lauren Mitchell, telephone number (303) 293-5028 and the project website provided below. When available, the EA and other supporting documentation will be posted at: http://www.wrcc.osmre.gov/initiatives/DryForkMineA2.shtm.

Sincerely,

Marcelo Calle, Manager
Field Operations Branch

Enclosed: Project Map

2


Dry Fork Mine Amendment 2 Tract 1 Mining Plan Modification
Environmental Assessment
Garner Lake Rd
59
14
Hannum Rd
Little Powder River Rd
Northern Drive
Garner Lake Rd
14
14
90
50
59
Amendment 2, Tract 1
Mine Boundary
Bureau of Land Management
State Land
Municipal Boundary
N

# APPENDIX B

PUBLIC SCOPING MAILING LISTS,
PUBLIC SCOPING and A2Tr1 EA REVIEW COMMENTS SUMMARIES
and
A2Tr1 EA REVIEW COMMENT RESPONSE LOG
(INDIVIDUAL LETTERS RECEIVED HAVE NOT BEEN INCLUDED)

## Mailing List

| Name | Title | |
|---|---|---|
| **Tribal** | | |
| Darwin St. Clair | Chairman | Eastern Shoshone Business Council |
| Dean Goggles | Chairman | Northern Arapaho Business Council |
| Shaun Chapoose | Chairperson | The Ute Tribe of the Uintah and Ouray Reservation |
| Harold C. Frazier | Chairman | Cheyenne River Sioux Tribal Government |
| Roxanne Sazue | Chairwoman | Crow Creek Sioux Tribe |
| Wanda Wells | Cultural Affairs | Crow Creek Sioux Tribe |
| Anthony Reider | President | Flandreau Santee Sioux Tribe |
| Michael Jandreau | Chairman | Lower Brule Sioux Tribe |
| Clair Green | Cultural Resources/Public Affairs | Lower Brule Sioux Tribe |
| John Yellow Bird Steele | President | Oglala Sioux Tribal Council |
| William Kindle | President | Rosebud Sioux Tribe |
| Garryl Rousseau Sr. | Vice-Chairman or Acting Chairman | Sisseton-Wahpeton Oyate Tribes |
| Robert Flying Hawk | Chairman | Yankton Sioux Tribe |
| Lyman Guy | Tribal Chairman | Apache Tribe of Oklahoma |
| Lisa Martin | Tribal Council Coordinator | Cheyenne-Arapaho Tribes of Oklahoma |
| Wallace Coffey | Chairman | Comanche Nation Tribe |
| Amber Toppah | Lady Chairman | Kiowa Business Committee |
| Roger Trudell | Chairman | Santee Sioux Tribe of Nebraska |
| Mark Fox | Chairman | MHA Nation Tribal Council, Three Affiliated Tribes |
| Dave Archambault II | Chairman | Standing Rock Sioux Tribe |
| Vernon Finley | Chairman | Confederated Salish and Kootenai Tribes of the Flathead Reservation |
| Floyd Azure | Chairman | Ft. Peck Assiniboine and Sioux Tribes |
| Harry Barnes | Chairman | Blackfeet Tribal Business Council |
| Darrin Old Coyote | Chairman | Crow Tribal Council |
| Llevando “Cowboy” Fisher Sr. | President | Northern Cheyenne Tribal Council |
| Blaine Edmo | Chairman | Shoshone-Bannock Tribes of the Fort Hall Reservation |

| Name | Title | |
|---|---|---|
| **State and Local Agencies** | | |
| Doug Miyamoto | Director | Wyoming Department of Agriculture |
| Todd Parfitt | Director | Wyoming Department of Environmental Quality |
| Mark Rogaczewski | | WDEQ Land Quality Division |
| David Waterstreet | Program Director | WDEQ Natural Resources |
| Scott Talbott | Director | Wyoming Department of Game and Fish |
| Mary Hopkins | SHPO | Wyoming Historic Preservation Office, SHPO |
| Milward Simpson | Director | Wyoming Department of Parks and Cultural Resources |
| Bridget Hill | Director | Office of State Lands and Investment |
| Bill Crapser | State Forester | Wyoming Forestry Division |
| John Cox | Director | Wyoming Department of Transportation |
| Thomas A. Drean | Director/State Geologist | Wyoming Geological Survey |
| Dan Noble | Director | Wyoming Department of Revenue |
| Mark W. Watson | State Oil and Gas Supervisor | Wyoming Oil and Gas Conservation Commission |
| Patrick T. Tyrrell | State Engineer | Wyoming State Engineer’s Office |
| Domenic Bravo | Division Administrator | Wyoming State Parks, Historic Sites & Trails Division |
| Harry C. LaBonde | Director | Wyoming Water Development Commission |
| | | Wyoming Office of the Governor |
| Delbert McOmie | Interim Director | Wyoming Department of Workforce Services |
| Diane Shober | Executive Director | Wyoming Office of Tourism Board |
| Alan B. Minier | Chairman | Wyoming Public Service Commission |
| | Economic Analysis Division | Wyoming Department of Administration and Information |
| Bridget Hill | | Office of State Lands and Investments |
| Mark Gordon | | Office of the State Treasurer |
| Kelly Bott | | WY DEQ Air Quality Division |
| Pat Tyrrell | | WY State Engineer's Office |
| Sarah Needles | | WY State Historic Pres Office |
| Kyle Wendtland | | Wyoming LQD - DEQ |
| | | Wyoming State Board of Land Commissioners |

| Name | Title | |
|---|---|---|
| | | WY Dept of Employment Research & Planning |
| Kelly | Bott | WY DEQ Air Quality Division |
| Milward | Simpson | WY Parks & Cultural Res Dept |
| Pat | Tyrrell | WY State Engineer's Office |
| Sarah | Needles | WY State Historic Pres Office |
| | Natural Resources & Policy Section | Wyoming Dept of Agriculture |
| Scott | Talbott | Wyoming Game and Fish Department |
| Al | Minier-Chairman | Wyoming Public Service Comm |
| Thomas A. | Drean, Director | Wyoming State Geological Survey |
| Harry | LaBonde | Wyoming Water Dev Comm |
| Mark Christensen | | Campbell County Commissioners |
| Dr. Garry Becker | | Campbell County Commissioners |
| Matt Avery | | Campbell County Commissioners |
| Rusty Bell | | Campbell County Commissioners |
| Micky Shober | | Campbell County Commissioners |
| | | Campbell County Airport |
| Keith Bowar | Chief Building Official | Campbell County Building Division |
| Phillip Giffin | P.E. | Campbell County Engineering Division |
| Megan Nelms | AICP, County Planner & Zoning Administrator | Campbell County Planning & Zoning Division |
| David King | CCEMA Coordinator | Campbell County Emergency Management |
| Bill Shank | Fire Chief | Campbell County Fire Department |
| Dave McCormick | Executive Director | Campbell County Parks and Recreation |
| Kevin King | P.E., Director | Campbell County Department of Public Works |
| Kevin F. Geis | P.E., Executive Director | Campbell County Road & Bridge |
| Quade Schmelzle | Director | Campbell County Weed & Pest |
| | | Campbell County Conservation District |
| | | Campbell County School District 1 |
| | Executive Director | Campbell County Economic Development Corporation |

| Name | Title | |
|---|---|---|
| | | Campbell County Public Land Board |
| Tom | Langston | Gillette Department of Commercial Development |
| Louise Carter-King | Mayor | City of Gillette |
| Kevin McGrath | City Council | City of Gillette |
| Tim Carsrud | City Council | City of Gillette |
| Robin Kuntz | City Council | City of Gillette |
| Dan Barks | City Council | City of Gillette |
| Billy Montgomery | City Council | City of Gillette |
| Ted Jerred | City Council | City of Gillette |
| Dustin Hamilton | Development Services Director | City of Gillette |
| Sawley Wilde | Public Works Director | City of Gillette |
| Kendall Glover | Director of Utilities | City of Gillette |
| Jim Hloucal | Chief of Police | City of Gillette |
| Pam Boger | Administrative Services Director | City of Gillette |
| Cartier Napier | City Administrator | City of Gillette |
| Hon. Matthew H. Mead | Governor | Wyoming Governor |
| Representative Scott Clem | District HD31 | Wyoming Legislature |
| Representative Roy Edwards | District HD53 | Wyoming Legislature |
| Representative Bill Pownall | District HD52 | Wyoming Legislature |
| Senator Ogden Driskill | District SD01 | Wyoming Legislature |
| Senator Michael Von Flatern | District SD24 | Wyoming Legislature |
| **Federal Agencies** | | |
| Darryl LaCounte | Regional Director | Rocky Mountain Regional Office, Bureau of Indian Affairs |
| Carlie Ronca | Area Manager | Wyoming Area Office, Bureau of Reclamation |
| | | Wyoming Regulatory Office, US Army Corps of Engineers, Omaha District |
| Mary Jo Rugwell | State Director | Wyoming State Office, Bureau of Land Management |
| Stephanie Connolly | High Plains District Manager | High Plains District Office, Bureau of Land Management |
| Mitchell Leverette | Division Chief | Bureau of Land Management |
| Jamie Connell | State Director | Montana State Office, Bureau of Land Management |

| Name | Title | |
|---|---|---|
| Todd Yeager | | Miles City Office, Bureau of Land Management |
| Duane Spencer | | Buffalo Field Office, Bureau of Land Management |
| Rhen Etzelmiller | | Casper Field Office, Bureau of Land Management |
| | | Library, Bureau of Land Management |
| | Coal Coordinator | Montana State Office, Bureau of Land Management |
| | Coal Coordinator | Wyoming State Office, Bureau of Land Management |
| Lawrence S. Roberts | Acting Assistant Secretary | Bureau of Indian Affairs |
| | Environmental Division | US Air Force Headquarters/CEVP |
| | | NPS |
| | | NPS - Air Quality |
| | | NPS Air Resources Division |
| | | NPS 2310 |
| | | U.S. Department of Energy |
| Shaun McGrath | Administrator | US EPA, Region 8 |
| Mark Sattelberg | Field Supervisor | Wyoming Ecological Services Field Office, US Fish and Wildlife Service |
| Dennis Jaeger | Forest Supervisor's Office | Thunder Basin National Grassland, USDA Forest Service |
| | | Devils Tower National Monument, National Park Service |
| Astrid Martinez | State Conservationist | Wyoming State Office, Natural Resources Conservation Service |
| Marcelo Calle | | Office of Surface Mining Reclamation and Enforcement<br>Program Support Division, Field Operations Branch |
| | | Advisory Council on Historic Preservation |
| | | US Army Corps of Engineers |
| | | US EPA |
| | Ecological Services | US Fish and Wildlife Service |
| | | US Geological Survey |
| | BLM Cooperator Lead | USDA-FS Douglas Ranger District |
| | | USGS Water Resources Division |
| | | US Fish and Wildlife Service, Ecological Services |
| | | U.S. Department of Energy |

| Name | Title | |
|---|---|---|
| | | US Army Corps of Engineers |
| | | US EPA |
| | | US Geological Survey |
| Michael Enzi | US Senate | Gillette Office |
| John Barrasso | US Senate | Casper Office |
| Cynthia Lummis | US House of Representatives | Casper Office |
| **Landowners** | | |
| Green Bridge Holdings Inc | | |
| Burkhardt Jackie Michael | | |
| Green Bridge Holdings Inc | | |
| Dept of Interior/Blm | | |
| Basin Electric Power Coop & | | |
| State of Wyoming | | |
| Macintosh Property Group Inc | | |
| Western Fuels Wyoming Inc | | |
| Western Fuels Wyoming Inc | | |
| Kawulok Joseph Living Trust | | |
| **Interested Groups and Businesses** | | |
| Mark | Thrall | Belle Ayr Mine |
| H.A. | True | President, Belle Fourche Pipeline Company |
| Mitchell J. | Reneau | VP Land, Bill Barrett Corporation |
| | | Biodiversity Conservation Alliance |
| | | BNSF Railway Company |
| | | Buckskin Mine-Kiewit Mining Group |
| Jason | Adrians | Casper Star Tribune |
| Amy M. | Atwood | Center for Biological Diversity |
| John | Trummel | Cloud Peak Energy |
| | | Converse County Commission |
| Dr. Dan | Espelan | Converse County School District #1 |

| Name | Title | |
|---|---|---|
| Kirk M. | Hughes | Converse County School District #2 |
| Paul W. | Musselman | Converse Cty, Special Projects |
| | | Cordero Rojo Mine |
| | | Defenders of Wildlife |
| | | Devils Tower National Monument |
| Matt | Adelman | Publisher, Douglas Budget |
| | | Environmental Policy and Culture Program |
| | | Federation for North American Wild Sheep |
| Energy Reporter | | Gillette News-Record |
| Steve | Bullock | Governor of Montana |
| Scott | Child | Interwest Mining Company |
| Joe | Mehl | Kiewit Mining Group Inc |
| Jim McLeland | Eric Bjordahl | M&K Oil Company Inc |
| Greg | Julian | Mineral Management Service |
| Hal | Quinn | National Mining Association |
| | | National Wildlife Federation |
| | | Natural Resources Defense Council |
| Shannon | Anderson | Powder River Basin Resource Council |
| Phil | Dinsmoor | Powder River Coal Company |
| James M. | Piccone | Resolute Wyoming |
| Bob | Comer | Rocky Mtn Region Solicitor |
| Peter | Morgan | Sierra Club |
| Lecia | Craft | Thunder Basin Coal Company |
| Ralph | Kingan | Mayor, Town of Wright |
| Roger | Miller | President, Trout Unlimited |
| Lance | Fritz | President, Chief Executive Officer, Union Pacific Railroad |
| | | US West Communications (Qwest Corp.) |
| Jason M. | Ryan | Business Analytics Director, US Western Surface Operations |
| Wendi | Chatman | UW Libraries |

| Name | Title | |
|---|---|---|
| Taylor | Jones | WildEarth Guardians |
| Mike | Evers | WWC Engineering |
| Dave | Spencer | WY Business Council/NE Region |
| Bill | Schilling | Wyoming Business Alliance |
| Matt | Grant | Wyoming Mining Association |
| Gary | Wilmont | Wyoming Outdoor Council |
| Niels | Hansen | Wyoming Stock Growers Assoc |
| Steve | Kilpatrick | Wyoming Wildlife Federation |
| Amy | Wallop-Hendrickson | Wyoming Wool Growers Association, Executive Director |
| Mike | McCraken-Publisher | Wyoming-Tribune Eagle |
| Katie | Parker | Yates Petroleum Corp et al |

## Summary of Scoping Comments

| ID# | Date | Organization | Comment Category | Comment | Campaign |
|---|---|---|---|---|---|
| 1 | 3/25/2016 | Alpha Natural Resources | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 2 | 3/22/2016 | | General Support | | |
| 3 | 4/12/2016 | Basin Electric Power Cooperative | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 4 | 3/21/2016 | Individual | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 5 | 3/21/2016 | Nelson Brothers Mining Services, LLC | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 6 | 3/19/2016 | Individual | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 7 | 4/4/2016 | Individual | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 8 | 3/21/2016 | Individual | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 9 | 3/16/2016 | Basin Electric Power Cooperative | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 10 | 3/18/2016 | Bowie Resources Partners, LLC | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 11 | 3/19/2016 | HIIG Energy | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 12 | 3/28/2016 | J.E. Stover & Associates, Inc. | General Support | | |
| 13 | 3/18/2016 | United Central Industrial Supply | General Support | | |
| 14 | 3/18/2016 | Nelson Brothers Incorporated | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 15 | 3/21/2016 | Individual | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 16 | 4/8/2016 | RESPEC | Economics | I urge the scope of the EA to heavily weigh consideration of the economic impacts of the mining operation on the State and local economies. | yes |
| 17 | 3/23/2016 | Individual | General Support | | |

| ID# | Date | Organization | Comment Category | Comment | Campaign |
|---|---|---|---|---|---|
| 18 | 3/18/2016 | Interstate PowerSystem | General Support | | |
| 19 | 3/16/2016 | Individual | Economics | In fact, the economic impacts of mining companies are so very important that you must give those impacts great consideration when developing the scope of the Environmental Assessment for the Dry Fork Mine, or any other mine in the State of Wyoming. | |
| 20 | 3/24/2016 | Manpower | General Support | | |
| 21 | 3/28/2016 | USFWS | T&E Species | For species identified by IPAC, you should review the recommendations and measures at http://www.fws.gov/wyoming/species_endangered.php. | |
| 22 | 3/28/2016 | USFWS | Wildlife | Review your Project relative to responsibilities under the Migratory Bird Treaty Act (see http://www.fsw.gov/mountain-prairie/es/wyoming/species_Migratory.php) | |
| 23 | 3/28/2016 | USFWS | Wildlife | Review Avian Power Line Interaction Committee (APLIC) guidelines to avoid and minimize electrocutions and collision (see http://www.aplic.org). | |
| 24 | 3/28/2016 | USFWS | Wetlands | Review your Project relative to responsibilities for wetland protection (see http://www.fws.gov/wyominges/landscapeConservation.php) | |
| 25 | 3/18/206 | Individual | Purpose and Need | The Dry Fork Mine Environmental Assessment should address the critical need to continue to provide coal resources to the area power plants to generate affordable, reliable electricity. | |
| 26 | 3/18/206 | Individual | Economics | Please be sure to address the positives of the jobs and revenues generated by the mining process. | |
| 27 | 3/18/206 | Individual | Purpose and Need | The EA should reflect their good record and enable the company to continue to mine and to serve the region for years to come. | |
| 28 | 4/6/2016 | WYGF | Reclamation | We recommend the mining plan continue to include appropriate WY DEQ/LQD reclamation standards. | |
| 29 | 4/6/2016 | WYGF | Wildlife | In addition, this amendment portion should include the wildlife monitoring protocol with annual reports provided to DEQ in Section D-9. | |

## Public Outreach (Scoping) Comments Categorized by Key Resource Category

| Comment Category | Number of Topics Discussed | % of Total Comments |
|---|---|---|
| Wetlands | 1 | 3% |
| Reclamation | 1 | 3% |
| Threatened and Endangered Species | 1 | 3% |
| Support Coal-fired Power Generation | 2 | 7% |
| Wildlife | 3 | 10% |
| General Support without Specific Topic | 6 | 21% |
| Economic Impacts to Local/State | 15 | 52% |
| Total | **29** | **100%** |

Add a Summary of EA Public Comments as well as a table showing the comments Categorized by Key Resource Category

EA Public Comment Log here

# APPENDIX C

$PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_X$, Hg, CO, and $CO_2e$ CONTRIBUTIONS FROM COAL COMBUSTION CALCULATIONS
(Completed by WWC Engineering)

GREENHOUSE GAS EMISSIONS CALCULATIONS
(Completed by WWC Engineering)

# GHG Calculations Assumptions

## Direct Emissions Variables

| Source | $CO_2e$/Mt Coal Mined |
|---|---|
| FUEL subtotal | 3,266.9 |
| ELECTRICITY subtotal | 2,670.1 |
| PROCESS subtotal | 1,147.7 |

Source: SGAC Calculations (BLM 2009)

## Indirect Emissions Assumptions

Train: 130 Cars/Train, 1/2 aluminum rotary, 1/2 aluminum bottom dump (From BAM)
23 Tons/car empty - 1/2 are 21 tons and 1/2 are 25 tons (BNSF 2016)
119 Tons of Coal/Car (BNSF 2016)
15,470 Tons of Coal/Train (calculated)
200 Tons/locomotive – four per train (BNSF 2016)
3,790 Weight of empty 130-car train (tons) (calculated)
19,260 Weight of loaded coal train (tons) (calculated)

## Transportation Emissions Variables

| Emission Rate | (kg/gal) | $CO_2e$ Conversion Rate | Kg $CO_2e$/Gal Diesel | Kg $CO_2e$/Mile/Ton |
|---|---|---|---|---|
| $CO_2$ | 10.21 | 1 | 10.21 | 0.023417431 |
| $CH_4$ | 0.0000112 | 25 | 0.00028 | 0.000001 |
| $N_2O$ | 0.0000224 | 298 | 0.0066752 | 0.000015 |
| **Total** | | | **10.2169552** | **0.0234** |

Source: Conversion Rate – EPA 2017c
Emission Rate – EPA 2014b

## Transportation Variables

| | Miles/gal/1 Ton[1] | Miles | Kg $CO_2e$/Mile/Ton[2] | Tons | Gal/Train | Kg $CO_2e$/Mile | Kg $CO_2e$/Trip | Metric Tons $CO_2e$/Trip |
|---|---|---|---|---|---|---|---|---|
| Loaded | 436 | 1,090 | 0.0234 | 19,260.0 (Calculated) | 451.3 (Calculated) | 4,611.2 (Calculated) | 5,026,194.3 (Calculated) | 5,026.2 (Calculated) |
| Empty | 436 | 1,090 | 0.0234 | 3,790.0 | 88.8 | 907.4 | 989,059.0 | 989.1 |

[1] FactCheck 2008
[2] EPA 2014b

## DFM Production, 2009-2016

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Average |
|---|---|---|---|---|---|---|---|---|---|
| Production (Tons) | 5,230,000 | 5,450,000 | 5,770,964 | 6,006,787 | 5,433,936 | 5,373,973 | 6,369,206 | 6,135,546 | 5,721,302 |

Source: WDWS (2009 through 2016)

Estimated 2011 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 5.8 | 3,266.9 | 18,853 |
| Electricity | | 2,670.1 | 15,409 |
| Mining Process | | 1,147.7 | 6,623 |
| **Total Direct** | | | **40,886** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 5,770,964 | | |
| 2011 Coal to DFS | 1,008,509 | | |
| 2011 Coal Shipped by Rail | 4,762,455 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 308 | | |
| # Empty Trains/year | 308 | | |
| Rail miles to power plant | 365 | | |
| Kg CO2e/Mi/Loaded Train | 451.3 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 9,979,473.9 | | |
| Kg CO2e/year Loaded | 50,713,632.4 | | |
| Kg CO2e/year Total | 60,693,106.3 | | |
| Total Metric Tons CO2e/year | 60,693 | | |
| Combustion ($CO_2e$) | 9,666,365 | | |
| **Total Indirect $CO_2e$** | **9,727,058** | | |
| **Total Direct + Indirect $CO_2e$** | **9,767,943** | | |

100% Coal shipped to U.S. power plants

Estimated 2012 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 6.0 | 3,266.9 | 19,624 |
| Electricity | | 2,670.1 | 16,039 |
| Mining Process | | 1,147.7 | 6,894 |
| **Total Direct** | | | **42,556** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 6,006,787 | | |
| 2011 Coal to DFS | 2,027,692 | | |
| 2011 Coal Shipped by Rail | 3,979,095 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 257 | | |
| # Empty Trains/year | 257 | | |
| Rail miles to power plant | 192 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 4,386,008.1 | | |
| Kg CO2e/year Loaded | 22,288,790.7 | | |
| Kg CO2e/year Total | 26,674,798.8 | | |
| Total Metric Tons CO2e/year | 26,675 | | |
| Combustion ($CO_2e$) | 10,061,368 | | |
| **Total Indirect $CO_2e$** | **10,088,043** | | |
| **Total Direct + Indirect $CO_2e$** | **10,130,599** | | |

100% Coal shipped to U.S. power plants

Estimated 2013 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 5.4 | 3,266.9 | 19,624 |
| Electricity | | 2,670.1 | 16,039 |
| Mining Process | | 1,147.7 | 6,894 |
| **Total Direct** | | | **42,556** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 5,433,936 | | |
| 2011 Coal to DFS | 1,993,629 | | |
| 2011 Coal Shipped by Rail | 3,440,307 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 222 | | |
| # Empty Trains/year | 222 | | |
| Rail miles to power plant | 250 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 4,937,659.1 | | |
| Kg CO2e/year Loaded | 25,092,167.4 | | |
| Kg CO2e/year Total | 30,029,826.5 | | |
| Total Metric Tons CO2e/year | 30,030 | | |
| Combustion ($CO_2e$) | 9,101,843 | | |
| **Total Indirect $CO_2e$** | **9,131,873** | | |
| **Total Direct + Indirect $CO_2e$** | **9,174,429** | | |

100% Coal shipped to U.S. power plants

Estimated 2014 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 5.4 | 3,266.9 | 17,556 |
| Electricity | | 2,670.1 | 14,349 |
| Mining Process | | 1,147.7 | 6,168 |
| **Total Direct** | | | **38,073** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 5,373,973 | | |
| 2011 Coal to DFS | 2,138,037 | | |
| 2011 Coal Shipped by Rail | 3,235,936 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 209 | | |
| # Empty Trains/year | 209 | | |
| Rail miles to power plant | 142 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 2,637,984.0 | | |
| Kg CO2e/year Loaded | 13,405,692.0 | | |
| Kg CO2e/year Total | 16,043,676.0 | | |
| Total Metric Tons CO2e/year | 16,044 | | |
| Combustion ($CO_2e$) | 9,001,405 | | |
| **Total Indirect $CO_2e$** | **9,017,448** | | |
| **Total Direct + Indirect $CO_2e$** | **9,055,521** | | |

100% Coal shipped to U.S. power plants

Estimated 2015 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 6.4 | 3,266.9 | 20,808 |
| Electricity | | 2,670.1 | 17,006 |
| Mining Process | | 1,147.7 | 7,310 |
| **Total Direct** | | | **45,124** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 6,369,206 | | |
| 2011 Coal to DFS | 2,097,518 | | |
| 2011 Coal Shipped by Rail | 4,271,688 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 276 | | |
| # Empty Trains/year | 276 | | |
| Rail miles to power plant | 132 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 3,237,109.2 | | |
| Kg CO2e/year Loaded | 16,450,322.8 | | |
| Kg CO2e/year Total | 19,687,432.0 | | |
| Total Metric Tons CO2e/year | 19,687 | | |
| Combustion ($CO_2e$) | 10,668,420 | | |
| **Total Indirect $CO_2e$** | **10,688,107** | | |
| **Total Direct + Indirect $CO_2e$** | **10,733,231** | | |

100% Coal shipped to U.S. power plants

Estimated 2016 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 6.1 | 3,266.9 | 20,026 |
| Electricity | | 2,670.1 | 16,368 |
| Mining Process | | 1,147.7 | 7,035 |
| **Total Direct** | | | **43,429** |
| Indirect | | | |
| Rail Transport | | | |
| 2011 Coal Production | 6,135,546 | | |
| 2011 Coal to DFS | 1,829,403 | | |
| 2011 Coal Shipped by Rail | 4,306,143 | | |
| Tons Coal/Train | 15,470 | | |
| Empty Train Tons | 3,790 | | |
| Loaded Train Tons | 19,260 | | |
| # Loaded Trains/year | 278 | | |
| # Empty Trains/year | 278 | | |
| Rail miles to power plant | 141 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.81 | | |
| Kg CO2e/year Empty | 3,485,711.6 | | |
| Kg CO2e/year Loaded | 17,713,669.2 | | |
| Kg CO2e/year Total | 21,199,380.8 | | |
| Total Metric Tons CO2e/year | 21,199 | | |
| Combustion ($CO_2e$) | 10,277,040 | | |
| **Total Indirect $CO_2e$** | **10,298,239** | | |
| **Total Direct + Indirect $CO_2e$** | **10,341,668** | | |

100% Coal shipped to U.S. power plants

## Summary of Estimated BAM 2011-16 $CO_2e$ Emissions

| CO2e Source | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2011 - 2016 Ave. | % From Indirect |
|---|---|---|---|---|---|---|---|---|
| Direct Emissions | | | | | | | | |
| Fuel | 18,853 | 19,624 | 19,624 | 17,556 | 20,808 | 20,026 | 19,415 | 0.0% |
| Electricity | 15,409 | 16,039 | 16,039 | 14,349 | 17,006 | 16,368 | 15,868 | 0.0% |
| Mining Process | 6,623 | 6,894 | 6,894 | 6,168 | 7,310 | 7,035 | 6,821 | 0.0% |
| **Total Direct Emissions** | **40,886** | **42,556** | **42,556** | **38,073** | **45,124** | **43,429** | **42,104** | **0.0%** |
| Indirect Emissions | | | | | | | | |
| Rail Transport | 60,693 | 26,675 | 30,030 | 16,044 | 19,687 | 21,199 | 29,055 | 0.3% |
| Power Plant Combustion | 9,666,365 | 10,061,368 | 9,101,843 | 9,001,405 | 10,668,420 | 10,277,040 | 9,796,073 | 99.7% |
| **Total Indirect Emissions** | **9,727,058** | **10,088,043** | **9,131,873** | **9,017,448** | **10,688,107** | **10,298,239** | **9,825,128** | **100.0%** |
| **Total Emissions** | **9,767,943** | **10,130,599** | **9,174,429** | **9,055,521** | **10,733,231** | **10,341,668** | **9,867,232** | **99.6%** |

Estimated Annual 2017-2053 DFM Equivalent $CO_2e$ (in metric tons)

| **Source** | **Coal (Mt)** | **Ave. Known Ratio (tons/Mt coal)** | **Tons** |
|---|---|---|---|
| Direct | | | |
| Fuel | 6.0 | 3,266.9 | 19,601 |
| Electricity | | 2,670.1 | 16,021 |
| Mining Process | | 1,147.7 | 6,886 |
| **Total Direct** | | | **42,508** |
| Indirect | | | |
| Rail Transport | | | |
| 2017-2053 Coal Production | 6,000,000 | | |
| 2017-2053 Coal to DFS | 2,000,000 | | |
| 2017-2053 Coal Shipped by Rail | 4,000,000 | | |
| Tons Coal/Train | 13,225 | | |
| Empty Train Tons | 35 | | |
| Loaded Train Tons | 13,260 | | |
| # Loaded Trains/year | 302 | | |
| # Empty Trains/year | 302 | | |
| Rail miles to power plant | 216 | | |
| Kg CO2e/Mi/Loaded Train | 451.33 | | |
| Kg CO2e/Mi/Empty Train | 88.8 | | |
| Kg CO2e/year Empty | 5,807,566.7 | | |
| Kg CO2e/year Loaded | 29,512,859.0 | | |
| Kg CO2e/year Total | 35,320,425.7 | | |
| Total Metric Tons CO2e/year | 35,320 | | |
| Combustion ($CO_2e$) | 10,050,000 | | |
| **Total Indirect $CO_2e$** | **10,085,320** | | |
| **Total Direct + Indirect $CO_2e$** | **10,127,829** | | |

100% Coal shipped to U.S. power plants

Summary of Estimated DFM 2017-2053 $CO_2e$ Emissions (in metric tons)

| **$CO_2e$ Source** | **2017-2053 Ave** | **% From Indirect** |
|---|---|---|
| Direct Emissions | | |
| Fuel | 19,601 | 0.0% |
| Electricity | 16,021 | 0.0% |
| Mining Process | 6,886 | 0.0% |
| **Total Direct** | **42,508** | **0.0%** |
| Indirect Emissions | | |
| Rail Transport | 35,320 | 0.4% |
| Power Plant Combustion | 10,050,000 | 99.6% |
| **Total Indirect Emissions** | **10,085,320** | **100.0%** |
| **Total Emissions** | **10,127,829** | **99.6%** |

## Parameters Used to Calculate Combustion Emissions

| | | |
|---|---|---|
| Btu per short ton | 16,890,000 | CEC 2011 |
| tons per kg | 0.00110231 | Conversion |
| tons to generate 1KW-h | 0.000618735 | CEC 2011 |
| tons to generate 1 MW-h | 0.61873467 | Calculated |
| PM10 Emissions per Btu (kg/MW-h) | 0.39 | CEC 2011 |
| PM10 Emissions per Btu (ton/MW-h) | 0.000429901 | Calculated |
| PM2.5 Emissions per Btu (kg/MW-h) | 0.305 | CEC 2011 |
| PM2.5 Emissions per Btu (ton/MW-h) | 0.00013112 | Calculated |
| SOx Emissions factor (lb/ton) | 17.5 | CEC 2011 |
| NOx Emission factor (lb/ton) | 7.2 | CEC 2011 |
| Hg Emission factor (lb/ton) | 0.000083 | CEC 2011 |
| CO Emission factor (lb/ton) | 0.5 | Calculated |

## Combustion Emissions Values

| | **Past Production** | | | | | | **Proposed Action** | **No Action** | **Campbell County[1]** | **US Emissions[2]** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Years** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017-2053** | **2017-2047** | **2011-2016 Avg** | **2015** |
| Tons mined (From CCW) | 5,770,964 | 6,006,787 | 5,433,936 | 5,373,973 | 6,369,206 | 6,135,546 | 6,000,000 | 6,000,000 | 369,718,568.0 | 824,768,000.0 |
| mw-h from coal mined | 9,327,424 | 9,708,577 | 8,782,697 | 8,685,780 | 10,294,343 | 9,916,686 | 9,697,608 | 9,697,608 | 597,564,269 | 1,333,046,078.5 |
| PM10 Emissions | 4,009.9 | 4,173.7 | 3,775.7 | 3,734.0 | 4,425.5 | 4,263.2 | 4,169.0 | 4,169.0 | 256,893.4 | 573,077.7 |
| PM 2.5 Emissions | 1,223.0 | 1,273.0 | 1,151.6 | 1,138.9 | 1,349.8 | 1,300.3 | 1,271.5 | 1,271.5 | 78,352.5 | 174,788.7 |
| SO2 Emissions | 50,495.9 | 52,559.4 | 47,546.9 | 47,022.3 | 55,730.6 | 53,686.0 | 52,500.0 | 52,500.0 | 3,235,037.5 | 7,216,720.0 |
| NOx Emissions | 20,775.5 | 21,624.4 | 19,562.2 | 19,346.3 | 22,929.1 | 22,088.0 | 21,600.0 | 21,600.0 | 1,330,986.8 | 2,969,164.8 |
| Hg Emissions | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 15.3 | 34.2 |
| CO Emissions | 1,442.7 | 1,501.7 | 1,358.5 | 1,343.5 | 1,592.3 | 1,533.9 | 1,500.0 | 1,500.0 | 92,429.6 | 206,192.0 |

# APPENDIX D

SURFACE WATER RIGHTS WITHIN 2 MILES of the A2Tr1 TRACT

GROUNDWATER RIGHTS WITHIN 2 MILES of the A2Tr1 TRACT

## Surface Water Rights within 2 Miles of A2Tr1 Tract

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | Facility Name | Status | Stream Source | Uses |
|---|---|---|---|---|---|---|---|---|---|---|
| P4492.0S | 03/06/1962 | 050N | 071W | 4 | NWNW | EUGENESPRINGEN | CHRIS STOCK RESERVOIR | Complete | Chris Draw | STO |
| P4493.0S | 03/06/1962 | 050N | 071W | 4 | SESW | EUGENESPRINGEN | KENIS STOCK RESERVOIR | Complete | Garner Lake Draw | STO |
| CR CR05/145 | 03/06/1962 | 050N | 071W | 4 | SESW | EUGENE D.SPRINGEN | Kenis Stock Reservoir | | Garner Lake Draw | STO |
| CR CR05/147 | 03/06/1962 | 050N | 071W | 4 | NWNW | EUGENE DSPRINGEN | Chris Stock Reservoir | | Chris Draw | STO |
| P2618.0S | 01/19/1959 | 050N | 071W | 8 | NWSW | O. H.KENITZER | SPRING STOCK RESERVOIR | Complete | Spring Draw | |
| CR CR02/339 | 01/19/1959 | 050N | 071W | 8 | NWSW | O. H.KENITZER | Spring Stock Reservoir | | Spring Draw | STO |
| P5275.0S | 05/27/1963 | 050N | 072W | 1 | NWSE | BASIN ELECTRIC POWER COOP | RATTLESNAKE STOCK RESERVOIR | Complete | Rattlesnake Draw | STO |
| P1697.0S | 11/19/1956 | 050N | 072W | 12 | NWSE | BASIN ELECTRIC POWER COOP | DUBOIS STOCK RESERVOIR | Complete | Little Powder River | STO |
| P12395.0D | 05/04/1914 | 051N | 071W | 20 | NESW | Nellie A.Wilson | Nellie A. Wilson Ditch | Fully Adjudicated | Prairie Creek | IRR_SW |
| P2281.0D | 09/16/1899 | 051N | 071W | 20 | SESE | C.A.MOYER | Lake Ditch | Fully Adjudicated | North Creek | IRR_SW |
| P2646.0R | 05/04/1914 | 051N | 071W | 20 | NESW | NELLIEWILSON | WILSON RESERVOIR | Complete | Prairie Creek | IRR_SW |
| CR CC13/046 | 09/16/1899 | 051N | 071W | 20 | SESE | C AMOYER | LAKE DITCH | Fully Adjudicated | North Creek | IRR_SW |
| CR CC38/033 | 05/04/1914 | 051N | 071W | 20 | NESW | NELLIE AWILSON | Nellie A. Wilson Ditch | | Prairie Creek | IRR_SW |
| CR CR38/034 | 05/04/1914 | 051N | 071W | 20 | NESW | NELLIE AWILSON | Wilson Reservoir | | Prairie Creek | IRR_SW |
| P6530.0S | 11/28/1969 | 051N | 071W | 21 | NWNE | ELMORE LIVESTOCK | ELMORE #6 STOCK RESERVOIR | Complete | Little Powder River | STO |
| P6532.0S | 11/28/1969 | 051N | 071W | 21 | NWNE | ELMORE LIVESTOCK | ELMORE #8 STOCK RESERVOIR | Complete | Little Powder River | STO |
| P5725.0S | 10/12/1966 | 051N | 071W | 27 | NWSW | TOTAL CONSTRUCTION | ELMORE #1 STOCK RESERVOIR | Complete | Elmore Draw | STO |
| P6529.0S | 11/28/1969 | 051N | 071W | 28 | NWNE | ELMORE LIVESTOCK | ELMORE #5 STOCK RESERVOIR | Complete | Elmore Draw | STO |
| P8898.0R | 08/22/1984 | 051N | 071W | 32 | SENW | LANDRICA DEVELOPMENT CO. | RAILROAD LOOP TS-1 CONTAINMENT RESERVOIR | Complete | Railroad Loop Draw (Drainage of) | CNG_SW; IND_SW |
| P13782.0R | 04/12/2010 | 051N | 071W | 32 | SENE | LANDRICA DEVELOPMENT COMPANY | FACILITIES AREA SEDIMENT POND #7 RESERVOIR | Complete | Facilities Area Draw | IND_SW |
| P13783.0R | 04/19/2010 | 051N | 071W | 32 | SENW | LANDRICA DEVELOPMENT COMPANY | RAILROAD LOOP SEDIMENT POND #6 RESERVOIR | Complete | Railroad Loop Draw | IND_SW |
| P8020.0R | 03/27/1979 | 051N | 071W | 33 | NENW | GREEN BRIDGE HOLDINGS INC | FT. UNION SEDIMENT POND NO. 4 RESERVOIR | Complete | Little Prairie Creek | IND_SW; STO |
| P5798.0S | 01/11/1967 | 051N | 071W | 34 | NWNE | EUGENE D AND PHYLLISSPRINGEN | BLACK BUTTE STOCK RESERVOIR | Complete | Elmore Draw | STO |
| CR CR05/146 | 01/11/1967 | 051N | 071W | 34 | NWNE | EUGENE DSPRINGEN | Black Butte Stock Reservoir | | Elmore Draw | STO |
| P11561.0D | 11/13/1912 | 051N | 072W | 25 | SWNW | A. S.FRENCH | Rabbit Ditch | | Rabbit Draw | IRR_SW |
| P13200.0D | 07/10/1915 | 051N | 072W | 25 | SESW | ANDREW S.FRENCH | Duck Ditch | | Little Powder River | IRR_SW |
| CR CC36/246 | 11/13/1912 | 051N | 072W | 25 | SWSW | A. S.FRENCH | Sage Hen Ditch | | Sage Hen Draw | IRR_SW |

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | Facility Name | Status | Stream Source | Uses |
|---|---|---|---|---|---|---|---|---|---|---|
| CR CR36/247 | 11/13/1912 | 051N | 072W | 25 | SWSW | A. S.FRENCH | Sage Hen Reservoir | | Sage Hen Draw | IRR_SW |
| P11562.0D | 11/13/1912 | 051N | 072W | 26 | SWSW | A.S.FRENCH | Sage Hen Ditch | | Sage Hen Draw | IRR_SW |
| P12220.0D | 04/12/1913 | 051N | 072W | 36 | SWNW | A.S.FRENCH | Moyer | | Dry Fork Little Powder River | IRR_SW |
| P2576.0R | 04/12/1913 | 051N | 072W | 36 | SWNW | A SFRENCH | MOYER RESERVOIR | Complete | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| P2577.0R | 04/12/1913 | 051N | 072W | 36 | SWNW | A SFRENCH | STORAGE RESERVOIR | Complete | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| CR CR37/324 | 04/12/1913 | 051N | 072W | 36 | SWNW | A. S.FRENCH | Storage Reservoir | | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| CR CR37/325 | 04/12/1913 | 051N | 072W | 36 | SWNW | A. S.FRENCH | Moyer Reservoir | | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| CR CR37/326 | 04/12/1913 | 051N | 072W | 36 | SWNW | LUELLAMOYER | Storage Reservoir | | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| CR CR37/327 | 04/12/1913 | 051N | 072W | 36 | SWNW | LUELLAMOYER | Moyer Reservoir | | Dry Fork Little Powder River | DOM_SW; IRR_SW |
| CR CC37/336 | 04/12/1913 | 051N | 072W | 36 | SWNW | LUELLAMOYER | Moyer | | Dry Fork Little Powder River | IRR_SW |
| CR CC37/337 | 04/12/1913 | 051N | 072W | 36 | SWNW | A. S.FRENCH | Moyer | | Dry Fork Little Powder River | IRR_SW |

## Groundwater Rights within 2 Miles of A2Tr1 Tract

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | FacilityName | Status | Uses | Yld. | TD (Ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P22983.0P | 07/31/1963 | 050N | 071W | 3 | NWSE | PHYLLIS A. SPRINGEN | SPRINGEN #1 | Complete | STK | 10 | 420 |
| P204916.0W | 11/17/2015 | 050N | 071W | 3 | NENE | ERIC FALLON | FALLON #1 | Incomplete | DOM_GW; STK | 25 | |
| P22987.0P | 12/31/1944 | 050N | 071W | 4 | SENW | PHYLLIS A. SPRINGEN | SPRINGEN #5 | Complete | STK | 15 | 90 |
| P21674.0P | 03/31/1955 | 050N | 071W | 5 | SWNW | Arthur J. & Edna E. Burkhardt | JINGLES #1 | Complete | STK | 10 | 80 |
| P21676.0P | 12/31/1925 | 050N | 071W | 5 | SWNW | Arthur J. & Edna E. Burkhardt | JINGLES #2 | Complete | DOM_GW; STK | 15 | 60 |
| P21677.0P | 09/30/1943 | 050N | 071W | 5 | NWSW | Arthur J. & Edna E. Burkhardt | CORRAL #1 | Complete | STK | 4 | 100 |
| P40362.0W | 08/29/1977 | 050N | 071W | 5 | SENW | ARTHUR BURKHARDT | JACK #1 | Complete | STK | 10 | 300 |
| P6536.0W | 09/18/1970 | 050N | 071W | 5 | NWSW | ARTHUR J. BURKHARDT | JINGLES #1 | Complete | STK | 3 | 744 |
| P24358.0W | 09/10/1973 | 050N | 071W | 6 | NENW | JEAN M. RYAN | JEAN M RYAN #2 | Complete | STK | 5 | 50 |
| P24662.0P | 09/10/1973 | 050N | 071W | 6 | SWNE | JOE KAWULOK | JAY KAY #1 | Complete | STK | 10 | 250 |
| P24663.0P | 09/10/1973 | 050N | 071W | 6 | SESE | JOE KAWULOK | JAY KAY #2 | Complete | STK | 3 | 240 |
| P24664.0P | 09/10/1973 | 050N | 071W | 6 | SWSE | JOE KAWULOK | JAY KAY #3 | Complete | STK | 2 | 80 |
| P31460.0W | 11/06/1975 | 050N | 071W | 6 | SENE | JOE KAWULOK | BINKY #1 | Complete | DOM_GW; STK | 20 | 700 |
| P33655.0W | 06/04/1976 | 050N | 071W | 7 | NENE | Carter Oil Co. | TCOC #201 | Complete | STK | 25 | 292 |
| CR UW03/300 | 12/08/1975 | 050N | 071W | 9 | SENW | WYO BOARD LAND COMMISSIONERS | EAST GILLETTE MINE #6 | | MIS | 30 | |
| CR UW03/301 | 01/05/1976 | 050N | 071W | 9 | SENW | WYO BOARD LAND COMMISSIONERS | EAST GILLETTE MINE #10 | | MIS | 100 | |
| CR UW04/194 | 05/19/1978 | 050N | 071W | 9 | NESW | WYO BOARD LAND COMMISSIONERS | EAST GILLETTE MINE #13 | | MIS | 125 | |
| P32378.0P | 03/03/1976 | 050N | 071W | 10 | SENW | WANDA L. BRICKER | BRICKER #1 | Complete | STK | 5 | 235 |
| P191997.0W | 12/21/2009 | 050N | 071W | 10 | NWNW | CRYSTAL PLUMB | PLUMB #1 STOCK WELL | Complete | STK | 15 | 565 |
| P193976.0W | 09/24/2010 | 050N | 071W | 10 | NWNW | CRYSTAL PLUMB | ENL PLUMB #1 STOCK WELL | Complete | STK | 0 | |
| P104994.0W | 02/06/1997 | 050N | 072W | 1 | SWSW | JIMS WATER SERVICE, INC | FORT UNION LTD 1-14-1 | Complete | CBM | 27 | 329 |
| P40835.0W | 11/16/1977 | 050N | 072W | 1 | SWNE | CARTER OIL COMPANY | PT 2 | Complete | MON | 0 | 270 |
| P105275.0W | 03/17/1997 | 050N | 072W | 2 | NWSW | JIMS WATER SERVICE, INC | DRY FORK COAL 1-13-2 | Complete | CBM | 26.5 | 373 |
| P111496.0W | 08/17/1998 | 050N | 072W | 2 | NWSW | Lance Oil & Gas Co. | Enl Dry Fork Coal 1-13-2 | Incomplete | CBM; MIS; STK | | |
| P178174.0W | 10/26/2006 | 050N | 072W | 2 | NESW | HIGH PLAINS GAS, LLC | DRY FORK 23-2-5072 | Complete | CBM; MIS | 32 | 372 |
| P178689.0W | 11/14/2006 | 050N | 072W | 2 | NWNW | HIGH PLAINS GAS, LLC | EAGLE BUTTE 11-2-5072 | Incomplete | CBM; MIS | 60 | |
| P101308.0W | 12/18/1995 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES INC | ENL MAKI NO. 1 WELL | Fully Adjudicated | MIS | 35 | 1,620 |

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | FacilityName | Status | Uses | Yld. | TD (Ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P105001.0W | 02/06/1997 | 050N | 072W | 11 | NENW | JIMS WATER SERVICE, INC | BARBARA B HOGUE TRUST 4-21-11 | Complete | CBM | 26 | 380 |
| P131454.0W | 11/22/2000 | 050N | 072W | 11 | NWSW | WESTERN GAS RESOURCES, INC. | MGU NO.9 11-50N-72W | | CBM; STK | 0 | 8,220 |
| P132906.0W | 01/25/2001 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES INC | ENL MAKI NO. 1 WELL | Fully Adjudicated | MIS | 5 | |
| P132907.0W | 01/25/2001 | 050N | 072W | 11 | SENW | WRANGLER ESTATES INC | MAKI #2 | Fully Adjudicated | MIS | 35 | 2,100 |
| P141488.0W | 12/27/2001 | 050N | 072W | 11 | NWNW | THUNDER CREEK GAS SERVICES, LLC | TC-MW1 | Complete | MON | 0 | 26 |
| P141489.0W | 12/27/2001 | 050N | 072W | 11 | NWNW | THUNDER CREEK GAS SERVICES, LLC | TC-MW2 | Complete | MON | 0 | 26 |
| P141490.0W | 12/27/2001 | 050N | 072W | 11 | NWNW | THUNDER CREEK GAS SERVICES, LLC | TC-MW3 | Complete | MON | 0 | 33 |
| P141491.0W | 12/27/2001 | 050N | 072W | 11 | NWNW | THUNDER CREEK GAS SERVICES, LLC | TC-MW4 | Complete | MON | 0 | 26 |
| P154686.0W | 10/23/2003 | 050N | 072W | 11 | NENW | THUNDER CREEK GAS SERVICES, LLC | TC-MW5-TC-MW14 | Complete | MON | 0 | 33 |
| P154687.0W | 10/23/2003 | 050N | 072W | 11 | NWNW | THUNDER CREEK GAS SERVICES, LLC | TC-MW15-TC-MW21 | Complete | MON | 0 | 34 |
| P20318.0W | 03/13/1973 | 050N | 072W | 11 | SWSE | ROBERT MAUL | MAUL #1 | Complete | DOM_GW | 20 | 420 |
| P34327.0W | 07/16/1976 | 050N | 072W | 11 | SWSE | SHELDON ANDERSON | WRIGHT #1 | Complete | DOM_GW | 20 | 168 |
| P66935.0W | 04/12/1984 | 050N | 072W | 11 | SWSE | WALLY & GEORGIA CASH | CASH #1 | Complete | DOM_GW | 24 | 1,228 |
| P69546.0W | 03/07/1985 | 050N | 072W | 11 | SWSW | TERRY & BONNIE GLADSON | 1 GLADSON | Complete | DOM_GW | 10 | 638 |
| P70505.0W | 06/27/1985 | 050N | 072W | 11 | SWSE | WALLY & GEORGIA CASH | ENL CASH #1 | Complete | STK | 0 | 1,228 |
| P93598.0W | 12/01/1993 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES INC | MAKI NO. 1 WELL | Fully Adjudicated | DOM_GW; STK | 25 | 1,620 |
| P95667.0W | 06/20/1994 | 050N | 072W | 11 | NWSW | Wyo State Water Development Commission | G-MON-7 | Complete | MON | 0 | 1,584 |
| P189564.0W | 08/11/2008 | 050N | 072W | 11 | NWSW | RODNEY MAKI | 3RD ENL. MAKI #1 | Incomplete | MIS | 85 | |
| P189569.0W | 12/22/2008 | 050N | 072W | 11 | NWSW | RODNEY MAKI | 1ST ENL MAKI #2 | Incomplete | MIS | 0 | |
| CR UW15/180 | 12/01/1993 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES, INC. | MAKI NO. 1 WELL | Fully Adjudicated | DOM_GW; STK | 25 | |
| CR UW15/181 | 12/18/1995 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES, INC. | ENL. MAKI NO. 1 WELL | Incomplete | MIS | 35 | |
| CR UW15/182 | 08/11/1998 | 050N | 072W | 11 | NWSE | PHILIP HOY | PHILIP'S NO. 2 WELL | Fully Adjudicated | MIS | 50 | |
| CR UW15/183 | 01/25/2001 | 050N | 072W | 11 | NWSW | WRANGLER ESTATES, INC. | ENL. MAKI NO. 1 WELL | Fully Adjudicated | MIS | 5 | |
| CR UW15/184 | 01/25/2001 | 050N | 072W | 11 | SENW | WRANGLER ESTATES, INC. | MAKI NO. 2 WELL | Fully Adjudicated | MIS | 35 | |
| P107571.0W | 07/28/1997 | 050N | 072W | 12 | NESW | JIMS WATER SERVICE, INC | FORT UNION LTD. 4-23-12 | Complete | CBM | 24 | 178 |
| P107573.0W | 07/28/1997 | 050N | 072W | 12 | NWNE | JIMS WATER SERVICE, INC | FORT UNION LTD. 5-31-12 | Complete | CBM | 23.5 | 305 |
| P107574.0W | 07/28/1997 | 050N | 072W | 12 | NENW | JIMS WATER SERVICE, INC | FORT UNION LTD. 2-21-12 | Complete | CBM | 26 | 275 |
| P168472.0W | 06/06/2005 | 050N | 072W | 12 | SWSE | L & J OPERATING, INC | KLUVER 15-12 (API NUMBER 551178) | | CBM; IRR_GW | 5.5 | |

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | FacilityName | Status | Uses | Yld. | TD (Ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P43845.0W | 06/13/1978 | 051N | 071W | 20 | SESE | DELZER CONST | 21-13C-OB2 | | MIS | 0 | 85 |
| P53133.0W | 07/25/1980 | 051N | 071W | 20 | SWNW | GLADYS STEPHENSON | S W 1 | Complete | MON | 0 | 160 |
| P22990.0P | 12/31/1943 | 051N | 071W | 27 | NWNE | PHYLLIS A. SPRINGEN | SPRINGEN #8 | Complete | STK | 7.5 | 5 |
| P107860.0W | 10/15/1997 | 051N | 071W | 28 | SENE | BELLE FOURCHE PIPELINE CO. | ER-1 | Complete | MON | 0 | 20 |
| P107861.0W | 10/15/1997 | 051N | 071W | 28 | SENE | BELLE FOURCHE PIPELINE CO. | ER-2 | Complete | MON | 0 | 20 |
| P107862.0W | 10/15/1997 | 051N | 071W | 28 | SENE | BELLE FOURCHE PIPELINE CO. | ER-3 | Complete | MON | 0 | 20 |
| P107863.0W | 10/15/1997 | 051N | 071W | 28 | NESE | BELLE FOURCHE PIPELINE CO. | ER-4 | Complete | MON | 0 | 20 |
| P14810.0W | 07/21/1972 | 051N | 071W | 28 | NESE | Amoco Production Co. | SPRINGEN RANCH WATER SUPPLY #2 | Fully Adjudicated | IND_GW | 450 | 3,620 |
| P22985.0P | 12/31/1944 | 051N | 071W | 28 | NENW | PHYLLIS A. SPRINGEN | SPRINGEN #3 | Complete | STK | 15 | 85 |
| P22988.0P | 12/31/1955 | 051N | 071W | 28 | SENW | PHYLLIS A. SPRINGEN | SPRINGEN #6 | Complete | DOM_GW; STK | 15 | 25 |
| P22989.0P | 12/31/1953 | 051N | 071W | 28 | SENW | PHYLLIS A. SPRINGEN | SPRINGEN #7 | Complete | DOM_GW | 15 | 25 |
| P5227.0W | 04/10/1970 | 051N | 071W | 28 | SESE | N. C. GINTHER GASOLINE PLANTS | GINTHER #1 | | DOM_GW; IND_GW | 10 | 578 |
| P56344.0W | 08/11/1980 | 051N | 071W | 28 | NWNW | ELMORE LIVESTOCK COMPANY | FT UNION #2 E | Complete | STK | 25 | 22 |
| CR UW02/296 | 07/21/1972 | 051N | 071W | 28 | NESE | AMOCO PRODUCTION CO. | SPRINGEN RANCH WATER SUPPLY #2 | | IND_GW | 450 | |
| P182018.0W | 04/25/2007 | 051N | 071W | 29 | NENW | BASIN ELECTRIC POWER COOPERATIVE | LANCE-FOX HILLS MONITOR #1 | Complete | MON | 0 | 3,754 |
| P182039.0W | 08/18/2006 | 051N | 071W | 29 | SENW | BASIN ELECTRIC POWER COOPERATIVE | LANCE-FOX HILLS NO. 2 WELL | Fully Adjudicated | IND_GW; MIS | 525 | 3,628 |
| P22991.0P | 12/31/1955 | 051N | 071W | 29 | SENE | PHYLLIS A. SPRINGEN | SPRINGEN #9 | Complete | STK | 7.5 | 130 |
| CR UW19/271 | 08/18/2006 | 051N | 071W | 29 | SENW | BASIN ELECTRIC POWER COOPERATIVE | LANCE-FOX HILLS NO. 2 | Fully Adjudicated | IND_GW; MIS | 525 | |
| P27745.0W | 08/15/1974 | 051N | 071W | 30 | NWNE | | PEABODY T H C | | MIS | -1 | 171 |
| P130688.0W | 11/03/2000 | 051N | 071W | 31 | NWNE | RMG I, LLC | WALLS 31-31-A | Complete | CBM | 25 | 398 |
| P131854.0W | 12/29/2000 | 051N | 071W | 31 | NWNE | RMG I, LLC | ENL Walls 31-31-A | Complete | CBM | 75 | 398 |
| P131855.0W | 12/29/2000 | 051N | 071W | 31 | SWNE | RMG I, LLC | ENL Walls 31-32-A | Complete | CBM | 75 | 453 |
| P131856.0W | 12/29/2000 | 051N | 071W | 31 | NWSE | RMG I, LLC | ENL Walls 31-33 | Complete | CBM | 75 | 571 |
| P6523.0P | 12/31/1949 | 051N | 071W | 31 | SWSE | GLENN M. GROVES | SHAW #1 | Complete | STK | 2 | 180 |
| P6525.0P | 08/21/1968 | 051N | 071W | 31 | SWSW | JEAN RYAN | RYAN #1 | Complete | STK | 10 | 19 |
| P101307.0W | 11/13/1995 | 051N | 071W | 32 | SWSE | LANDRICA DEVELOPMENT COMPANY | KFX-4 | Fully Adjudicated | MIS | 200 | 1,747 |
| P101309.0W | 01/05/1996 | 051N | 071W | 32 | NWNE | LANDRICA DEVELOPMENT COMPANY | MED #3 | Fully Adjudicated | MIS | 25 | 144 |
| P107664.0W | 09/17/1997 | 051N | 071W | 32 | NWSE | LANDRICA DEVELOPMENT COMPANY | ENL KFX-4 | Fully Adjudicated | IND_GW; MIS | 20 | 1,747 |

| Permit No. | Priority | Twn | Rng | Sec | Qtr-Qtr | Applicant | FacilityName | Status | Uses | Yld. | TD (Ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P108950.0W | 02/20/1998 | 051N | 071W | 32 | SWNE | GREEN BRIDGE HOLDINGS, INC | KFP-1 | Complete | MON | 0 | 137 |
| P2267.0W | 07/26/1968 | 051N | 071W | 32 | SWSW | GLENN M. GROVES | GROVES #1 | Complete | DOM_GW; STK | 18 | 738 |
| P26527.0W | 04/29/1974 | 051N | 071W | 32 | NESE | REX MONAHAN | SPRINGEN RANCH MUDDY FORMATION UNIT BATTERY #2 | | IND_GW | 300 | -1 |
| P6524.0P | 12/11/1959 | 051N | 071W | 32 | SWSW | GLENN M. GROVES | SHAW #2 | Complete | STK | 2 | 311 |
| P76017.0W | 11/19/1987 | 051N | 071W | 32 | NWSE | LANDRICA DEVELOPMENT COMPANY | ENERGY BROTHERS #1 | Fully Adjudicated | MIS | 45 | 843 |
| CR UW10/294 | 01/05/1996 | 051N | 071W | 32 | NWNE | ENERGY DEVELOPMENT CO. | MED #3 | | MIS | 25 | |
| CR UW10/338 | 11/13/1995 | 051N | 071W | 32 | | ENERGY DEVELOPMENT CO. | KFX-4 | | IND_GW; MIS | 200 | |
| CR UW10/339 | 09/17/1997 | 051N | 071W | 32 | | ENERGY DEVELOPMENT CO. | ENL KFX-4 | | IND_GW; MIS | 20 | |
| P197516.0W | 02/17/2012 | 051N | 071W | 32 | NWNE | QUALITY ENVIRONMENTAL TECH SOLUTIONS, LLC | QE #1 | Incomplete | MIS | 25 | |
| P21675.0P | 12/31/1943 | 051N | 071W | 33 | SESW | Arthur J. & Edna E. Burkhardt | JINGLES #3 | Complete | STK | 4 | 230 |
| P22986.0P | 12/31/1944 | 051N | 071W | 33 | NWNW | PHYLLIS A. SPRINGEN | SPRINGEN #4 | Complete | STK | 15 | 100 |
| P26526.0W | 04/29/1974 | 051N | 071W | 33 | NENE | REX L. MONAHAN | SPRINGEN RANCH MUDDY FORMATION UNIT BATTERY #1 | | IND_GW | 250 | -1 |
| P43849.0W | 06/13/1978 | 051N | 071W | 33 | NWNW | GREEN BRIDGE HOLDINGS, INC | EP 01A | Complete | MON | 0 | 75 |
| P43861.0W | 06/13/1978 | 051N | 071W | 33 | SESE | GREEN BRIDGE HOLDINGS, INC | EP-11 | Complete | MON | 0 | 140 |
| P9928.0W | 07/26/1971 | 051N | 071W | 33 | NENE | LANDRICA DEVELOPMENT COMPANY | SPRINGEN RANCH WATER SUPPLY WELL NO. 1 | Fully Adjudicated | IND_GW | 510 | 3,685 |
| CR UW02/292 | 07/26/1971 | 051N | 071W | 33 | NENE | AMOCO PRODUCTION CO. | SPRINGEN RANCH WATER SUPPLY #1 | | IND_GW | 625 | |
| P22984.0P | 08/31/1960 | 051N | 071W | 34 | NENW | PHYLLIS A. SPRINGEN | SPRINGEN #2 | Complete | STK | 10 | 52 |
| P140135.0W | 10/16/2001 | 051N | 072W | 25 | NENE | RMG I, LLC | RAG FED 25-41A | Complete | CBM | 100 | 701 |
| P178179.0W | 10/26/2006 | 051N | 072W | 26 | SESE | HIGH PLAINS GAS, LLC | DRY FORK 44-26-5172 | Complete | CBM; MIS | 46 | 322 |
| P178183.0W | 10/26/2006 | 051N | 072W | 35 | SWSE | HIGH PLAINS GAS, LLC | DRY FORK 34-35-5172 | Complete | CBM; MIS | 60 | 360 |
| P178184.0W | 10/26/2006 | 051N | 072W | 35 | SENE | HIGH PLAINS GAS, LLC | DRY FORK 42-35-5172 | Complete | CBM; MIS | 54 | 217 |
| P178185.0W | 10/26/2006 | 051N | 072W | 35 | NESE | HIGH PLAINS GAS, LLC | DRY FORK 43-35-5172 | Complete | CBM; MIS | 50 | 244 |
| P178186.0W | 10/26/2006 | 051N | 072W | 35 | SESE | HIGH PLAINS GAS, LLC | DRY FORK 44-35-5172 | Complete | CBM; MIS | 60 | 260 |
| P58261.0W | 07/07/1981 | 051N | 072W | 36 | NESW | Wyo State Office of Lands & Investments | DF 48 | Complete | MON | 0 | 210 |
| P58262.0W | 07/07/1981 | 051N | 072W | 36 | NWNW | Wyo State Office of Lands & Investments | DF 49 | Complete | MON | 0 | 220 |
| P69750.0W | 04/21/1985 | 051N | 072W | 36 | SESE | MASEK OIL COMPANY | MILL GILLETTE UNIT #2 | | IND_GW | 30 | 8,083 |

# APPENDIX E

DRY FORK MINE OBSERVED WILDLIFE SPECIES LIST
SPECIAL STATUS SPECIES SUMMARY TABLE
FOR FEDERAL LEASE MODIFICATION APPROVAL
WYW-0271199, WYW-0271200

## Campbell County Species of Concern

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| Amphibians | Tiger Salamander | *Ambystoma mavortium* | No | | | | | S4 | G5 |
| Amphibians | Great Plains Toad | *Anaxyrus cognatus* | No | | | | NSSU (U) | S3 | G5 |
| Amphibians | Northern Leopard Frog | *Lithobates pipiens* | No | Not Warranted for Listing (NW) | Sensitive | Region 2 Sensitive | NSSU (U) | S3 | G5 |
| Amphibians | Plains Spadefoot | *Spea bombifrons* | No | | | | NSSU (U) | S4 | G5 |
| Birds | Northern Goshawk | *Accipiter gentilis* | No | Not Warranted for Listing (NW) | Sensitive | Region 4 Sensitive | NSSU (U) | S2B;S3N | G5 |
| Birds | Baird's Sparrow | *Ammodramus bairdii* | No | | Sensitive | | | S1?B | G4 |
| Birds | Grasshopper Sparrow | *Ammodramus savannarum* | Yes | MBCC | | Region 2 Sensitive | NSS4 (Bc) | S4 | G5 |
| Birds | Sprague's Pipit | *Anthus spragueii* | No | Not Warranted for Listing (NW) | | | | SNA | G4 |
| Birds | Golden Eagle | *Aquila chrysaetos* | Yes | MBCC | | | | S4B;S4N | G5 |
| Birds | Sagebrush Sparrow | *Artemisiospiza nevadensis* | No | | Sensitive | Region 2 Sensitive | NSS4 (Bc) | S3 | G5 |
| Birds | Short-eared Owl | *Asio flammeus* | Yes | MBCC | Sensitive | | NSS4 (Bc) | S2 | G5 |
| Birds | Burrowing Owl | *Athene cunicularia* | Yes | MBCC | Sensitive | Region 2 Sensitive | NSSU (U) | S4B | G4 |
| Birds | Ring-necked Duck | *Aythya collaris* | No | | | | | S4B | G5 |
| Birds | Upland Sandpiper | *Bartramia longicauda* | Yes | MBCC | | | NSSU (U) | S3B | G5 |
| Birds | American Bittern | *Botaurus lentiginosus* | No | MBCC | | Region 2 Sensitive | NSS3 (Bb) | S3B | G4 |
| Birds | Bufflehead | *Bucephala albeola* | No | | | | | S2B | G5 |
| Birds | Common | *Bucephala clangula* | Yes | | | | | S3B | G5 |

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| | Goldeneye | | | | | | | | |
| Birds | Ferruginous Hawk | *Buteo regalis* | Yes | MBCC | Sensitive | Region 2 Sensitive | NSSU (U) | S4B;S5N | G4 |
| Birds | Swainson's Hawk | *Buteo swainsoni* | Yes | MBCC | | | | S4B | G5 |
| Birds | Chestnut-collared Longspur | *Calcarius ornatus* | Yes | | | Region 2 Sensitive | NSS4 (Bc) | S1 | G5 |
| Birds | Greater Sage-Grouse | *Centrocercus urophasianus* | Yes | Not Warranted for Listing (NW) MBCC | Sensitive | Region 4 Sensitive | NSS2 (Ba) | S4 | G3G4 |
| Birds | Mountain Plover | *Charadrius montanus* | No | Not Warranted for Listing (NW) MBCC | Sensitive | Region 2 Sensitive | NSSU (U) | S2B;S3B | G3 |
| Birds | Black-billed Cuckoo | *Coccyzus erythropthalmus* | No | | | | | S2 | G5 |
| Birds | Bobolink | *Dolichonyx oryzivorus* | No | | | | NSS4 (Bc) | S2 | G5 |
| Birds | Merlin | *Falco columbarius* | Yes | | | | NSSU (U) | S3B;S4N | G5 |
| Birds | Prairie Falcon | *Falco mexicanus* | Yes | MBCC | | | | | |
| Birds | Peregrine Falcon | *Falco peregrinus* | No | Delisted; formally monitored (DM) | Sensitive | Region 4 Sensitive | NSS3 (Bb) | S2 | G4 |
| Birds | Common Loon | *Gavia immer* | No | | | Region 4 Sensitive | NSS1 (Aa) | S1B;S2N | G5 |
| Birds | Whooping Crane | *Grus americana* | No | Listed Endangered (LE); and Endangered - Nonessential Experimental Population (LEXN) | | | | SH | G1 |
| Birds | Sandhill Crane | *Grus canadensis* | No | | | | NSS4 (Bc) | S3B;S5N | G5 |

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Pinyon Jay | *Gymnorhinus cyanocephalus* | No | MBCC | | | | | |
| Birds | Bald Eagle | *Haliaeetus leucocephalus* | Yes | Delisted; formally monitored (DM) MBCC | Sensitive | Region 4 Sensitive | NSS2 (Ba) | S3B;S5N | G5 |
| Birds | Black-necked Stilt | *Himantopus mexicanus* | No | | | | | S3B | G5 |
| Birds | Dark-eyed Junco | *Junco hyemalis* | No | | | | | S5B;S5N | G5 |
| Birds | White-winged Junco | *Junco hyemalis aikeni* | Yes | | | | | S3S5BS5N | G5T4 |
| Birds | Loggerhead Shrike | *Lanius ludovicianus* | Yes | MBCC | Sensitive | Region 2 Sensitive | | S3 | G4 |
| Birds | Herring Gull | *Larus argentatus* | Yes | | | | | SNA | G5 |
| Birds | California Gull | *Larus californicus* | No | | | | | S2B | G5 |
| Birds | Ring-billed Gull | *Larus delawarensis* | No | MBCC | | | | S2 | G5 |
| Birds | Black Rosy-Finch | *Leucosticte atrata* | No | MBCC | | | NSSU (U) | S3S5BS5N | G4 |
| Birds | Eastern Screech-Owl | *Megascops asio* | No | | | | | S3 | G5 |
| Birds | Lewis's Woodpecker | *Melanerpes lewis* | No | | | Region 2 Sensitive | NSSU (U) | S2 | G4 |
| Birds | Long-billed Curlew | *Numenius americanus* | Yes | MBCC | Sensitive | Region 2 Sensitive | NSS3 (Bb) | S3B | G5 |
| Birds | Sage Thrasher | *Oreoscoptes montanus* | Yes | MBCC | Sensitive | | NSS4 (Bc) | S5 | G5 |
| Birds | Osprey | *Pandion haliaetus* | No | | | | | S3B | G5 |
| Birds | American White Pelican | *Pelecanus erythrorhynchos* | No | | | | | S1B | G4 |
| Birds | Red-necked Phalarope | *Phalaropus lobatus* | No | | | | | S3N | G4G5 |
| Birds | Rose-breasted Grosbeak | *Pheucticus ludovicianus* | No | | | | | S1 | G5 |

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| Birds | White-faced Ibis | *Plegadis chihi* | No | | Sensitive | | NSS3 (Bb) | S1B | G5 |
| Birds | Virginia Rail | *Rallus limicola* | No | | | | NSS3 (Bb) | S3B | G5 |
| Birds | American Avocet | *Recurvirostra americana* | Yes | | | | | S3B | G5 |
| Birds | Golden-crowned Kinglet | *Regulus satrapa* | Yes | | | | | S3B;S4N | G5 |
| Birds | McCown's Longspur | *Rhynchophanes mccownii* | Yes | MBCC | | Region 2 Sensitive | NSS4 (Bc) | S2 | G4 |
| Birds | Eastern Bluebird | *Sialia sialis* | No | | | | | S2 | G5 |
| Birds | Pygmy Nuthatch | *Sitta pygmaea* | Yes | | | | NSSU (U) | S2 | G5 |
| Birds | Dickcissel | *Spiza americana* | No | MBCC | | | NSS4 (Bc) | S1 | G5 |
| Birds | Brewer's Sparrow | *Spizella breweri* | No | MBCC | Sensitive | Region 2 Sensitive | NSS4 (Bc) | S5 | G5 |
| Birds | Clay-colored Sparrow | *Spizella pallida* | No | | | | | S3B | G5 |
| Birds | Forster's Tern | *Sterna forsteri* | No | | | | NSS3 (Bb) | S1 | G5 |
| Birds | Common Tern | *Sterna hirundo* | No | | | | | S1 | G5 |
| Birds | Barn Owl | *Tyto alba* | No | | | | | S2 | G5 |
| Mammals | Plains Bison | *Bos bison* | No | Not Warranted for Listing (NW) | | | | S1 | G4TU |
| Mammals | Gray Wolf | *Canis lupus* | No | Listed Threatened - Nonessential Experimental Population (LTXN) | | Region 4 Sensitive | | S1 | G4G5 |
| Mammals | Black-tailed Prairie Dog | *Cynomys ludovicianus* | No | Not Warranted for Listing (NW) | Sensitive | Region 2 Sensitive | | S2 | G4 |

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| Mammals | Thirteen-lined Ground Squirrel | *Ictidomys tridecemlineatus* | No | | | | | S5 | G5 |
| Mammals | Black-footed Ferret | *Mustela nigripes* | No | Listed Endangered (LE); and Endangered - Nonessential Experimental Population (LEXN) | | | NSS1 (Aa) | S1 | G1 |
| Mammals | Western Small-footed Myotis | *Myotis ciliolabrum* | No | | | | NSS4 (Cb) | S3B | G5 |
| Mammals | Long-eared Myotis | *Myotis evotis* | No | | Sensitive | | NSS3 (Bb) | S4 | G5 |
| Mammals | Northern Long-eared Bat | *Myotis septentrionalis* | No | Listed Threatened (LT) | | | NSS3(Bb) | S1BS1N | G2G3 |
| Mammals | Little Brown Myotis | *Myotis lucifugus* | No | Petition Under Review (UR) | | | NSS4 (Cb) | S3 | G3 |
| Mammals | Long-legged Myotis | *Myotis volans* | No | | | | NSS3 (Bb) | S3B | G5 |
| Mammals | Olive-backed Pocket Mouse | *Perognathus fasciatus* | No | | | | NSS4 (Cb) | S4 | G5 |
| Mammals | White-footed Deermouse | *Peromyscus leucopus* | No | | | | | S3 | G5 |
| Mammals | Dwarf Shrew | *Sorex nanus* | No | | | | NSS3 (Bb) | S4 | G4 |
| Mammals | Plains Spotted Skunk | *Spilogale putorius interrupta* | No | Petition Under Review (UR) | | | | S3 | G4T4 |
| Mammals | Grizzly Bear | *Ursus arctos* | No | Listed Threatened (LT) – Proposed for Delisting (PDL) | | | | S1 | G4T4 |
| Mammals | Swift Fox | *Vulpes velox* | No | Not Warranted for Listing (NW) | Sensitive | Region 2 Sensitive | NSS4 (Cb) | S2 | G3 |

| Group | Common Name | Scientific Name | Observed During Wildlife Surveys[1] | USFWS | WY_BLM | USFS | WGFD | STATE RANK | GLOBAL RANK |
|---|---|---|---|---|---|---|---|---|---|
| Reptiles | Eastern Spiny Softshell | *Apalone spinifera* | No | | | | NSS4 (Bc) | S4 | G5T5 |
| Reptiles | Eastern Yellow-bellied Racer | *Coluber constrictor flaviventris* | No | | | | | S4 | G5T5 |
| Reptiles | Pale Milksnake | *Lampropeltis triangulum multistriata* | No | | | | NSS3 (Bb) | S3 | G5TNR |
| Reptiles | Bullsnake | *Pituophis catenifer sayi* | No | | | | | S4 | G5T5 |
| Reptiles | Plains Gartersnake | *Thamnophis radix* | No | | | | NSSU (U) | S5 | G5 |
| Reptiles | Red-sided Gartersnake | *Thamnophis sirtalis parietalis* | No | | | | NSSU (U) | S5 | G5T5 |

[1] Highlights indicates species has been observed during DFM wildlife surveys
MBCC – Migratory Birds of Conservation Concern
USFS:
Region 2 Sensitive, R2 - In Wyoming, sensitive in Bighorn, Black Hills, Medicine Bow, and Shoshone National Forests, and Thunder Basin National Grassland
Region 4 Sensitive, R4 - In Wyoming, sensitive in Bridger-Teton, Caribou, Targhee, Wasatch-Cache, and Ashley (including Flaming Gorge National Recreation Area) National Forests
WGFD:
NSS1-NSS4:
The NSS rank of the species is subtracted from 5 and multiplied by 6: [(5-NSS)x6]. This would result in scores of NSS1 = 24, NSS2 = 18, NSS3 = 12, NSS4 = 6.
The species is assigned a score of 1-10 based on the variable "Wyoming's contribution to the species' overall conservation"; 10 being the highest contribution and 1 being the lowest contribution. The WYNDD G rank (global chance of extinction) and Wyoming Conservation Contribution score were consulted in determining this score. The species is assigned a score of 1-5; 5 being the highest and 1 the lowest for each of the following variables:
Regulatory/monetary impacts of the species' listing under the Endangered Species Act.
Urgency of conservation action.
Ability to implement effective conservation actions.
The species' ecological or management role as a keystone, indicator, or umbrella species.
Rank:
G = Global rank assigned by NatureServe: range-wide probability of extinction for a species
S = Subnational (state/jurisdiction) rank assigned by WYNDD biologists for Wyoming
T = Trinomial rank: refers to the range-wide probability of extinction for a subspecies or variety
**These letters are each followed by a numeric, 1-5 score:**
1 = critically imperiled
2 = imperiled
3 = vulnerable
4 = apparently secure
5 = secure
Source: WYNDD (2016)

# APPENDIX F

STATE AND FEDERAL REVENUE CALCULATIONS

## Estimated 2016 Fiscal Revenue from 2015 Coal Production in Campbell Co. (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 564.2 | 282.1 | 282.1 |
| Abandoned Mine Lands Fund | 95.4 | 67.4 | 28.0 |
| Severance Tax | 241.1 | | 241.1 |
| Bonus Bid Annual Revenues | 307.9 | 153.9 | 153.9 |
| Ad Valorem Tax | 187.6 | | 187.6 |
| Black Lung | 182.1 | 182.1 | |
| Sales and Use Tax | 29.8 | | 29.8 |
| **Totals** | **1,608.0** | **685.5** | **922.5** |
| **$/Ton** | | | **$2.48** |

## Total Future Revenues from DFM (No Action Alternative) (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 117.9 | 59.0 | 59.0 |
| Abandoned Mine Lands Fund | 19.9 | 10.0 | 10.0 |
| Severance Tax | 49.1 | | 49.1 |
| Bonus Bid Annual Revenues | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 39.20 | | 39.2 |
| Black Lung | 39.16 | 39.2 | |
| Sales and Use Tax | 5.7 | | 5.7 |
| **Totals** | **271.0** | **108.1** | **162.9** |
| **$/Ton** | | | **$2.29** |

## Future Revenues added by the A2Tr1 Tract only (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 53.6 | 26.8 | 26.8 |
| Abandoned Mine Lands Fund | 9.1 | 4.5 | 4.5 |
| Severance Tax | 20.9 | | 20.9 |
| Bonus Bid Annual Revenues | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 17.8 | | 17.8 |
| Black Lung | 17.8 | 17.8 | |
| Sales and Use Tax | 2.6 | | 2.6 |
| **Totals** | **121.8** | **49.1** | **72.7** |
| **$/Ton** | | | **$2.25** |

## Total Future Revenues from DFM (existing mine plus A2Tr1 tract) (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 171.5 | 85.8 | 85.8 |
| Abandoned Mine Lands Fund | 29.0 | 14.5 | 14.5 |
| Severance Tax | 70.0 | | 70.0 |
| Bonus Bid Annual Revenues | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 57.0 | | 57.0 |
| Black Lung | 57.0 | 57.0 | |
| Sales and Use Tax | 8.3 | | 8.3 |
| **Totals** | **171.5** | **85.8** | **85.8** |
| **$/Ton** | | | **$2.27** |

## Difference Between the No Action Alternative and the Proposed Action (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 53.6 | 26.8 | 26.8 |
| Abandoned Mine Lands Fund | 9.1 | 4.5 | 4.5 |
| Severance Tax | 20.9 | | 20.9 |
| Bonus Bid Annual Revenues | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 17.8 | | 17.8 |
| Black Lung | 17.8 | 17.8 | |
| Sales and Use Tax | 2.6 | | 2.6 |
| **Totals** | **121.8** | **49.1** | **72.7** |

## Estimated 2022 Campbell Co. Fiscal Revenue (Million U.S. Dollars)

| Revenue Source | Total Collected | Federal Revenue | State Revenue |
|---|---|---|---|
| Federal Mineral Royalties | 600.6 | 300.3 | 300.3 |
| Abandoned Mine Lands Fund | 101.5 | 50.8 | 50.8 |
| Severance Tax | 234.7 | | 234.7 |
| Bonus Bid Annual Revenues | 0.0 | 0.0 | 0.0 |
| Ad Valorem Tax | 199.7 | | 199.7 |
| Black Lung | 199.4 | 199.4 | |
| Sales and Use Tax | 29.0 | | 29.0 |
| **Totals** | 1,364.9 | 550.5 | 814.4 |
| **$/Ton** | | | **$2.25** |

All revenues were calculated using variables presented below

## Bonus Bid Payments, 2008-2017

| Bonus Bids | Lease-Month | Tons | Total Bid | $/Ton | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WYW155132 | Eagle Butte West - May | 255,000,000 | $180,540,000.00 | $0.71 | $36,108,000.00 | $36,108,000.00 | $36,108,000.00 | $36,108,000.00 | $36,108,000.00 | | | | | |
| | | | | | $144,432,000.00 | $108,324,000.00 | $72,216,000.00 | $36,108,000.00 | $0.00 | | | | | |
| WYW174407 | South Maysdorf - August | 288,100,000 | $250,800,000.00 | $0.87 | $50,160,000.00 | $50,160,000.00 | $50,160,000.00 | $50,160,000.00 | $50,160,000.00 | | | | | |
| | | | | | $200,640,000.00 | $150,480,000.00 | $100,320,000.00 | $50,160,000.00 | $0.00 | | | | | |
| WYW154432 | North Maysdorf - August | 54,657,000 | $48,098,424.00 | $0.88 | | $9,619,684.80 | $9,619,684.80 | $9,619,684.80 | $9,619,684.80 | $9,619,684.80 | | | | |
| | | | | | | $38,478,739.20 | $28,859,054.40 | $19,239,369.60 | $9,619,684.80 | $0.00 | | | | |
| WYW177903 | West Antelope South | 56,356,000 | $49,311,500.00 | $0.88 | | | | $9,862,300.00 | $9,862,300.00 | $9,862,300.00 | | | | |
| | | | | | | | | $39,449,200.00 | $29,586,900.00 | $0.00 | | | | |
| WYW163340 | West Antelope North | 350,263,000 | $297,723,228.00 | $0.85 | | | | $59,544,645.60 | $59,544,645.60 | $59,544,645.60 | $59,544,645.60 | $59,544,645.60 | | |
| | | | | | | | | $238,178,582.40 | $178,633,936.80 | $119,089,291.20 | $59,544,645.60 | $0.00 | | |
| WYW161248 | Belle Ayr North | 221,734,800 | $210,648,060.00 | $0.95 | | | | $42,129,612.00 | $42,129,612.00 | $42,129,612.00 | $42,129,612.00 | $42,129,612.00 | | |
| | | | | | | | | $168,518,448.00 | $126,388,836.00 | $84,259,224.00 | $42,129,612.00 | $0.00 | | |
| WYW172657 | Caballo West | 130,196,000 | $143,417,403.80 | $1.10 | | | | $28,683,480.76 | $28,683,480.76 | $28,683,480.76 | $28,683,480.76 | $28,683,480.76 | | |
| | | | | | | | | $114,733,923.04 | $86,050,442.28 | $57,366,961.52 | $28,683,480.76 | $0.00 | | |
| WYW174596 | South Hilight | 222,676,000 | $300,001,011.66 | $1.35 | | | | | $60,000,202.33 | $60,000,202.33 | $60,000,202.33 | $60,000,202.33 | $60,000,202.33 | |
| | | | | | | | | | $240,000,809.33 | $180,000,607.00 | $120,000,404.66 | $60,000,202.33 | $0.00 | |
| WYW176095 | South Porcupine LBA | 401,830,508 | $446,031,864.00 | $1.11 | | | | | $89,206,372.80 | $89,206,372.80 | $89,206,372.80 | $89,206,372.80 | $89,206,372.80 | |
| | | | | | | | | | $356,825,491.20 | $267,619,118.40 | $178,412,745.60 | $89,206,372.80 | $0.00 | |
| WYW173408 | North Porcupine LBA | 721,154,828 | $793,270,311.00 | $1.10 | | | | | $158,654,062.20 | $158,654,062.20 | $158,654,062.20 | $158,654,062.20 | $158,654,062.20 | |
| | | | | | | | | | $634,616,248.80 | $475,962,186.60 | $317,308,124.40 | $158,654,062.20 | $0.00 | |
| Average | | | | **$0.98** | **$86,268,000.00** | **$95,887,684.80** | **$95,887,684.80** | **$236,107,723.16** | **$543,968,360.49** | **$457,700,360.49** | **$438,218,375.69** | **$438,218,375.69** | **$307,860,637.33** | **$0.00** |

Source: BLM 2017. Bids are paid off in equal four annual payments, after the initial 1/5 amount payment attached to the bid.

## Revenue Variables

| Coal Surface # | Units of Taxable Valuation | Taxable Valuation | Taxable Valuation Per Unit | Average Tax Levy (Mills) | Estimated Ad Valorem Tax Levied | Average Tax Per Unit | Sev. Tax Rate % | Estimated Severance Tax Collectible | Average Sev. Tax Per Unit |
|---|---|---|---|---|---|---|---|---|---|
| 2015 Wyoming | 392,418,629 | $3,894,432,347 | 9.92 | $0.059925 | $233,373,858 | 0.5947 | 0.07 | $272,610,264 | $0.6947 |
| 2015 Campbell Co. | 358,196,669 | $3,348,921,099 | 9.35 | $0.059592 | $199,568,906 | 0.5571 | 0.07 | $234,424,477 | $0.6545 |
| 2016 Wyoming | 372,577,808 | $3,646,317,231 | 9.79 | $0.059910 | $218,450,865 | 0.5863 | 0.07 | $255,242,206 | $0.6851 |
| 2016 Campbell Co. | 340,675,046 | $3,149,810,399 | 9.25 | $0.059554 | $187,583,809 | 0.5506 | 0.07 | $220,486,728 | $0.6472 |

Source: WDOR 2015 and 2016a

## Revenue Calculations Variables

| | | | |
|---|---|---|---|
| **Coal Production (tons)[1]** | | | |
| | | Campbell | Wyoming |
| | 2015 Tons Produced | 340,675,046 | 372,577,808 |
| | 2022 Tons Produced (Estimated) | 362,625,000 | 375,000,000 |
| | | From Campbell Co. | 91.44% |
| | DFM Tract[2] | (tons minable) | (tons recoverable) |
| | No Action Alternative | 75,700,000 | 71,200,000 |
| | Added by Proposed Action | 34,800,000 | 32,364,000 |
| | Average 2015 Sales Price ($/ton) | | |
| | 2015 8800 Btu Coal | $13.23[2] | $13.25[3] |
| | 2015 Price without BLT[4] | $12.68 | $12.70 |
| **Federal Royalties** | | | |
| | WY share of FR = 0.5 x FR | | |
| | Federal Royalties[3] | $564,243,044.94 | |
| | Wyoming Share | $282,121,522.47 | |
| **Abandoned Mine Lands Funds[5]** | | | |
| | Campbell AML Total | $95,389,012.88 | |
| | WY Share[6] | $28,000,000.00 | |
| **Severance Taxes[7]** | | | |
| | Campbell ST Rate/Ton | $0.6472 | |
| | 2016 Severance Taxes[8] | $241,132,357.34 | |
| **Lease Bonus Bids (2017 Payments)** | | | |
| | 2016 | $307,860,637.33 | |
| | 2017 | $0.00 | |
| | 2019+ | $0.00 | |
| | Total 2017+ Bonus Bid Payments | $0.00 | |
| | WY share | $0.00 | |
| **Campbell Ad Valorem Taxes[7]** | | | |
| | AVT Rate/ton | $0.55 | |
| | AVT (Total) | $187,575,680.33 | |
| **Black Lung** | | | |
| | 2016 BLT Rate/Ton[9] | $0.534 | |
| | 2016 BLT Collected[10] | $182,058,833.01 | |
| | Future BLT Rate/Ton[11] | $0.535 | |
| | Future BLT Collected | $194,094,683.91 | |
| **2015 Campbell Co. Employment (mining)[12]** | | | |
| | Buckskin | 218 | |
| | Belle Ayr | 286 | |
| | Eagle Butte | 290 | |
| | Cordero Rojo | 521 | |
| | Antelope | 632 | |
| | Caballo | 133 | |
| | NARM | 1428 | |
| | Rawhide | 195 | |
| | Black Thunder | 1622 | |
| | Coal Creek | 153 | |
| | Dry Fork | 80 | |
| | Wyodak | 68 | |
| | Total | 5626 | |
| **Federal Income Tax[13]** | | | |
| | Head of Household income info: | | |
| | 10% on first $12,750 | | |
| | 15% on next (up to $48,600) | | |
| | Rate[10] | 13.6% | |
| | Tax/employee | $6,185.55 | |
| | Fed Tax | $34,799,904.30 | |
| **Fiscal Year 2016 Sales and Use Tax[14]** | | | |
| | Coal Mining | $29,765,322 | |
| | $/ton | $0.08 | |

1 Source: WDOR 2016a
2 CCW 2017
3 Calculated - Tons produced x 2014 sales price per ton x 12.5%
4 Black lung tax removed since it is included in the sale price