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BLM e-Planning link:
https://eplanning.blm.gov/eplanning-ui/project/2026886/510

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

DOI-BLM-WY-0000-2024-0001-EA

Table of Contents

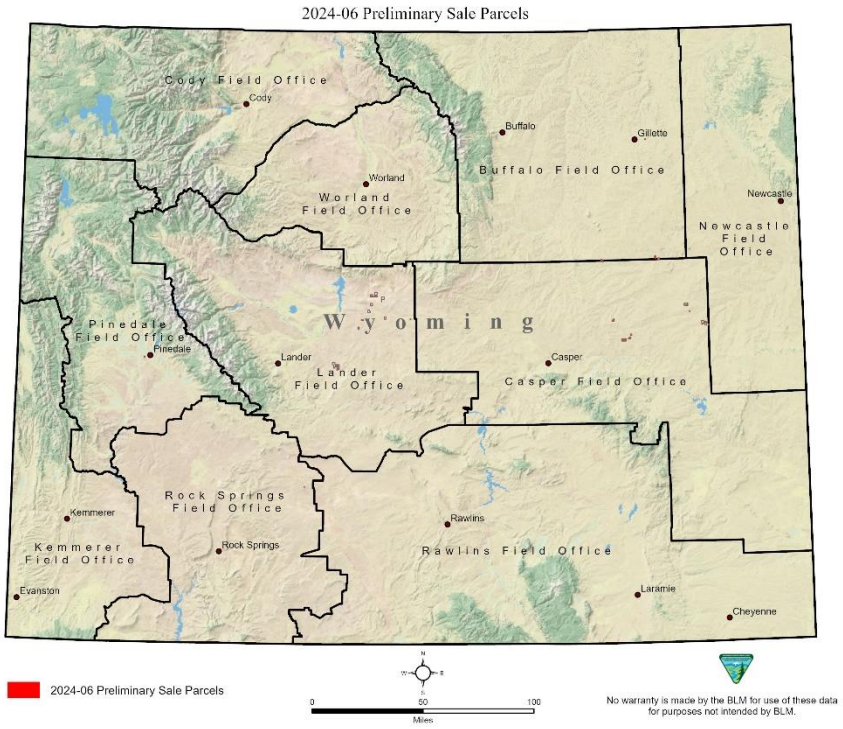
1 Introduction

In accordance with the Mineral Leasing Act of 1920 (MLA), as amended [30 U.S.C. § 181 et seq.], Federal Onshore Oil & Gas Leasing Reform Act of 1987 [30 U.S.C. § 181 et seq.] and Title 43 Code of Federal Regulations (CFR) 3120.1-2(a), the BLM Wyoming State Office (WSO) conducts a quarterly competitive oil and gas lease sale for lands that are eligible and available for leasing. A Notice of Competitive Oil and Gas Lease Sale (Sale Notice), which lists parcels to be offered at the auction, will be published by the WSO at least 45 days before each of the subject auction dates. Applicable lease stipulations for each parcel will be identified in the Sale Notices. The decision as to which public lands and minerals are open for leasing and what leasing stipulations may be necessary is made during the BLM's land use planning process in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) [43 U.S.C. § 1712]. Surface management for mineral extraction on non-BLM administered surface overlying Federal minerals is determined by the BLM in consultation with the appropriate surface management agency or the private surface owner when surface use is proposed by the leaseholder or its designated operator.

After the end of the nomination period, the WSO prepared a draft list of lease sale parcels (the "preliminary parcel list") for this portion of the sale. The WSO submitted the draft list of lease sale parcels to the applicable BLM field and district offices for initial review and processing. Interdisciplinary Teams (IDTs) in each field office, in coordination with their district office, reviewed the parcels to determine 1) if they are located in areas open to leasing under the approved RMP; 2) the appropriate stipulations required under the approved RMP; 3) whether new information or changed circumstances are present since the land use plan was approved; 4) necessary coordination requirements with other Federal or State agencies; and 5) if there are special conditions of which potential bidders should be made aware. The IDT relied on personal knowledge of the areas involved and reviewed existing databases (including Geographic Information System (GIS) data and digital aerial imagery) and file information to determine the appropriate stipulations. Where the BLM personnel determined field visits were necessary, field visits were made to those parcels where the BLM had legal access; results of any onsite visit is documented in the administrative record. No parcels analyzed in this EA required additional site visitation because after IDT review BLM determined existing information was sufficient to support the decision to offer the parcels.

This Environmental Assessment (EA) has been prepared to document compliance with National Environmental Policy Act (NEPA). Recent changes to Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA reinstated previous definitions concerning direct, indirect and cumulative effects as defined under 40 CFR 1508.1 (g)(3). Potential effects, through implementation of this project, are discussed within this EA.

Figure 1-1. 2024 Second Quarter Competitive Lease Sale Parcels



1.1 Background

BLM is responsible for oil and gas leasing on about 700 million acres of BLM, national forest, and other Federal lands, and seeks to ensure that mineral resources are developed in an environmentally responsible manner.

In accordance with the MLA and 43 CFR § 3120.1-2, the BLM WSO conducts quarterly competitive oil and gas lease sales for lands that are eligible and available. Private individuals or entities may file Expressions of Interest (EOIs) to suggest parcels for consideration for leasing by the BLM. The authorized officer also may identify lands for leasing consideration. Additional information on the competitive lease sale (CLS) process is available on-line at: https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing.

The offering and subsequent issuance of oil and gas leases, in and of itself, does not cause or directly result in any surface disturbance. The BLM cannot determine, prior to conducting a lease sale, whether a proposed parcel actually will be leased, or if it is subsequently leased, whether the lease will be explored or developed.

Once a parcel is sold and the lease is issued, the lessee has the right to use the leased lands to explore and drill for all of the oil and gas within the lease boundaries, subject to the stipulations attached to the lease, restrictions derived from specific nondiscretionary statutes, and other reasonable measures to minimize adverse impacts (see 43 § CFR 3101.1-2). Further, relevant regulations at 43 CFR § 3162.5-1(a) provide: "The operator shall conduct operations in a manner which protects the mineral resources, other natural resources, and environmental quality. In that respect, the operator shall comply with the pertinent orders of the authorized officer and other standards and procedures as set forth in the applicable laws, regulations, lease terms and conditions, and the approved drilling plan or subsequent operations plan. Before approving any Application for Permit to Drill (APD) submitted pursuant to § 3162.3-1 of this title, or other plan requiring environmental review, the authorized officer shall prepare an environmental record of review or an environmental assessment, as appropriate. These environmental documents will be used in determining whether or not an environmental impact statement is required and in determining any appropriate terms and conditions of approval of the submitted plan." Accordingly, the BLM can subject development of existing leases to reasonable conditions to minimize impacts to other resources, through the application of Conditions of Approval (COAs) at the time of permitting. Any constraints must conform with the applicable land use plan and be consistent with rights granted to the holder under the lease. In addition, upon cessation of lease operations, the lessee must plug

the well(s) and abandon any facilities on the lease. The surface must also be reclaimed to the satisfaction of the BLM authorized officer, in accordance with the MLA, Section 17g [30 U.S.C. § 226(g)].

Oil and gas leases are issued for a 10-year period and continue for so long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil or gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, the lease may terminate or be cancelled, and BLM may consider offering the lands for lease at another lease sale after a new review process.

1.2 Purpose and Need and Decision to be Made

It is the policy of the BLM as derived from various laws, MLA and FLPMA to make mineral resources available for extraction and to encourage development of mineral resources to meet national, regional, and local needs. Continued sale and issuance of lease parcels in conformance with the approved RMPs would allow for continued production of oil and gas from public lands and reserves.

The need is to respond to Expressions of Interest, as established by the Federal Onshore Oil & Gas Leasing Reform Act of 1987 (FOOGLRA), MLA, and FLPMA.

BLM will decide, based on this analysis, whether to make parcels available for lease and what stipulations will be placed on those parcels, in conformance with the approved RMPs.

1.3 Tiering and Conformance with BLM Land Use Plans and Other Environmental Assessments

Pursuant to 40 CFR § 1501.11, this EA tiers to the Final Environmental Impacts Statements (FEISs) prepared for each Field Office (FO) Resource Management Plan (RMP), and any subsequent amendments or updates, and incorporates by reference the relevant portions of the FEISs. The impacts analysis in the FEISs for the effects from oil and gas leasing and development incorporates the Reasonably Foreseeable Development (RFD) scenarios (i.e., the level of oil and gas development projected for the life of the plan based on historically and projected trends).

The sale and issuance of the leases conforms to the approved RMPs (43 CFR § 1610.5) and Records of Decision (RODs) for the applicable planning areas, as amended or updated, including:

High Plains District (HPD)
The Casper Field Office (CFO) RMP ROD approved on December 7, 2007 (supported by June 2007 FEIS), updated March 19, 2021, as amended by the Record of Decision and Bureau of Land Management Casper, Kemmerer, Newcastle, Pinedale, Rawlins, and Rock Springs Field Offices Approved Resource Management Plan Amendment (ARMPA) for Greater Sage-Grouse approved on September 21, 2015 (supported by May 2015 FEIS).
The Buffalo Field Office (BFO) Buffalo/Rocky Mountain Region RMP ROD approved on September 21, 2015 (supported by May 2015 FEIS), maintained December 28, 2022, as amended by the Buffalo Field Office Record of Decision and Approved Resource Management Plan Amendment (November 22, 2019).

Wind River/Bighorn Basin District (WR/BBD)
The Lander Field Office (LFO) RMP ROD signed on June 26, 2014 (supported by February 2013 FEIS), updated April 8, 2022.
The Cody Field Office (CYFO) Bighorn Basin/Rocky Mountain Region RMP ROD approved on September 21, 2015 (supported by May 2015 FEIS), maintained June 27, 2022.

High Desert District (HDD)
The Green River (Rock Springs Field Office (RSFO)) RMP ROD approved on August 8, 1997 (supported by April 1996 FEIS), maintained July 13, 2021, as amended by the ARMPA (supported by May 2015 FEIS).
The Pinedale Field Office (PFO) RMP ROD approved on November 26, 2008 (supported by August 2008 FEIS), as amended by the ARMPA (supported by May 2015 FEIS).

The FO RMPs include allocation decisions which identify lands as either open or closed to fluid mineral leasing, and (if open) provide stipulations that are attached to new leases to mitigate effects of potential development operations.

This EA discloses the affected environment (including the reasonably foreseeable environmental trends and planned actions in the area), analysis of potential impacts not already considered in the EISs to which this EA tiers, and potential mitigation of those impacts. The EA provides information for BLM to determine whether this project would have significant impacts not already disclosed and analyzed in other NEPA documents, warranting an EIS. The RMP EISs have already evaluated potentially significant impacts arising from the BLM's land use planning decisions. See 43 CFR § 46.140(c). Based on this EA, the BLM may issue a "finding of no significant impacts" (FONSI), if no significant impacts are identified. If a FONSI is reached, a Decision Record (DR) may be signed approving the selected alternative, which could be the proposed action, the no-action alternative, or a combination thereof.

1.4 Relationship to Statutes, Regulations, and Other Plans or Decisions

The proposed action and alternatives are consistent with other plans, programs, and policies of other federal agencies, the State of Wyoming, local governments, and affected Tribes, to the extent practical, including but not limited to the following:

- Federal Land Policy and Management Act of 1976, as amended [43 U.S.C § 1701 et seq.] Mineral Leasing Act of 1920, as amended [30 U.S.C. § 181 et seq.]
- Federal Onshore Oil & Gas Leasing Reform Act of 1987 [30 U.S.C. § 181 et seq.] The National Environmental Policy Act [42 U.S.C. 4321 et seq.]
- Clean Air Act [42 U.S.C. § 1857 et seq.], as amended and recodified [42 U.S.C. § 7401 et seq.] Clean Water Act [33 U.S.C. § 1251 et seq.]
- Endangered Species Act [16 U.S.C. § 1531 et seq.]
- Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations
- Migratory Bird Treaty Act [16 U.S.C. § 703 et seq.] National Trails Systems Act [16 U.S.C. § 1241 et seq.]
- National Landscape Conservation System Act [16 U.S.C. § 7202]
- National Historic Preservation Act of 1966, as amended [54 U.S.C. § 300101 et seq.] Protection of Historic Properties (36 CFR § 800)
- Native American Graves Protection and Repatriation Act of 1990 [25 U.S.C. § 3001 et seq.] and 43 CFR § 10 American Indian Religious Freedom Act of 1978 [42 U.S.C. 1996]
- Native American Trust Resource Policy standards are presented in the Department of the Interior Comprehensive Trust Management Plan dated March 28, 2003
- Wild and Scenic Rivers Act of 1968, as amended [16 U.S.C. § 1271 et seq.]
- Bald and Golden Eagle Protection Act of 1940, as amended [16 U.S.C. § 668 et seq.] Paleontological Resources Preservation Act of 2009 [16 U.S.C. §470aaa et seq.]
- Greater Sage-grouse Record of Decision and Land Use Plan Amendments and Revisions for the Rocky Mountain Region, 2015 (United States Department of Agriculture, Forest Service)
- USFS Supplemental Information Report to the Biological Assessment and Evaluation for Revised Land and Resource Management Plans and Associated Oil and Gas Leasing Decisions, 2018

1.5 Scoping

To identify preliminary issues for analysis (see the BLM's NEPA Handbook H-1790-1 at page 41), the BLM conducted internal scoping. The BLM personnel listed in Appendix 5.4.2 provided information and input for this EA. Through the BLM's internal scoping, and in light of the numerous EAs the BLM has prepared for oil and gas lease sales in Wyoming, this EA incorporates by reference the analysis of issues previously addressed in the RMP FEISs, to which it tiers.

BLM Wyoming personnel also conferred with the Wyoming Game and Fish Department (WGFD) in accordance with an interagency Memorandum of Understanding. BLM Wyoming also conferred with the United States Forest Service (USFS) regarding nominated parcels in which the USFS is the surface management agency. For these specific parcels, the BLM received lease parcel stipulations from the USFS and have attached those stipulations accordingly (see Appendix 5.1).

In addition, BLM conducted a 30-day public scoping period which began on October 16, 2023. The main issues identified through public scoping included, but were not limited to, leasing in Greater Sage-Grouse habitat, big game habitat and migrations corridors, potential emissions impacts, water resources, expressions of interest, and support for continued leasing. Comments received through the public scoping process were incorporated into this document.

1.6 Public Participation

Formal public participation was initiated when the original parcel list (20 parcels) was posted to the ePlanning database on October 16, 2023 (https://eplanning.blm.gov/eplanning-ui/project/2026886/510). A news release was issued on October 16, 2023, notifying the public that the parcels were being posted for a 30-calendar day public scoping period. A news release was issued on January 9, 2024, notifying the public that this EA was being posted on the BLM Wyoming website for a 30-calendar day public comment period. As required by BLM leasing policies, where parcels include split estate lands, the BLM WSO sent notification letters to the surface owner(s) identified by the party submitting the EOI.

After the public comment period BLM reviewed and addressed all substantive comments on the EA before issuing a decision on which parcels will be offered at the lease sale. Parcel acreages released during public scoping were carried forward into the following analysis. After further review and adjudication several parcels had minor corrections made to the available acreage. Final parcel acreage is available in the sale book that is posted on ePlanning with this EA.

In November 2021, the Department of the Interior released a Report on the Federal Oil and Gas Leasing Program (Report). The Report made specific recommendations to address documented deficiencies in the program to meet three programmatic goals:

- Providing a fair return to the American public and States from Federal management of public lands and waters, including for development of energy resources;
- Designing more responsible leasing and development processes that prioritize areas that are most suitable for development and ensure lessees and operators have the financial and technical capacity to comply with all applicable laws and regulations; and
- Creating a more transparent, inclusive, and just approach to leasing and permitting that provides meaningful opportunity for public engagement and Tribal consultation.

The Report also recommends: As an overarching policy, BLM should ensure that oil and gas is not prioritized over other land uses, consistent with BLM's mandate of multiple-use and sustained yield. The BLM should carefully consider what lands make the most sense to lease in terms of expected yields of oil and gas, prospects of earning a fair return for U.S. taxpayers, and conflicts with other uses, such as outdoor recreation and wildlife habitat. The BLM should always ensure it is considering the views of local communities, Tribes, businesses, State and local governments, and other stakeholders. While the leasing decisions for this lease sale result from the BLM's exercise of its discretion based on its analysis and review of the record, they are also consistent with the recommendations in the Report, as well as numerous reports issued by the Governmental Accountability Office and Congressional Budget Office, including: ensuring public participation and Tribal consultation, addressing conflicts with other resources, avoiding lands with low potential for oil and gas development, focusing leasing near existing development and ensuring a fair return to taxpayers. This lease sale and NEPA process includes a 30-day scoping period, 30-day comment period on the environmental assessment. The BLM has also ensured applicable Tribal consultation is current. The BLM's leasing decisions will take into account public comments received during this process and will further evaluate points raised in any protests received.

Oil and Gas Program Administration:
As the steward of onshore Federal energy resources, including deposits of oil and gas, the BLM is responsible for balancing conservation, energy production, and generating a fair return to the public for the extraction of public resources. Revenue from Federal oil and gas development is distributed to several Federal programs, as well as being shared with the States in which the oil and gas development occurs. At the same time, energy development can pose significant risks to the environment. The BLM is charged with balancing these competing considerations in a manner that best serves the public interest.

For all competitively issued leases, the Mineral Leasing Act (MLA) requires a royalty "at a rate of not less than 12.5 percent in amount or value of the production removed or sold from the lease." 30 U.S.C. § 226(b)(1)(A); see also 30 U.S.C. § 352 (applying that requirement to leases on acquired land). Although the BLM is authorized by the MLA and its implementing regulations (43 C.F.R. 3103.3-1(a)(2)(ii)) to specify a royalty rate higher than 12.5 percent for competitive leases, the MLA sets a flat 12.5 percent royalty rate for noncompetitive leases. 30 U.S.C. § 226(c); 30 U.S.C. § 352 (acquired lands).

On August 16, 2022, the Inflation Reduction Act (Act) was signed into law. Section 50262 discusses how this Act affects oil and gas leasing and the fees associated. Of those fees and topics addressed in the Act, any fees associated with royalty rates, minimum bid amount (from $2 per acre to $10 per acre), annual rental amounts, reinstatements, reinstatement rental fees, expression of interest (EOI), do not impact the analysis of this EA. The minimum bid amount and the royalty rates increases are addressed within the EA. For the minimum bid amount, 49% of the total amount per parcel is provided to the state, while the federal government retains 51%. For royalty rates, the new rate is 16.67%. This is split equally between the state (8.335%) and the federal government (8.335%). The opportunity to acquire a noncompetitive lease was also removed under the Act.

In addition, the Act also included language regarding the issuance of a right-of-way for wind or solar energy projects. The Act (Section 50265) states, "the Secretary may not issue a right-of-way for wind or solar energy development on Federal land unless (A) an onshore lease sale has been held during the 120-day period ending on the date of the issuance of the right-of-way for wind or solar energy development; and the sum total of acres offered for lease in onshore lease sales during the 1-year period ending on the date of the issuance of the right-of-way for wind or solar energy development is not less than the lesser of (i) 2,000,000 acres; and (ii) 50 percent of the acreage for which expressions of interest have been submitted for lese sales during that period…" To be incompliance with Sec. 50265 of the Act, BLM must have held an onshore oil and gas lease sale within the previous 120 days prior to issuance of a wind or solar right-of-way. In addition, either a sum total of 2,000,000 acres or 50% of the acreage nominated through expressions of interest (whichever is lesser) must be offered for sale through the competitive lease sale process. BLM is in the process of completing guidance in order to calculate/report these numbers.

1.7 Issues Identified for Analysis

Analysis issues include resource issues that could potentially be affected by oil and gas leasing. The BLM focuses its analysis on changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives (40 CFR 1508.1(g). Consistent with 43 CFR § 3120.3 and § 3120.4-1, the BLM identified site-specific resource concerns and lease stipulations for proposed parcels through a preliminary review process conducted prior to a public scoping period. The following resources/issues are analyzed in detail in this EA:

Greenhouse Gases
How would future potential development of leases contribute to greenhouse gas (GHG) emissions and climate change?

Water Resources
What are the effects of potential oil and gas development, including hydraulic fracturing, on parcels that may be offered for lease on surface and groundwater quality and quantity?

Greater Sage-Grouse
What are the effects to sage-grouse habitats and populations if the parcels nominated for the June 2024 lease sale are leased and subsequently developed for oil or gas production?

Big Game Species
What are the effects from potential oil and gas development on parcels that may be offered for lease to big game habitats and populations within state identified crucial winter range and designated migration corridors?

Lands with Wilderness Characteristics
What are the effects of potential oil and gas development, including hydraulic fracturing, on parcels that may be offered for lease to lands with wilderness characteristics?

Socioeconomics, Environmental Justice, and Public Health and Safety
What are the effects of potential oil and gas development, including hydraulic fracturing, on parcels that may be offered for lease on Socioeconomics, Environmental Justice, and Public Health and Safety?

1.8 Issues Eliminated from Further Analysis

Based on a review of the context and scale of the Proposed Action, the BLM has considered and eliminated the following issues from further analysis, with justifications provided. The following resources/issues are either not present or did not warrant detailed analysis and not considered in this EA: lands and realty conflicts, locatable and saleable minerals, forest and woodland, cave and karst resources, wilderness study areas, Master Leasing Plans, and wild and scenic rivers. Other resource issues BLM considered but eliminated from further analysis due to environmental impacts previously analyzed through prior NEPA reviews and/or lease notices or stipulations that were applied to avoid and minimize impacts are discussed below:

Cultural and Heritage Resources
Cultural and Heritage resources include traditions cultural properties and historic trails. All parcels addressed in this EA have the potential to contain surface and buried archaeological materials or may be in an area which could affect the setting of known or unknown historic sites, and/or Traditional Cultural Properties (TCPs). Once the decision is made by the lessee to develop a lease, an area-specific cultural records review would be completed to determine if there is a need for a cultural inventory of the areas of proposed surface disturbance. Generally, a cultural inventory will be required before new surface disturbance and all historic and archaeological sites that are eligible for listing in the National Register of Historic Places would be either avoided by the undertaking, have adverse effects to sites minimized or mitigated, or have the information in the sites extracted through archaeological data recovery.

The application of lease terms, cultural resource lease stipulations and the cultural resource lease notices (See Appendix 5.1 for parcels with specific cultural resource stipulations and/or paleontological stipulations. In addition, Lease Notice No. 2, and Lease Stipulation HQ-CR-1) at leasing provides protection to cultural and heritage resources, paleontology, traditional cultural properties, and historic trails. The BLM will not approve any ground disturbing activities that may affect such properties or resources until it completes its obligations associated with the stipulations that are applied to each respective parcel as well as applicable requirements of the National Historic Preservation Act and any other authorities. The BLM may require modification to exploration or development proposals to protect such properties or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

Paleontology
The application of lease terms and the paleontological lease notices (Appendix 5.1) at leasing provides protection to paleontological resources. Leased lands that fall into this category could require professional assessment which may include a field survey prior to surface disturbance. The results of the assessment and survey by a BLM-permitted paleontologist will serve as the basis for a mitigation plan during development. If the inventory resulted in the identification of paleontological resources, mitigation measures may include avoidance, professional monitoring or spot checking, development of an Unanticipated Resource Discovery Plan, and salvage. These mitigation measures would be initiated by BLM and the operator.

Soils
The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to soils. Prior to authorization of surface disturbance on a lease, the BLM will require the lessee or their designated operator to submit a Surface Use Plan of Operations to the BLM. The requirements in the BLM-Wyoming Reclamation Policy would be implemented for all surface-disturbing activities. Stabilization and reclamation of disturbed areas (both interim and final) will be required, in accordance with 43 CFR § 3171. Site-specific, ground-truthed soils data will be provided if and when any associated ground-disturbing activity (drill pad construction or pipeline installation) is proposed. As required in the applicable RMPs, surface disturbance may be restricted or prohibited on steep slopes

and within floodplains. Lease Notice No. 1 addresses surface disturbance on slopes greater than 25 percent and is applied to all parcels. Additional stipulations to protect soils can be found in Appendix 5.1.

Vegetation
Vegetation resources will not be impacted to the degree that will require detailed analysis in this EA. This proposed sale and issuance of an oil and gas leases would not authorize any ground disturbances which could affect vegetation resources. Leasing is an administrative action that does not result in any surface disturbance. Site- specific effects cannot be analyzed until an exploration or development application is received, after leasing has occurred. There would be no impacts to vegetation resources through sale of leases. There is some expectation that exploration or development could occur, at which time additional NEPA would be conducted should an APD be filed. The applied lease stipulations and notices will notify buyers during sale of leases which resources may be present, allow the opportunity to adjust the location of potential development at the site-specific level when an APD is received to minimize impacts and ensure impacts are addressed.

Future development proposals on the leases would be subject to the standard lease terms, and all applicable laws, regulations in existence at the time of lease issuance.

Visual Resources
BLM is required to manage for visual resources on BLM owned surface lands. Each RMP contains Visual Resource Management (VRM) requirements and considerations specific for the geographical location to which they apply. VRM practices and standards will be implemented consistent with the respective RMP they are subject to. New oil and gas development would implement, as appropriate for the site, Best Management Practices (BMPs) to maintain visual qualities where possible. This includes, but would not be limited to, proper site selection, reduction of visibility, minimizing disturbance selecting color(s)/color schemes that blend with the background and reclaiming areas that are not in active use. Repetition of form, line, color and texture when designing projects would reduce contrasts between landscape and development. Where applicable, VRM lease stipulations are applied to the proposed parcels in conformance with the approved RMPs (Appendix 5.1). The application of a stipulation would be sufficient at the leasing stage to notify operators that additional measures may be necessary to reduce visual impacts from potential future development (at the APD stage). This provides for the protection and conservation of the visual resources on public lands, as classified by FLPMA regarding BLM- authorized activities.

Recreation
No direct impacts to recreational opportunities would occur as a result of offering leases for sale. The leasing action would be considered in compliance with all relevant recreation regulations, protocols and policies. Impacts on recreation from potential future exploration and development would be analyzed at the APD stage and included design features, and mitigation would be integrated to avoid or minimize potential impacts to recreation consistent with the RMP for the respective planning area.

Wildlife:
Fish and Special Status Species (Plants and Vertebrate and Invertebrate Wildlife)
The BLM screened parcels for plants and wildlife species which may be impacted if a lease parcel is sold and subsequently developed. Stipulations were applied to parcels that contain habitat for these species according to the field office RMP (see Appendix 5.1). BLM also reviewed each proposed lease parcel for special status species and threatened and endangered species (see next three paragraphs for further detail).

Threatened and Endangered Species
In additions to the appropriate RMP stipulations, the BLM applies HQ-TES-1 to all parcels (see Appendix 5.1), which states that the BLM may require modifications to, or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. The BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 et seq., including completion of any required procedure for conference or consultation. At this time, none of the proposed parcels contain designated critical habitat for any of the threatened or endangered species in Wyoming. However, all parcels are located in an ‘area of influence’ as designated by the U.S, Fish and Wildlife Service. Any surface disturbing

activities that may be proposed on any of these parcels (if sold) will be further evaluated for impacts to T&E species at the time of proposal.

Special Status Species

The Federal Land Policy and Management Act of 1976, Section 102.8, requires environmental resources to be managed to provide food and habitat for fish and wildlife. The Sikes Act instructs agencies to develop, maintain, and coordinate programs for the conservation and rehabilitation of wildlife, fish and game (16 U.S.C. § 670 et seq., section 670h). The DOI Manual 632 and BLM Manual 6840 requires conservation of special status species and the ecosystems upon which they depend on BLM-administered lands. BLM special status species are those listed or proposed for listing under the ESA, and species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. Instructional Memorandum No. WY IM-2010-027 provides the plant and wildlife Species lists for BLM- administered public lands in Wyoming and these species have been evaluated for potential impacts from the proposed lease sale, as documented by stipulations found in Appendix 5.1 of this EA.

Parcels proposed for lease may contain habitat for sensitive species. Leasing of the proposed parcels would not, by itself, authorize any ground disturbance; however, the proposed lease sale has the potential to impact habitat through future oil and gas development. Although site-specific effects cannot be analyzed until an exploration or development application is received, attachments of stipulations and notices to leases will assure the opportunity to make adjustments, such as design modifications, at the site-specific level when an Application for Permit to Drill is received, to address specific wildlife and plant resources.

Solid and Hazardous Wastes

None of the parcels are known to contain open sources of solid waste. Historical management of split estate lands is unknown but unlikely to contain reportable levels of hazardous waste; these lands may have been impacted through normal everyday living including but not limited to spills of oils, paints, etc.

Several parcels have been previously leased and contain well bores that have been plugged and abandoned or are active injection wells. Any of these parcels may also contain previously approved for abandonment, oilfield materials in the subsurface; they may also contain materials that were disposed of without authorization.

Should a parcel be leased and developed, generation and temporary storage of waste materials would likely occur. Waste materials would be managed in accordance with 43 CFR § 3171 and 3177, the Resource Conservation and Recovery Act (RCRA), applicable WDEQ regulations, and Wyoming Oil and Gas Conservation Commission (WOGCC) rules. Fluid handling would be evaluated at the development stage and fluids associated with any subsequent drilling, completions and/or production would either be treated, evaporated, or transferred to a WDEQ-authorized commercial treatment, storage, or disposal facility; solids would be treated on site or transferred to a WDEQ-authorized facility. BMPs, SOPs and site-specific mitigation may be applied at the APD stage as COAs.

Grazing

Some of the parcels are located within livestock grazing allotments or private pastures. Leasing or production activities would not cause changes to grazing permit terms and conditions. Any activity that involves surface disturbance or direct resource impacts would have to be authorized as a lease operation through future NEPA analysis, on a case-by-case basis, at the APD stage. Impacts to livestock grazing may occur as a result of subsequent actions including exploration development, production, etc. Therefore, reclamation provisions/procedures including re-vegetation (utilizing appropriate seed mix based on the ecological site, elevation, and topography), road reclamation, range improvement project replacement/restoration (e.g., fences, troughs and cattle guards), noxious weed control, would be identified in future NEPA/decision documents on a case-by-case basis (at the APD stage). In addition, if any range improvement projects could be impacted by wells or associated infrastructure, well pads could be moved 200 meters to avoid rangeland improvements or vegetation monitoring plots as per 43 CFR § 3101.1-2. BMPs, SOPs and site-specific mitigation may be applied at the APD stage as COAs.

Geology and Mineral Resources

Oil and gas exploration could lead to an increased understanding of the geologic setting, as subsurface data obtained through lease operations may become public record. This information promotes an understanding of mineral resources as well as geologic interpretation. While conflicts could arise between oil and gas operations and other

mineral operations, these could generally be mitigated under 43 CFR § 3101.1-2 and under standard lease terms (see Appendix 5.1) where siting and design of facilities may be modified to protect other resources.

Depending on the success of oil and gas drilling, non-renewable natural gas and/or oil would be extracted and delivered to market. Production would result in the irretrievable loss of these resources. Any oil and gas development can be managed to avoid or work within other mineral resources. Mining claims and Mineral Materials were reviewed and no parcels have active gravel pits or commercial rock quarries within their boundaries and none are located within a Known Sodium Lease Area.

At the time of a site-specific proposal for development of the lease, Standard Lease Stipulation No. 3 protects the prior rights:

Operations will not be approved which, in the opinion of the authorized officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

The oil and gas lessee would conduct its operations, so far as reasonably practicable, to avoid damage to any known deposit of any mineral for which any mining claim is located. The lessee would be required to not endanger or unreasonably or materially interfere with any mining claimant's operations, including any existing surface or underground improvements, workings, or facilities that may have been made for the purpose of mining operations. The provisions of the Multiple Mineral Development Act (30 U.S.C. § 521 et seq.) will apply to the leased lands as well as any applicable oil and gas EIS.

Designated Development Areas (DDAs)/Oil and Gas Management Areas
Designated Development Areas and Oil and Gas Management Areas are managed primarily for oil and gas exploration and development. None of the parcels are located within a Designated Development Area (DDA). The respective field office's Approved RMPs designates these areas for development incorporating almost all lands with moderate to high oil and gas potential. Potential for future mineral development is primarily limited to lands in the Designated Development Areas which do not conflict other resources.

Areas of Critical Environmental Concern (ACECs)
Areas of Critical Environmental Concern are identified during the RMP process. Parcels offered for sale are subject to the stipulations shown in Appendix 5.1, which includes protecting the relevant and important ACEC values. Should a parcel be sold, and subsequently developed, any further mitigation measures to reduce impacts would be applied at the site-specific project level.

2 Description of Alternatives, Including Proposed Action

Leasing is generally a three-step process. First, the BLM issues a RMP, as required by FLPMA, assessing the resources in a given area a determines what lands to open for development (43 CFR § 1601.0-5(n)). Step two, after the RMP has been signed, is to identify parcels eligible for lease, subject to public protest, and hold a competitive lease sale at which parcels are auctioned off and sold to the highest bidder (see 43 CFR § 3120.1-3, 43 CFR § 3120.5-1, 43 CFR § 3120.5-3). For the third and final step, after leases are issued, the lessees submit proposals to develop the leases. Prior to any surface disturbance occurring, an Application for Permit to Drill (APD) must be submitted and approved (43 CFR § 3162.3-1) by the field office. For each APD, the Bureau determines whether to approve the proposals and what conditions to impose (30 U.S.C. § 226(g) and 43 CFR § 3162.3-1).

BLM developed a parcel list of nominated lands from EOIs and the WSO created a shapefile of all parcels. The shapefile is used in the ArcGIS® mapping program (ArcMap®). Once the shapefile of parcels is created, the shapefile and parcels list are forwarded to BLM WSO specialists and field offices for further review and posted to ePlanning for scoping.

Using GIS, WSO screens all parcels to determine which parcels move forward for further review by the field offices. Each field office (FO) with potential parcels within its boundaries receives a list to review containing only those parcels.

The WSO specialists and the FO's use the same ArcMap® system to screen the proposed parcels. This screen is based on the RMP decisions in each FO. The FO reviews the potential parcels and recommends; which lands need to be removed from further consideration (e.g. lands unavailable for lease due to RMP decisions); which lands need to be deferred (potential conflicts that may have arisen); and leasing stipulations (based on RMP decisions). These recommendations are forwarded to the district offices.

The district office (DO) staff compiles all parcels within the district and verifies the recommendations from each FO within the district. Any discrepancies are discussed between the FO and DO staff to resolve those issues. The DO then sends the compiled list back to the WSO, specifically the fluid minerals staff.

The fluid minerals staff then compiles all three DO recommendations and potential parcels back into one list. The State Director (SD) and the District Managers (DMs) then coordinate and discuss the recommendations and concur on which potential parcels, or portions of parcels move forward for analysis and inclusion into the quarterly CLS EA.

The WSO fluid minerals staff prepares the EA and posts it on the ePlanning website for a 30-day public comment period. After the 30-day public comment period, the fluid minerals staff reviews and responds to the comments and makes changes to the EA, if necessary. Any major conflicts identified are discussed with the SD and Deputy State Director (DSD) for Lands and Minerals (and other staff if determined necessary by the SD) for a decision on whether to delete, defer or move the parcel forward.

The public comments and responses are then posted on the ePlanning website. The WSO publishes a Notice of Competitive Oil & Gas Lease Sale (Sale Notice), beginning a 30-day protest period. After the 30-day protest period, the fluid minerals staff reviews the protests and prepares responses. Once the protest responses are completed, the fluid minerals staff sends the EA, FONSI, Response to Public Comments, Response to Protests and Decision Record (DR) to other WSO staff for review and comment. These reviews are typically obtained from the Planning and Environmental Coordinator(s), Branch Chiefs, DSDs and finally the SD. The SD typically signs the FONSI and DR the day prior to the CLS. At any point in the review process (up until the day the sale is held), parcels or portions of parcels may be deleted or deferred.

2.1 Alternative 1 – No Action Alternative

Under the Alternative 1, BLM Wyoming would not offer the 20 parcels nominated and located in areas open to leasing under the approved RMPs, containing approximately 11,250.55 acres. This would mean that the Expressions of Interest would be rejected, and the lease parcels would not be offered. Choosing the No Action alternative would not prevent future leasing in these areas consistent with land use planning decisions and subject to appropriate stipulations, identified in the respective land use plans.

2.2 Alternative 2 – Proposed Action

Alternative 2 would offer 20 parcels containing approximately 11,250.55 acres nominated through the Expression of Interest as indicated in Table 2-1below.

Table 2-1. 2023-12 Proposed Lease Parcels

Field Office	Acres Nominated	# of Parcel Nominations	NUMBER DELETE WHOLE (acres)	NUMBER DELETE PART (acres)
BFO	409.55	2	0.00	0.00
CFO[1]	3,846.19	6	0.00	0.00
NFO	0.00	0	0.00	0.00
CYFO	0.00	0	0.00	0.00

[1] Parcel WY-2024-06-1838 is split between the Buffalo and Casper Field Offices. This parcel is counted towards the total number of parcels in the Casper Field Office.

Field Office	Acres Nominated	# of Parcel Nominations	NUMBER DELETE WHOLE (acres)	NUMBER DELETE PART (acres)
LFO	6,882.61	10	0.00	0.00
WFO	0.00	0	0.00	0.00
KFO	0.00	0	0.00	0.00
PFO	72.20	1	0.00	0.00
RFO	0.00	0	0.00	0.00
RSFO	40.00	1	0.00	0.00
Totals	11,250.55	20	0.00	0.00

2.3 Alternative 3 – Modified Proposed Action

The decision as to which public lands and minerals are open for leasing and what leasing stipulations may be necessary is made during the land use planning process. Surface management/use for mineral extraction on non-BLM administered land overlaying federal minerals will be determined by the BLM in consultation with the appropriate surface management agency or the private surface owner at the time such surface use is proposed by the leaseholder or designated agent. Under the MLA, issuing oil and gas leases is a discretionary authority conveyed to the Secretary of the Interior. In this alternative, BLM would not defer any parcels in accordance with Instruction Memorandum (IM) 2023-007 - Evaluating Competitive Oil and Gas lease Sale Parcels for Future Lease Sales.

One (1) whole parcel (WY-2024-06-1824) would be deferred based on Greater-sage grouse prioritization and one (1) whole parcel (WY-2024-06-1786) would be deferred because the parcel is within the boundaries of an active coal lease (See Table 4.11 for a full list of parcel recommendations). The parcels proposed for deferral are detailed in the tables below, Section 4.3, and in Appendix 5.1.

Table 2-2. Summary of parcels deferred, deleted, and available for sale

FIELD OFFICE	NOMINATED ACRES	PARCEL COUNT	WHOLE DEFERRAL	PARTIAL DEFERRAL	DELETE WHOLE	DELETE PART	OFFERED PARCELS (ACRES)
BFO	409.55	2	1	0	0	0	1 (34.33)
CFO	3,846.19	6	1	0	0	0	5 (3,126.19)
NFO	0.00	0	0	0	0	0	0 (0)
CYFO	0.00	0	0	0	0	0	0 (0)
LFO	6,882.61	10	0	0	0	0	10 (6,882.61)
WFO	0.00	0	0	0	0	0	0 (0)
KFO	0.00	0	0	0	0	0	0 (0)
PFO	72.20	1	0	0	0	0	1 (72.2)
RFO	0.00	0	0	0	0	0	0 (0)
RSFO	40.00	1	0	0	0	0	1 (40)

FIELD OFFICE	NOMINATED ACRES	PARCEL COUNT	WHOLE DEFERRAL	PARTIAL DEFERRAL	DELETE WHOLE	DELETE PART	OFFERED PARCELS (ACRES)
Total	11,250.55	20	2	0	0	0	18 (10,155.33)

Under Alternative 3, 18 parcels containing approximately 10,155.33 acres would be offered for lease during the Second Quarter 2024 (2024-06) Competitive Lease Sale. Parcels were evaluated for RMP conformance, including but not limited to sage grouse prioritization, and subsequently screened using the five leasing preference criteria listed in IM-2023-007 and further described its associated attachment (Guidelines for Evaluating Nominated Lease Parcels and Recording Preferential Status in NFLSS) of the IM. The preference criteria are comprised of:

1. Proximity to existing oil and gas development, giving preference to lands upon which a prudent operator would seek to expand existing operations;

    - Proximity to existing development includes proximity to active wells or other types of oil and gas infrastructure (i.e., development, excluding pipelines and access roads, within five miles of the exterior boundary of the parcel), or where federal mineral estate is potentially being drained of the federal resource. Any nominated parcel subject to immediate drainage or within five miles of existing development will be considered to have a preference value of HIGH for this criterion.

2. The presence of important fish and wildlife habitats or connectivity areas, giving preference to lands that would not impair the proper functioning of such habitats or corridors;

    - All EOI lands for which oil and gas development would have a high potential for conflict with important habitats, as well as all nominated lease parcels that are within identified and existing migration areas and connectivity areas, will have a preference value of LOW for this criterion.

3. The presence of historic properties, sacred sites, or other high value cultural resources, giving preference to lands that do not contribute to the cultural significance of such resources;

    - EOI lands for which a parcel contains known cultural resources, such as historic properties protected under the National Historic Preservation Act (NHPA), and/or other cultural resources protected under the American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders, or where Tribes have identified the presence of Traditional Cultural Properties, sacred sites, or other properties of religious or cultural significance, will be evaluated for potential conflict. All parcels that have high potential of conflict with cultural resources will automatically have a preference value of LOW for this criterion.

4. The presence of recreation and other important uses or resources, giving preference to lands that do not contribute to the value of such uses or resources; and

    - EOI lands with existing resources or uses that would not be compatible with oil and gas development automatically will have a preference value of LOW for this criterion.

5. Potential for development, giving preference to lands with high potential for development.

    - Potential for development is based on the BLM Office's Reasonably Foreseeable Development (RFD) scenario where the RFD contains projections of the number of possible oil and gas wells that could be drilled and produced within each of the development potential areas specified as Very High, High, Moderate, Low, and Very Low development potential. Any nominated parcel that falls within Very High or High in the RFD will have a preference value of HIGH for this criterion. Specialists may consider site-specific changes that may have occurred since the Resource Management Plan was initiated/signed and will address and identify the preference value of parcels with Moderate development potential on a case-by-case basis.

Proposed parcels with a high preference value will be considered first for potential inclusion in a lease sale. The BLM will defer lease parcels with a low preference value (Table 2-3). Throughout the review period for the lease sale, BLM may also consider additional measures and deferrals to address the potential impacts of leasing, as well as new information that is presented during the NEPA process for the lease sale.

In accordance with IM 2023-007, the BLM WY State and Field offices evaluated sale parcels as shown in **Error! Reference source not found.** None of the parcels have a low preference for leasing based on evaluation criteria 1 through 5 of the IM and RMP requirements. If a parcel is recommended for deferral under one of these criteria, the table indicates which criteria. For example, if the parcel is recommended for deferral based upon sage-grouse prioritization, it meets the requirements under Leasing Preference Criteria #2 due to RMP prioritization requirements. However, if the parcel is recommended for deferral due to migration corridors, it meets Leasing Preference Criteria #2 and the recommendation would be to 'Defer for IM-2023-007, Criteria 2 – GSG Habitat/ Connectivity'. It is important to note that if a parcel is deferred under the Greater Sage-Grouse prioritization process (which occurs prior to the screening for the IM), it would also meet the 'Low' leasing preference criteria; however, it would be listed as 'Low (GSG Prioritization)' and not due to the IM preference criteria. Parcels in criteria 5 (RFD) were evaluated utilizing the best available information from the RMP RFDs, as well as a development potential map created by BLM specialists utilizing publicly available data through the Wyoming State Geological Survey and the Wyoming Oil and Gas Conservation Commission, existing federal oil and gas leases, federal units, participations areas, and well data from the Wyoming Oil and Gas Conservation Commission to screen for development potential.

Table 2-3. IM 2023-007 Leasing Preference

Office	Parcel WY-2024-06-	1 Proximity Criteria	2 Habitat Criteria	3 Cultural Resources Criteria	4 Other Resources Criteria	5 RFD Criteria	High Preference for Leasing	Low Preference for Leasing
LFO	1770	High	High	High	High	High	X	
LFO	1771	High	High	High	High	High	X	
BFO	1786	High	High	High	High	High	X	
RSFO	1823	High	High	High	High	High	X	
CFO	1824	High	Low	-	-	-		X (Defer for Greater Sage-Grouse Prioritization)
CFO	1825	High	High	High	High	High	X	
LFO	1828	High	High	High	High	High	X	
LFO	1829	High	High	High	High	High	X	
LFO	1832	High	High	High	High	High	X	
PFO	1833	High	High	High	High	High	X	
LFO	1834	High	High	High	High	High	X	
CFO	1835	High	High	High	High	High	X	
CFO	1836	High	High	High	High	High	X	
LFO	1837	High	High	High	High	High	X	
CFO	1838	High	High	High	High	High	X	
LFO	1840	High	High	High	High	High	X	
LFO	1841	High	High	High	High	High	X	
CFO	7294	High	High	High	High	High	X	
LFO	7295	High	High	High	High	High	X	
BFO	7296	High	High	High	High	High	X	

2.4 Alternatives Considered but Not Analyzed in Detail

Offer All Nominated Parcels as Originally Submitted Through the Expression-Of-Interest (EOI)
Offering all 20 nominated parcels as originally submitted through the EOI process was considered as an alternative to analyze all nominated lands. This alternative was not analyzed in detail because the offering all parcels would not be in conformance with the RMP(s).

Offer All Nominated Parcels Subject to Standard Lease Terms and Conditions
Offering all nominated parcels with only the standard lease terms and conditions on the BLM's lease form was considered to reduce constraints to oil and gas development on public lands. Such an alternative is not in conformance with the approved RMPs where the applicable RMP prescribes stipulations in accordance with FLMPA's Section 102(a)(8) mandate to manage the public lands to protect resource values. Therefore, this alternative was not analyzed in detail.

Offer All Available Parcels Subject to No Surface Occupancy (NSO) Stipulations
An alternative was considered that would offer all parcels located in areas open to leasing with a NSO stipulation. This alternative was not carried forward to detailed analysis because it is not in conformance with the approved RMPs and would only prohibit surface occupancy for oil and gas development; other non-oil and gas occupancy may not be similarly constrained. This alternative would unnecessarily limit oil and gas occupancy in areas where the approved RMPs have determined that less restrictive stipulations would adequately mitigate the anticipated impacts under our mandate of multiple-use and sustained yield.

Defer All Priority Sage-Grouse Habitat Parcels
BLM considered deferring all Greater Sage-Grouse Priority Habitat Management Area (PHMA) parcels. Under this alternative 18 parcels would be offered during a competitive oil and gas lease sale including 18 parcels in General Habitat Management Area (GHMA). This alternative was not analyzed in detail because the ARMPA allows for leasing in PHMA. See alternative 3 for full prioritization analysis.

Defer All Sage-Grouse Habitat Parcels
An alternative was considered that would defer all Greater Sage-Grouse GHMA and PHMA parcels. Under this alternative no parcels would be offered during a competitive oil and gas lease sale. This alternative was not analyzed in detail because the ARMPA allows for leasing in both GHMA and PHMA and it would be the same analysis as Alternative 1. See Alternative 3 for full prioritization analysis.

3 Affected Environment

Introduction

The sale of parcels and issuance of oil and gas leases is an administrative action. Nominated parcels are reviewed under the approved RMP, and stipulations are attached to mitigate any known environmental or resource conflicts that may occur on a proposed lease parcel. On-the-ground impacts would not occur until a lessee or their designated operator applies for and receives approval to undertake surface-disturbing lease actions.

The BLM cannot reasonably determine at the leasing stage whether a nominated parcel will actually be leased, or if leased, whether or not the lease would be explored or developed or at what intensity development may occur.

The uncertainty that exists at the time the BLM offers a lease for sale includes factors that will affect potential impacts, such as: well density; geological conditions; development type (vertical, directional, horizontal); hydrocarbon characteristics; equipment to be used during construction, drilling, production, and abandonment operations; and potential regulatory changes over the life of the 10-year primary lease term.

If lands are offered, leased, and a proposal for site-specific lease operations is received by the BLM, additional NEPA compliance documentation and technical analysis would be prepared by the BLM. Aside from the applicable protection measures required under the lease stipulations (see Appendix 5.1), additional mitigation may be applied as COAs at that time to mitigate identified impacts.

As described in Section 1.3, above, this EA tiers to the applicable RMP FEISs (40 CFR § 1502.20). In the impacts analysis for the alternatives, below, this EA will only address those resources and impacts where the BLM has determined there are new circumstances or information, or where BLM believes it will be helpful to inform the public about actions that may occur on public lands. This approach comports with the BLM's NEPA Handbook H-1790-1 (at page 28).

For additional descriptions of the potential effects for the alternatives considered below, please refer to the RMP FEISs referenced in Section 1.3.

Resources Carried Forward for Analysis

The BLM IDT identified resources that could be affected by the Proposed Action and alternatives and potential environmental impacts for each resource as the key issues to be analyzed in the EA.

Resources that are not present or are not affected by the Proposed Action or alternatives, as determined during scoping, do not warrant further analysis. These resources will not be discussed further in this EA.

3.1 Air Resources

3.1.1 Air Quality

The Wyoming Bureau of Land Management (BLM) has prepared this air monitoring report to present existing environment conditions for use in impact assessments. The BLM authorizes activities that can affect air resources by releasing pollutants into the atmosphere. The report assists the BLM in managing air resources by establishing current conditions and monitoring trends for National Environmental Policy Act (NEPA) analysis. Additionally, the report is used to promote education, awareness, and transparency of air resources on public lands. Air pollution does not stop at governmental or jurisdictional boundaries and engaging the public, various levels of government, and tribes through cooperative airshed management is a key to protecting air quality.

Note to reader: the "2023 Air Resource Monitoring Report" incorporated by reference as the foundation for this analysis and is available at 2023 BLM Wyoming Air Resource Monitoring Report (Data Through 2022).pdf.

Air Resource Management

The airshed concept is a means for evaluating the local and regional air quality effects of a pollutant source. An airshed is a volume of air that is generally homogeneous with respect to atmospheric properties and the dispersion of air pollutants. In Wyoming, geographical and meteorological constraints often define an airshed's boundaries and limit the dispersion of pollutants away from a source. The size of an airshed can vary from small valleys that are a few miles across to larger urban or regional areas that can be tens or hundreds of miles across. Pollutants move through an airshed by two processes: transport and dispersion. Transport is movement caused by a time-averaged wind flow, with pollutants moving on scales of miles per hour. Dispersion is much smaller movement, primarily caused by localized turbulence on the scale of inches or feet. The transportation and dispersion extent of pollutants is the main factor for the area covered by an airshed.

Regulatory Framework

This section discusses the laws, policies, and directives that guides the BLM in its multiple use mission with respect to air resources.

Federal Land Policy and Management Act

Federal Land Policy and Management Act (FLPMA) of 1976 [43 U.S.C. §§ 1701-1785], often referred to as the BLM's "Organic Act," provides the majority of the BLM's legislated authority, direction policy, and basic management guidance. This Act outlines the BLM's role as a multiple use land management agency and provides for management of the public lands under principles of multiple use and sustained yield. The Act directs public lands

to be managed “in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values” (Sec. 102. (a) (8)). To fulfill this responsibility, the BLM's land use plans ensure “compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans” (Sec. 202. (a)(8)). Accordingly, BLM leases and ensures operating permits for fossil fuels comply with all state and federal air pollution requirements. FLPMA also gives the BLM authority to revoke or suspend any BLM-authorized activity that is found to be in violation of regulations applicable to public lands and/or noncompliance with applicable state or federal air quality standards or implementation plans, thus ensuring that the BLM can provide for compliance with applicable air quality standards, regulations, and implementation plans (Sec. 302(c)). Thus, when authorizing activities, the BLM assumes full compliance with applicable state and federal air quality requirements, emissions standards, and related equipment and performance standards in effect at the time.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 et seq.) ensures that information on the potential environmental and human impact of federal actions is available to public officials and citizens before decisions are made and actions are taken. One of the purposes of the act is to “promote efforts which will prevent or eliminate damage to the environment and biosphere” and to promote human health and welfare. This act requires that agencies prepare a detailed statement on the environmental impact of the proposed action for major federal actions expected to significantly affect the quality of the human environment (Section 102(C)). In addition, agencies are required, to the fullest extent possible, to use a “systematic, interdisciplinary approach” in planning and decision-making processes that may have an impact on the environment (Section 102(A)).

Clean Air Act

The Clean Air Act (CAA) of 1963 [42 U.S.C. § 1857 et seq.], as amended and recodified [42 U.S.C. § 7401 et seq.] is the primary Federal legislation and provides the framework for protecting and enhancing the quality of the Nation’s air resources so as to promote the public health and welfare and the productive capacity of its population (Section 101(b)(1)). The Act focuses on reducing criteria air pollutants and hazardous air pollutants. As required by the CAA, EPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants (Section 109 (a)(1)(A)). Compliance and enforcement of these Federal requirements is delegated to applicable Tribal, State, and local regulatory agencies (Sections 107(a), 301(d), 302). The CAA also allows these agencies to establish regulations which are more, but not less, stringent than the Federal requirement (Section 116) (EPA 2007). The BLM has no authority to determine how air quality standards will be achieved nor to determine if an area is following air quality standards.

Other Guidance and Policies

Other guidance and policy are useful for the BLM in managing air resources. While this guidance is not required by law, it can be useful for managing and analyzing air resources. Such guidance includes, but is not limited to:

- Council on Environmental Quality (CEQ) guidance on NEPA analysis,
- CEQs NEPA guidance on consideration of GHG emissions and climate change,
- Federal Land Managers’ Air Quality Related Values Work Group (FLAG), and
- BLM Guidance for Conducting Air Quality General Conformity Determinations (BLM IM2013-025 2012) (BLM IB 2014-084 2014).

Specific Regulatory Requirements for the Oil and Gas Industry

Federal Rules

The EPA has established emissions control requirements in the New Source Performance Standards (NSPS) at 40 CFR Part 60 that apply to coal, oil, and natural gas production facilities (40 CFR 60, Subparts OOOO and OOOOa), for example, and serve to control methane emissions from oil and natural gas industry sources. Subpart OOOOa requires reduced emissions completions (“green” completions) on new hydraulically fractured gas wells as well as

emissions controls on pneumatic controllers, pumps, storage vessels, and compressors. Other relevant NSPS requirements under 40 CFR Part 60 include:

- Subpart GG – Standards of Performance for Stationary Gas Turbines
- Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines
- Subpart K – Standards of Performance for Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced after June 11, 1973 and prior to May 19, 1978
- Subpart Ka – Standards of Performance for Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced after May 18, 1978 and prior to July 23, 1984
- Subpart Kb – Standards of Performance for Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced after July 23, 1984
- Subpart KKK – Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011
- Subpart KKKK – Standards of Performance for Stationary Combustion Turbines
- Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which Construction, Modification, or Reconstruction Commenced after August 23, 2011
- Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which Construction, Modification, or Reconstruction Commenced on or after September 18, 2015
- Subpart TTTT - Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units
- Subpart Y - Standards of Performance for Coal Preparation and Processing Plants

State Rules

The Wyoming Department of Environmental Quality/Air Quality Division (WDEQ-AQD) is responsible for ensuring that air in Wyoming meets health and safety standards established under the CAA. To fulfil this responsibility, the WDEQ-AQD is required by the federal government to ensure compliance with the NAAQS statewide. Additionally, the state ensures compliance with visibility standards through regional haze rules. The WDEQ-AQD enacts rules pertaining to air quality standards, develops plans to meet the federal standards, when necessary, issues preconstruction and operating permits to stationary sources, and ensures compliance with State and Federal air quality rules (WDEQ 2022).

EPA's Tribal Authority Rule gives Tribes the ability to develop air quality management programs, write rules to reduce air pollution and implement, and enforce their rules in Indian Country. While state and local agencies are responsible for all CAA requirements, Tribes may develop and implement only those parts of the CAA that are appropriate for their lands (EPA 2007).

While the EPA, State, and Tribes have regulatory authority to control air pollution emissions, it is the mission of the BLM to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Regulated Air and Atmospheric Values

Criteria Air Pollutants

The EPA has established NAAQS for six common air pollutants (also known as "criteria air pollutants"). These pollutants are found all over the U.S. Concentrations of air pollutants greater than the national standards represent a risk to human health and the environment. Criteria pollutants include carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead, and are discussed below. Periodically, the EPA reviews the latest science to ensure that NAAQS appropriately protect human health and safety and to update the standards when necessary. Indicators for assessing environmental impacts from criteria air pollutants include emissions (mass per unit of time) and concentrations (mass per volume, or number of molecules over total molecules).

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless gas emitted from incomplete combustion of carbon-containing materials. The greatest sources of CO to outdoor air are cars, trucks, and other vehicles or machinery that burn fossil fuels. Very high levels of CO usually do not occur in outdoor environments. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. This can cause specific complications in people who have some types of heart disease as they are especially vulnerable to the effects of CO when exercising or under increased stress. For these individuals, short-term exposure to elevated CO may be accompanied by angina, a type of chest pain caused by reduced blood flow to the heart. Other symptoms of carbon monoxide exposure include headache, nausea, rapid breathing, weakness, exhaustion, dizziness, and confusion (Center for Disease Control 2018). At extremely high levels, CO can cause hypoxia (severe oxygen deficiency) and death (EPA, 2018).

Nitrogen Oxides

Nitrogen oxides (NOx) are a group of highly reactive gasses and include nitrogen dioxide (NO2), nitrous acid, and nitric acid. While EPA's NAAQS cover this entire group of NOx, NO2 is the component of greatest interest and the indicator for the larger group of nitrogen oxides. NO2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO2 is linked with several adverse effects on the respiratory system (EPA, 2018). High concentration of NO2 can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms. Longer exposures to elevated concentrations of NO2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma and lung cancer, as well as children and the elderly are generally at greater risk for the health effects of NO2. Nitrogen dioxide exposure has also been linked to cardiovascular harm, lower birth weight in newborns, and an increased risk of premature death (American Lung Association 2023). NO2 and other NOx interact with water, oxygen, and other chemicals in the atmosphere to produce acid rain. High levels of NO2 are also harmful to vegetation, damaging foliage, decreasing growth, and reducing crop yields (Rowland 1985).

Ozone

Ground-level ozone (O3) is a secondary pollutant. It is formed by a chemical reaction between NOx and volatile organic compounds (VOCs) in the presence of sunlight (photochemical oxidation). Sources of ozone precursors for NOx and VOCs include motor vehicle exhaust, industrial emissions, gasoline vapors, biogenic emissions (e.g., terpenes), wood burning, and chemical solvents. Abundant solar radiation drives the photochemical reaction and creates ground-level O3. Primary health effects from O3 exposure range from breathing difficulty to permanent lung damage. Ozone aggressively attacks lung tissue by reacting chemically with it, making it a unique pollutant because it can cause issues in otherwise healthy individuals (American Lung Association 2023). Anyone who spends time outdoors where ozone pollution levels are high is at risk, but especially those who are pregnant, children and teens, those over 65, people with existing lung diseases, and people who work or exercise outdoors. Short-term exposure to ozone pollution results in temporary obstruction of airways, causing shortness of breath, wheezing, and coughing. Long-term exposure to ozone is linked to aggravation of asthma or chronic obstructive pulmonary disease (COPD) and is one of many causes of asthma and COPD development, especially in newborns. Long-term exposure to ozone is linked to a higher risk of death from respiratory diseases associated with increases in ground-level ozone. Lifetime ozone exposure has also been linked to an increased risk of metabolic disorders, including glucose intolerance, hyperglycemia, and diabetes. High concentrations of ground-level O3 contributes to plant and ecosystem damage. Many tree species are particularly susceptible to ozone damage including the black cherry, quaking aspen, white pine, ponderosa pine, and red alder. Exposure to ozone increases the plants' risk of disease, damage from insects, effects of other pollutants, and harm from severe weather (EPA 2022). Ozone pollution is a significant contributor to haze and was referred to as "smog" for many years.

While ozone is generally considered a summertime air pollutant, in certain parts of the country it has become a wintertime issue due to highly concentrated precursor pollutants under low-level temperature inversions and additional photochemical reaction from snow reflecting solar radiation back into the atmosphere. This is of

particular concern in the Upper Green River Basin of Wyoming where wintertime ozone concentrations can exceed the NAAQS for extended periods of time in the winter months.

Ozone and its precursors are a regional air quality issue due to possible transport hundreds of miles from origination, thus maximum O3 levels can occur at locations many miles downwind from the sources.

Particulate Matter (PM10 AND PM2.5)

Airborne particulate matter (PM) consists of tiny coarse-mode (PM10) or fine-mode (PM2.5) particles or aerosols combined with dust, dirt, smoke, and liquid droplets. PM2.5 have diameters that are generally 2.5 micrometers or smaller and derive primarily from the incomplete combustion of fuel sources and secondarily formed aerosols. PM10 have diameters that are generally 10 micrometers or smaller and derive primarily from crushing, grinding, or abrasion of surfaces. Sources of particulate matter include industrial processes, power plants, vehicle exhaust, fugitive dust, construction activities, home heating, and fires. Due to the size of these particles, they can travel deep into the bronchioles of the lungs and can enter the bloodstream (EPA 2023). Many scientific studies have linked breathing PM to serious health problems, including aggravated asthma, increased respiratory symptoms, difficult or painful breathing, chronic bronchitis, decreased lung function, nonfatal heart attacks, irregular heartbeat, and premature death. In adults, long-term particle pollution is linked to worsening of heart disease/atherosclerosis/COPD, higher risk of developing diabetes, higher risk of developing fatal lung cancer, impaired cognitive functioning, and increased risk of Parkinson's disease/Alzheimer's disease/other dementias (American Lung Association 2023). Particulate matter is a major cause of reduced visibility. It can stain and damage stone and other materials, including culturally important objects, such as monuments and statues (EPA, 2018). Airborne dust can also deposit on snow. This dust deposition accelerates snowmelt by reducing albedo through surface darkening and enhanced snow grain growth (Skiles and Painter 2016). The degree of advanced snowmelt during has a linear relationship to the amount of dust loading on the snowpack, which can affect the availability of late season water in areas dependent on snowmelt to fill their watersheds.

Sulfur Dioxide

Sulfur dioxide (SO2) is one of a group of highly reactive gases known as "oxides of sulfur" or SOx. SO2 can react with other compounds in the atmosphere to form fine particles, PM2.5. The largest sources of SO2 emissions are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%). Smaller sources of SO2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels like diesel by locomotives, large ships, and non-road equipment. SO2 is linked with several adverse effects on the respiratory system (EPA, 2018). The consequences of exposure include wheezing, shortness of breath, chest tightness, and reduced lung function. People with asthma, particularly children, are sensitive to these effects of SO2. At high concentrations, gaseous SOx can harm trees and plants by damaging foliage and decreasing growth. SO2 and other sulfur oxides can contribute to acid rain.

Lead

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been from fuels in on-road motor vehicles (such as cars and trucks) and industrial sources. As a result of EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector declined by 95% between 1980 and 1999, and levels of lead in the air decreased by 94% during the same period. Major sources of lead emissions to the air today are ore and metals processing and piston-engine aircraft using leaded aviation gasoline (EPA, 2018). Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems, and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. Lead can accumulate in the body over time, where it is stored in bones along with calcium. The lead effects most likely to be encountered in current populations are neurological effects in children. Infants and young children are especially sensitive to lead exposures, which may contribute to behavioral problems, learning deficits, lowered IQ, and hyperactivity. Children are also at an increased risk of slowed growth, hearing problems, and anemia. Adults exposed to lead can suffer from cardiovascular effects, decreased kidney function, and both male and female reproductive issues.

National Ambient Air Quality Standards (NAAQS)

The WDEQ-AQD is responsible to for ensuring compliance with the NAAQS within the state of Wyoming. Table 3-1 Table 3-1shows current NAAQS for the EPA designated criteria pollutants (EPA 2018).

Table 3-1. Primary Criteria Pollutant NAAQS

Pollutant	Primary/ Secondary	Averaging Time	Level*	Form
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$	Not to be exceeded
Nitrogen Dioxide (NO_2)	primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary	1 year	53 ppb	Annual Mean
Ozone (O_3)	primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Fine Particulate Matter ($PM_{2.5}$)	primary	1 year	12.0 $\mu g/m^3$	Annual mean, averaged over 3 years
	secondary	1 year	15.0 $\mu g/m^3$	Annual mean, averaged over 3 years
	primary and secondary	24 hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years
Coarse Particulate Matter (PM^{10})	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

* Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).

Hazardous Air Pollutants (HAPs)

Hazardous air pollutants (HAP) are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental impacts. The EPA has classified 188 air pollutants as HAPs. Examples of listed HAPs associated with the oil and gas industry include formaldehyde, benzene, toluene, ethyl benzene, isomers of xylene (BTEX) compounds, and normal-hexane (n-hexane). Indicators for assessing environmental impacts from HAPs include emissions (mass per unit of time) and concentrations (mass per volume).

The CAA requires the EPA to regulate emissions of toxic air pollutants from a published list of industrial sources referred to as “source categories.” The EPA has developed a list of source categories that must meet control technology requirements for these toxic air pollutants. Under Section 112(d) of the CAA, the EPA is required to develop regulations establishing national emission standards for hazardous air pollutants (NESHAP) for all industries that emit one or more of the pollutants in major source quantities. These standards are established to reflect the maximum degree of reduction in HAP emissions through application of maximum achievable control

technology (MACT). Source categories for which MACT standards have been implemented include oil and natural gas production and natural gas transmission and storage.

Although HAPs do not have federal air quality standards, some states have established “thresholds” to evaluate human exposure for potential chronic inhalation illness and cancer risks. There are no applicable federal or State of Wyoming ambient air quality standards for assessing potential HAP impacts to human health and monitored background concentrations. Therefore, reference concentrations (RfC) for chronic inhalation exposures and reference exposure levels (REL) for acute inhalation exposures can be applied as evaluation criteria below provides the RfCs and RELs. Both the RfC and REL guideline values are for non-cancer effects (See Table 6).

Air Quality Related Values

Air resources also encompass Air Quality Related Values (AQRVs). Air pollution can impact AQRVs through ambient exposure to elevated atmospheric concentrations, such as O3 effects to vegetation, impairment of scenic views by PM in the atmosphere, and deposition of air pollutants, such as sulfur and nitrogen compounds on the earth’s surface through dry and wet precipitation. AQRVs are identified and managed within the respective jurisdictions of several land management agencies in designated Class I areas. The requirement to assess impacts to AQRVs is established in the CAA Prevention of Significant Deterioration (PSD) rules. PSD is a permitting program for new and modified major sources of air pollution that are located in attainment areas. The Federal land managers have the responsibility to consider whether new emissions from proposed major facilities (or modifications to major facilities) would have an adverse impact on AQRVs areas they manage. Impact indicators for visibility include changes to color and contrast for an exhaust or dust plume, or changes to light extinction (deciview) for a cumulative assessment. Indicators for deposition include the Deposition Analysis Threshold (DAT), and critical load thresholds, both measured as mass over area and time.

Greenhouse Gases

Greenhouse gases (GHGs) became regulated pollutants on January 2, 2011, under the PSD and Title V Operating Permit Programs (EPA 2018) because of their contribution to global climate change effects. These gases absorb energy emitted from the earth’s surface and re-emit a larger portion of the heat back to the earth, rather than allowing the heat to escape into space, which would be the case under more natural conditions. The EPA’s GHG Tailoring Rule (40 CFR § 51, 52, 70, et al.) set initial emissions thresholds for PSD and Title V permitting based on carbon dioxide equivalent (CO2e). These thresholds apply to stationary sources that emit greater than 100,000 tons CO2e per year (e.g., power plant, or landfill, etc.) or modifications of major sources with resulting emissions increase greater than 75,000 tons CO2e per year.

In addition to the Tailoring Rule, the EPA requires reporting of GHGs from facilities with stationary sources that emit 25,000 metric tons CO2e per year or more in the United States. The Mandatory Reporting Rule (40 CFR § 98, Subpart C) does not require control of GHGs, it only requires that sources above the threshold levels monitor and report emissions. Facilities used for injecting carbon dioxide for geological sequestration must report net emissions regardless of quantity (40 CFR § 98, Subpart RR). This provides a basis for future EPA policy decisions and regulatory initiatives regarding GHGs. Additional regulations and policies for GHG’s are incorporated by reference from the BLM Specialist Report on Annual GHG Emissions and Climate Trends (BLM 2023).

Criteria for Detailed Analysis of Air Quality Pollutants in NEPA

Generally, the criteria followed for the inclusion of a detailed analysis in NEPA documents for air quality resources is based upon emission limits. This could result in a project being analyzed in detail below the emission levels, and not being analyzed in detail above the emission levels in Table 3-2. In most scenarios, project related mobile sources are excluded from the emission limits in Table 3-2 since they are dispersed over large distances. The emission limits in Table 3-2 are specific to point source/stationary sources. Exceptions to the exclusion of project related mobile source are possible based on specific project details. The criteria have been developed based on 40 CFR 52.21(b)(23)(i) and State of Wyoming/Department of Environmental Quality/Air Quality Division Wyoming Administrative Rules, Chapter 6, Section 13(b)(i) (WDEQ 2022).

Table 3-2. Emissions Criteria for Detailed Analysis of Air Quality in NEPA

Pollutant	Emissions Limit
Sulfur Dioxide	40 tons per year
Nitrogen Oxides	40 tons per year
PM10 – Fugitive Emissions and Fugitive Dust*	5 tons per year
PM10 – Non-fugitive Emissions	15 tons per year
PM2.5	10 tons per year
Carbon Monoxide	100 tons per year
Lead	0.6 tons per year
Ozone	40 tons per year of volatile organic compounds or nitrogen oxides

*Fugitive emissions and fugitive dust from point/stationary sources.

Other Pollutants and Odors

The Bureau of Land Management primarily manages odors as a nuisance. Odors are usually not a reliable indicator of health impacts as toxic compounds can exhibit no odor or an odor threshold lower or higher than its REL. The human nose is particularly sensitive to compounds containing sulfide. The BLM issued 43 CFR § 3176 that provides requirements and standards for conducting oil and gas operations in an environment knows to or expected to contain hydrogen sulfide (H2S) gas in order to protect human health and the environment.

Baseline Conditions and Trends

Emissions

The National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants. The NEI is released every three years based primarily upon data provided by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data developed by the US EPA. The NEI is built using the Emissions Inventory System (EIS) first to collect the data from State, Local, and Tribal air agencies and then to blend that data with other data sources (EPA 2023). The NEI includes emissions estimates for point, nonpoint, and mobile sources (EPA 2023)

Point

Point sources include large energy and industrial sites, such as electric generating utilities, portland cement manufacturing plants, petroleum refineries, natural gas compressor stations, and facilities that manufacture pulp and paper, automobiles, machinery, chemicals, fertilizers, pharmaceuticals, glass, food products, and other products. Additionally, smaller point sources can include crematoria, dry cleaners, and gas stations. There are also some portable sources in the point source data category such as hot mix asphalt facilities. Point source data includes emissions from the landing and take-off points of aircraft operations, the ground support equipment at airports, and locomotive emissions within railyards (EPA 2023).

Nonpoint

Nonpoint, or area emission sources, are those that are too small or too numerous to be treated as point sources. This includes biogenics, and new for the 2020 NEI, all fires, including wildfires, prescribed burning and agricultural field burning. Residential heating, asphalt paving, solvent use, and oil and gas production are examples of nonpoint area sources. Some “nonroad” mobile sources such as trains and commercial marine vessels are discussed in the nonpoint category (EPA 2023).

Mobile

Onroad Mobile

Mobile sources include emissions from on-road vehicles that use gasoline, diesel, and other fuels. On-road sources includes passenger cars, motorcycles, minivans, sport-utility vehicles, light- and heavy-duty trucks, and buses. The mobile sources sector also includes emissions generated from parking areas, emissions from short-duration idle during pickups/deliveries, emissions from vehicles when they start, and emissions when vehicles are moving. It also includes “hoteling” emissions, which refers to the time spent idling in a diesel long-haul combination truck during federally mandated rest periods of long-haul trips (EPA 2023). Onroad emissions in the 2020 NEI are comprised of emission estimates based on version 3 of the MOVES model (EPA 2023).

Nonroad Mobile

Nonroad sources includes all mobile source emissions that do not operate on roads, excluding commercial marine vessels, railways, and aircraft. The emissions included in the NEI cover nonroad equipment in 10 broad economic sectors: construction, agriculture, industrial, lawn & garden (commercial and residential), commercial, logging, railroad support (excluding locomotives), recreational vehicles, recreational marine (pleasure craft; excluding commercial marine vessels), and underground mining (EPA 2023). Nonroad equipment emissions were computed using MOVES3, which incorporates the NONROAD model, and was used for all states other than California who has developed their own emissions tool.

Fugitive Dust

Fugitive dust refers to particulate matter that enters the atmosphere without first passing through a stack or duct designed to direct or control its flow. Fugitive dust has been linked to various respiratory issues including aggravated asthma, chronic bronchitis, emphysema, and chronic obstructive pulmonary disease. Common sources of fugitive dust include paved and unpaved roads, construction, and crops and livestock. Dust and particulate matter from these sources become fugitive when lifted into the air by turbulent air currents such as wind erosion, or mechanical forces such as vehicle traffic (EPA 2022).

Crops and Livestock

Fugitive dust emissions from agricultural tilling include the airborne soil particulate emissions produced during the preparation of agricultural lands for planting. Dust kicked up by animals refers to the dust emitted from different types of livestock feet. These emissions are primarily considered to be made by cattle and swine, but poultry emissions of dust are also examined. The calculations for estimating emissions from agricultural tilling involves distributing state-level tilling data by tilling type to the county level and developing a county-level emissions factor for each crop and tilling type. The calculations for estimating emissions from dust kicked up by animals involves multiplying the livestock counts by an emission factor (EPA 2023).

Construction

Construction dust refers to residential and non-residential construction activity, which are functions of acreage disturbed for construction and volume of soil excavated for construction. Residential construction activity is developed from data obtained from the U.S. Department of Commerce’s Bureau of the Census (EPA 2023). The calculations for estimating the emissions from non-residential construction involve first estimating the acres disturbed from non-residential construction in each county. Emissions factors for PM10 and PM2.5 are calculated based on precipitation-evaporation values and dry silt content in each county. The total amount of acres disturbed is multiplied by these emissions factors to estimate emissions of PM from non-residential construction (EPA 2023)

Paved Roads

The paved road dust sector reflects emissions of particulate matter from vehicles driving over paved roads. Uncontrolled paved road emissions were calculated at the county level by roadway type. This was done by

multiplying the county/roadway class paved road vehicle miles traveled (VMT) by the appropriate paved road emission factor. VMT data on US roads can be obtained by the Federal Highway Administration (FHWA) (EPA 2023).

Unpaved Roads

The unpaved road dust sector reflects emissions of particulate matter from vehicles driving over unpaved roads. Uncontrolled unpaved road emissions were calculated at the county level by roadway type. This was done by multiplying the county/roadway class unpaved road VMT by the appropriate unpaved road emission factor. Emissions by roadway class were then totaled to the county level and adjusted for meteorological conditions, silt content, and speed (EPA 2023).

Criteria Pollutant Emissions

Statewide emissions data from 2020 NEI is presented in Table 3-3. The 2020 inventory contains the best available existing emissions information. Inventories are subject to change if new information becomes available for the NEI reporting year. Emissions from common source categories that occur on public lands include categories such as dust (livestock, construction, paved and unpaved roads), fires (prescribed, wildfire, wood burning), industrial processes (oil & gas, and mining).

Table 3-3. 2020 Statewide Criteria Air Pollutant and Precursor Emissions (tpy) by County

County	CO	NO_x	PM10	PM2.5	SO_2	VOC	NH_3	County Total
Albany	186,531.01	5,165.55	33,785.28	17,264.82	1,290.91	52,017.64	4,621.33	300,676.53
Big Horn	6,655.55	1,013.35	11,008.93	1,707.99	28.7854	6,555.06	2,654.16	29,623.83
Campbell	11,980.60	3,221.50	22,351.63	3,002.39	43.8557	14,048.10	2,137.29	56,785.36
Carbon	203,878.69	5,845.37	33,720.59	18,414.72	1,363.15	60,968.47	6,403.60	330,594.57
Converse	8,142.10	4,562.45	8,947.50	1,451.00	47.3269	9,355.72	2,101.53	34,607.62
Crook	4,665.55	1,312.15	9,831.09	1,359.62	6.60243	14,840.32	1,090.61	33,105.93
Fremont	11,736.27	2,319.81	33,000.91	4,004.28	18.6732	16,992.26	2,693.50	70,765.70
Goshen	3,880.05	1,909.98	9,734.08	1,419.63	7.11739	5,902.02	3,139.04	25,991.91
Hot Springs	2,412.81	507.6275	4,664.25	605.8565	6.3124	3,755.07	698.3352	12,650.26
Johnson	8,955.10	1,392.50	7,332.91	1,308.68	48.7934	9,524.75	1,765.82	30,328.56
Laramie	14,503.66	4,454.31	25,391.11	3,322.68	21.9282	6,382.81	2,497.10	56,573.60
Lincoln	6,316.50	1,695.29	22,510.27	2,750.28	12.7153	11,559.03	1,170.56	46,014.64
Natrona	14,787.14	2,644.95	25,330.78	3,175.06	29.7351	11,306.82	1,505.43	58,779.91
Niobrara	2,921.55	1,186.68	5,893.27	768.9626	3.69439	5,705.31	1,681.13	18,160.59
Park	12,866.08	1,687.57	28,388.77	3,655.58	39.9609	18,787.26	2,082.96	67,508.19
Platte	5,557.81	1,929.45	5,266.47	942.8672	18.4752	5,633.23	2,491.83	21,840.13
Sheridan	12,842.29	1,853.20	14,861.76	2,508.68	81.4332	10,099.97	1,413.63	43,660.95
Sublette	7,150.64	965.557	14,444.53	1,971.58	20.8128	12,390.84	2,420.41	39,364.38
Sweetwater	12,771.65	6,113.12	15,518.45	1,984.68	20.0916	12,450.43	942.9773	49,801.40
Teton	20,897.13	1,180.13	24,651.35	3,769.78	91.5789	17,990.17	748.2505	69,328.39
Uinta	4,864.53	1,951.19	9,289.76	1,245.49	9.44161	4,060.38	1,808.24	23,229.04
Washakie	13,489.46	836.0193	6,679.04	1,704.13	105.61	6,274.37	1,606.81	30,695.44

County	CO	NO_x	PM10	PM2.5	SO_2	VOC	NH_3	County Total
Weston	3,089.65	1,573.86	7,440.37	938.7033	4.42585	8,197.16	995.6291	22,239.80
State Total	580,895.83	55,321.60	380,043.08	79,277.45	3,321.43	324,797.20	48,670.15	1,472,326.74

Hazardous Air Pollutant Emissions

The NEI contains HAP emissions as part of the total NEI. Total HAPs emissions for each county is presented in Table 3-4, including a subset of emissions sources related to activities occurring on BLM managed lands. HAPs emissions breakdown into five main categories: vegetation, soils, and wildfires comprise 60% of total state emissions with prescribed fire accounting for 39%, and oil and gas production accounting for 1 %.

Table 3-4. 2020 Statewide BLM Managed Lands Hazardous Air Pollutant Emissions (tpy) by County

County	Vegetation and Soils	Wildfire	Prescribed Fire	Oil and Gas Production	County Total
Albany	1,511.31	-	10,353.60	-	11,864.91
Big Horn	1,116.36	47.04	39.52	1.37	1,204.28
Campbell	2,352.62	19.22	239.77	18.31	2,629.92
Carbon	2,721.11	3.60	10,951.74	4.21	13,680.66
Converse	1,533.31	9.21	181.32	135.93	1,859.78
Crook	2,148.85	7.33	6.02	1.16	2,163.36
Fremont	3,231.00	4.27	31.38	7.71	3,274.37
Goshen	1,026.18	11.60	3.37	-	1,041.16
Hot Springs	716.30	0.06	38.56	1.75	756.67
Johnson	1,637.82	4.79	358.69	1.80	2,003.10
Laramie	919.29	0.72	20.70	-	940.70
Lincoln	1,599.71	1.32	7.44	99.03	1,707.50
Natrona	1,955.02	7.88	106.16	7.10	2,076.17
Niobrara	1,194.74	-	17.03	-	1,211.77
Park	2,248.41	18.88	168.43	8.35	2,444.07
Platte	926.30	9.96	108.14	-	1,044.41
Sheridan	1,279.74	1.46	574.48	--	1,855.68
Sublette	1,571.95	0.61	119.13	42.28	1,733.98
Sweetwater	2,919.10	1.27	71.98	8.08	3,000.43
Teton	1,764.98	-	596.81		2,361.79
Uinta	692.27	-	22.49	0.73	715.50
Washakie	810.62	169.77	634.78	4.57	1,619.73
Weston	1,455.27	1.69	10.31	0.20	1,467.46
Total	37,332.27	320.69	24,661.86	342.57	62,657.40

Common HAPs emitted in the oil and gas industry include benzene, toluene, ethyl benzene, mixed xylenes, formaldehyde, normal-hexane, acetaldehyde, and methanol. Statewide these individual pollutants make up 95% of the HAPs emissions from the oil and gas production. Table 55 presents the emissions of these pollutants from the oil and gas industry in Wyoming. Only counties with oil and gas production sources are included in Table 3-5.

Table 3-5. 2020 Hazardous Air Pollutant Emissions from Oil and Gas Production

County	Acetaldehyde (tpy)	Benzene (tpy)	Ethylbenzene (tpy)	Formaldehyde (tpy)	Hexane (tpy)	Naphthalene (tpy)	Toluene (tpy)	Xylenes (tpy)	Total of the listed HAPs (tpy)
Albany	1,677.47	408.65	8.31	3,229.89	60.86	432.47	355.34	288.94	6,461.93
Big Horn	184.09	14.50	4.59	238.35	8.69	6.69	28.98	18.67	504.55
Campbell	388.57	29.95	9.25	661.99	27.37	18.72	74.68	47.13	1,257.66
Carbon	1,891.42	427.57	6.46	3,563.52	54.66	456.56	353.70	293.92	7,047.81
Converse	236.94	19.18	5.20	464.37	18.72	12.27	35.97	25.62	818.28
Crook	360.67	9.15	4.97	683.17	5.77	4.23	26.50	18.37	1,112.84
Fremont	438.50	23.65	9.97	574.25	15.16	10.36	63.71	41.53	1,177.12
Goshen	143.86	8.03	4.05	216.26	4.20	3.09	24.57	15.72	419.78
Hot Springs	96.12	6.05	4.08	131.92	3.34	2.86	19.50	15.09	278.96
Johnson	273.19	21.78	5.48	422.22	6.30	18.13	38.50	29.17	814.76
Laramie	168.71	31.76	17.48	222.56	22.14	16.61	114.32	74.25	667.83
Lincoln	242.68	22.51	8.53	320.70	24.42	6.29	66.48	49.91	741.52
Natrona	281.30	34.93	16.05	380.05	44.30	15.98	120.67	74.40	967.68
Niobrara	161.69	7.31	7.26	259.61	3.77	2.15	30.65	24.79	497.23
Park	377.78	26.37	8.95	509.00	17.84	14.48	59.70	39.64	1,053.76
Platte	142.15	11.85	4.47	219.70	6.02	8.33	28.54	19.90	440.95
Sheridan	294.75	36.43	6.76	476.08	11.43	30.01	59.50	41.45	956.42
Sublette	236.47	19.72	7.37	327.32	24.73	8.42	52.33	35.78	712.15
Sweetwater	361.18	23.92	11.09	499.56	32.75	14.37	81.87	53.26	1,078.00
Teton	395.17	48.17	11.71	565.68	12.41	34.00	79.26	57.90	1,204.30
Uinta	103.63	10.83	4.91	136.71	7.56	6.37	30.61	20.40	321.04
Washakie	219.97	36.81	3.85	364.79	8.63	34.74	46.67	36.85	752.31
Weston	223.06	6.53	3.88	397.35	4.59	2.24	20.78	14.66	673.10
State Total	8,899.35	1,285.67	174.66	14,865.06	425.66	1,159.38	1,812.82	1,337.37	29,959.98

No monitored concentration data is available for HAPs on lands managed by BLM, so the EPA Air Toxics Screening Assessment tool (AirToxScreen) is used to evaluate impacts from existing HAPs emissions in each county and the entire state of Wyoming (EPA 2022). AirToxScreen provides a snapshot of outdoor air quality with respect to emissions of HAPs and estimates the cancer risks from breathing air toxics over a lifetime of exposure (70 years). The AirToxScreen tool cannot provide precise exposure and risks for a specific person and is best used for a cumulative assessment for larger areas (e.g., county, state, national). The EPA has determined that, for the entire state of Wyoming the total cancer risk is 11.8 in 1 million (EPA 2022) and all the counties range from 10.03 to 15.19 in 1 million, see Table 3-6. This cancer risk is within the acceptable range of risk published by the EPA of 100 in 1 million as discussed in the National Contingency Plan, 40 CFR § 300.430. The noncancer respiratory hazard (Hazard Index) for the entire state of Wyoming is 0.13, and ranges from 0.10 to 0.18 for all the counties in Wyoming. Hazard index (HI) values less than one mean it is unlikely that air toxics will cause adverse noncancer health effects over a lifetime of exposure.

Table 3-6. Total Cancer Risk and Noncancer Respiratory Hazard from Existing Hazardous Air Pollutant Emissions (2019 Reporting Year)

County	Total Cancer Risk (per million)	BACKGROUND Cancer Risk (per million)	Oil & Gas Cancer Risk (per million)	Total Respiratory Hazard Index (HI)
Albany	12.08	2.46	0.01	0.13

County	Total Cancer Risk (per million)	BACKGROUND Cancer Risk (per million)	Oil & Gas Cancer Risk (per million)	Total Respiratory Hazard Index (HI)
Big Horn	11.65	2.77	0.41	0.13
Campbell	13.03	2.74	0.38	0.14
Carbon	10.66	2.51	0.04	0.11
Converse	12.23	2.68	0.79	0.14
Crook	11.75	2.75	0.21	0.12
Entire State	12.34	2.62	0.16	0.14
Fremont	10.92	2.65	0.18	0.12
Goshen	12.66	2.75	0.01	0.13
Hot Springs	10.87	2.70	0.18	0.12
Johnson	10.39	2.66	0.16	0.10
Laramie	13.86	2.58	0.11	0.18
Lincoln	10.04	2.53	0.10	0.10
Natrona	12.38	2.64	0.10	0.14
Niobrara	11.41	2.70	0.26	0.11
Park	10.79	2.68	0.26	0.12
Platte	11.89	2.69	0.03	0.12
Sheridan	12.45	2.76	0.01	0.13
Sublette	10.03	2.51	1.01	0.10
Sweetwater	15.19	2.55	0.05	0.18
Teton	10.38	2.52	0.00	0.11
Uinta	11.71	2.52	0.08	0.12
Washakie	12.26	2.75	0.18	0.14
Weston	11.71	2.73	0.15	0.12
Entire State	11.79	2.64	0.20	0.13

Greenhouse Gas Emissions and Sinks

Current ongoing global climate change is caused, in part, by the atmospheric buildup of GHGs, which may persist for decades or even centuries. The buildup of GHGs such as carbon dioxide (CO2), methane (CH4,), nitrous oxide (N2O), and fluorinated gases since the start of the industrial revolution has substantially increased atmospheric concentrations of these compounds compared to historical background levels. Because GHGs circulate freely throughout Earth's atmosphere, climate change is a cumulative global issue.

A detailed discussion of climate change science and predicted impacts, as well as the existing and reasonably foreseeable GHG emissions associated with BLM's actions, are included in the BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (hereinafter referred to as the Annual GHG Report). The Annual GHG report presents the estimated emissions of greenhouse gases attributable to fossil fuels produced on lands and mineral estate managed by the BLM, and is incorporated by reference. The Annual GHG Report is available at https://www.blm.gov/content/ghg/2021/.

The impact of a given GHG on global warming depends both on its radiative forcing and how long it lasts in the atmosphere. Each GHG varies with respect to its concentration in the atmosphere and the amount of outgoing radiation absorbed by the gas relative to the amount of incoming radiation it allows to pass through (i.e., radiative

forcing). Different GHGs also have different atmospheric lifetimes. Some, such as methane, react in the atmosphere relatively quickly (on the order of 12 years); others, such as carbon dioxide, typically last for hundreds of years or longer. Climate scientists have calculated a factor, known as the global warming potential (GWP), for each GHG that accounts for these effects.

The GWP is used as a conversion factor to convert a mixture of different GHG emissions into carbon dioxide equivalents (CO2e). The larger its GWP, the more the specific gas warms the Earth as compared to CO2. The BLM uses the 100-year time horizon for GWPs in most report metrics, to be consistent with the scientific and regulatory communities that develop climate change assessments and policy. The 100-year GWP (GWP100) was adopted by the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol and is now used widely as the default metric by researchers and regulators. Global Warming Potentials from the IPCC AR 6 are summarized in Table 3-7.

Table 3-7. Greenhouse Gases and Their Global Warming Potentials

Time Horizon	Carbon Dioxide (CO_2)	Methane (CH_4) Fossil	Methane (CH_4) Non-Fossil	Nitrous Oxide (N_2O)
100-year	1	29.8	27.2	273
20-year	1	82.5	80.8	273

Source: (IPCC 2021)

Emissions

State, national, and global annual GHG emissions from the Annual GHG Report are presented in Table 3-8 (BLM 2023). Global emissions were obtained from the Emissions Database for Global Atmospheric Research (EDGAR) (EDGAR 2022). National and state emissions come from the EPA Inventory of US Greenhouse Gases Emission and Sinks 1990-2021 (EPA 2022). Note that state-level data is not yet available for 2021.

Table 3-8. Annual State, National, and Global GHG Emissions (CO2e) in Megatonnes (Mt) per Year

Area	1990	2005	2017	2018	2019	2020	2021
Global	33,208.5	42,319.7	51,010.7	52,081.2	52,356.6	50,485.3	52,598.9
United States	6,487.3	7,477.4	6,561.8	6,754.8	6,617.9	6,026	6,340.2
US Fossil CO_2	4,728.2	5,747.3	4,852.5	4,989.8	4,855.9	4,344.9	4,639.1
Wyoming	**77.3616**	**97.0352**	**90.0628**	**91.6585**	**85.2203**	**79.1958**	**NA**

Source: Annual GHG Report (Table 5-1 and Table 5-2), state data is not yet available for 2021.

GHG emissions information is available in the most recent NEI (2020) and includes emissions data for mobile sources, prescribed fires, and wildfires while the FLIGHT tool includes emissions data for major industrial facilities. No reliable information for residential, commercial, agriculture, and fugitive emissions are available at county level scales. County level anthropogenic GHG emissions from the NEI is provided in Table 3-9.

Table 3-9. County level GHG Emissions (CO2e) in Metric Tonnes (t) for the 2020 Reporting Year

County	CO_2 (t)	CH_4 (t)	N_2O (t)	County Total
Albany	2,572,183.62	8,743.74	6.95	2,580,934.30
Big Horn	141,997.06	66.45	2.22	142,065.73
Campbell	613,782.34	191.46	9.08	613,982.88
Carbon	2,687,870.33	9,541.49	5.73	2,697,417.55

County	CO_2 (t)	CH_4 (t)	N_2O (t)	County Total
Converse	539,494.94	170.02	8.39	539,673.35
Crook	197,391.86	25.03	2.25	197,419.14
Fremont	406,588.93	59.96	6.17	406,655.06
Goshen	226,729.34	29.19	4.38	226,762.91
Hot Springs	65,287.27	28.65	0.83	65,316.75
Johnson	305,414.07	220.43	1.81	305,636.30
Laramie	1,129,836.90	89.65	15.77	1,129,942.32
Lincoln	244,821.53	26.09	3.74	244,851.36
Natrona	717,868.87	130.20	10.87	718,009.93
Niobrara	120,768.15	24.19	1.79	120,794.13
Park	369,305.27	167.21	5.45	369,477.94
Platte	313,967.42	112.24	3.59	314,083.25
Sheridan	425,034.98	358.89	5.49	425,399.36
Sublette	157,926.70	131.35	1.64	158,059.69
Sweetwater	1,128,165.07	111.48	11.95	1,128,288.50
Teton	421,638.31	543.21	4.02	422,185.53
Uinta	413,146.74	39.04	4.55	413,190.33
Washakie	239,578.45	533.83	1.37	240,113.65
Weston	158,823.53	21.87	3.23	158,848.64
State Total	**13,597,621.68**	**21,365.67**	**121.25**	**13,619,108.60**

Federal Fossil Fuel Emissions

Oil and Gas

Estimated annual GHG emissions from existing oil and gas wells for fiscal year 2022 are incorporated from the Annual GHG report and presented in Table 3-10 and Table 3-11. The estimates presented here include emissions from the full oil and gas lifecycle, including emissions arising from activities outside of the BLM's jurisdiction (such as emissions associated with refining and processing). Emissions from coal production on the federal mineral estate in FY 2022 are provided in Table 3-12. The coal emissions estimates were obtained by multiplying the representative emission factors (Table 4-1, Annual GHG report) by the state-specific production amounts (Table 4-2, Annual GHG report). The estimates cover emissions from the typical coal lifecycle, including emissions arising from activities outside of the BLM's jurisdiction (such as emissions associated with coal exports).

Table 3-10. GHG Emissions form Oil Production on the Federal Mineral Estate in Fiscal Year 2022 (Mt CO2e)[1]

Area	Oil Extraction	Oil Processing	Oil Transport	Oil Combustion	Total Oil
Wyoming	3.6665	2.5248	0.5002	21.55	28.24
Onshore Total	35.2774	24.2925	4.8124	207.31	271.69
Federal Total	55.7236	56.199	11.1331	479.6	602.66

[1]Information obtained from the Annual GHG report, Chapter 7, Table 7-4.

Table 3-11. GHG Emissions from Gas Production on the Federal Mineral Estate in Fiscal Year 2022 (Mt CO2e)[1]

Area	Gas Extraction (mcf)	Gas Processing	Gas Transport	Gas Combustion	Total Gas
Wyoming	5.7095	1.9513	12.5446	54.9	75.1
Onshore Total	20.5536	7.0244	45.159	197.63	270.36
Federal Total	25.2504	8.6033	55.3094	242.05	331.21

[1]Information obtained from the Annual GHG report, Chapter 7, Table 7-11.

Coal

The total coal production within Wyoming for fiscal year 2022 from the federal mineral estate represents about 4% of the total amount produced from federal lands. Data from the Department of the Interior's Office of Natural Resources Revenue indicate that Wyoming's 2022 coal production of 233,022,508 tons (see Table 3-12).

Table 3-12. GHG Emissions from Coal Production on the Federal Mineral Estate in Fiscal Year 2022 (Mt CO2e)[1]

Area	2022 Production (tons)	Extraction CO2e	Processing CO2e	Transport CO2e	Combustion CO2e	Total CO2e
Wyoming	233,022,508	3.2157	0.8715	5.7299	393.66	403.48
Federal Total	270,220,938	4.80	1.40	9.77	475.79	491.76

[1]Information obtained from the Annual GHG report, Chapter 7, Table 7-1.

Air Quality Index and Air Pollutant Concentrations

Air Quality Index

Air quality for Wyoming is examined using the EPA Air Quality Index Summary Report (EPA 2023). The Air Quality Index (AQI) is an indicator of overall air quality as it accounts for all criteria air pollutants in a county and is one way to quickly evaluate how clean or polluted the air is. The EPA calculates a daily AQI based on local air monitoring data. The terms "Good", "Moderate", and "Unhealthy" help to interpret the AQI. When the AQI value is in the good range, pollutant concentrations are well below the NAAQS and air pollution poses little or no risk. Moderate AQI values occur when pollution is below but near the NAAQS and voluntary emission reduction measures are encouraged. The AQI is considered unhealthy when the NAAQS is exceeded, and major pollution sources are often required to implement mandatory emission reduction measures. Counties without AQI data usually have fewer air pollutant sources and are assumed to have good air quality. Statistical AQI data from 2020 to 2022 is presented in Table 3-13. Proposed projects occurring in counties with more than 1% (approximate number of annual exceedances allowed for the O3 NAAQS) of days with an unhealthy AQI, could merit further NEPA air quality impacts.

Table 3-13. 2020-2022 Wyoming AQI Index Summary Statistics by County

County	# Days with AQI	# Days with Good AQI	# Days with Moderate AQI	# Days with Unhealthy AQI	% of Days Rated Good	% of Days Rated Moderate	% of Days Rated Unhealthy
Albany	1096	676	393	22	61.7	35.9	2.0
Big Horn	1085	1029	53	3	94.8	4.9	0.3
Campbell	1096	681	387	26	62.1	35.3	2.4
Carbon	1013	1013	0	0	100.0	0.0	0.0

County	# Days with AQI	# Days with Good AQI	# Days with Moderate AQI	# Days with Unhealthy AQI	% of Days Rated Good	% of Days Rated Moderate	% of Days Rated Unhealthy
Converse	1096	892	196	8	81.4	17.9	0.7
Fremont	1096	834	248	13	76.1	22.6	1.2
Johnson	1094	991	95	8	90.6	8.7	0.7
Laramie	1093	891	186	14	81.5	17.0	1.3
Lincoln	1096	980	109	7	89.4	9.9	0.6
Natrona	1096	927	159	10	84.6	14.5	0.9
Park	618	584	32	2	94.5	5.2	0.3
Platte	941	837	77	11	88.9	8.2	1.2
Sheridan	1095	964	124	7	88.0	11.3	0.6
Sublette	1096	858	225	12	78.3	20.5	1.1
Sweetwater	1096	767	305	17	70.0	27.8	1.6
Teton	1096	945	129	17	86.2	11.8	1.6
Uinta	1095	1047	46	2	95.6	4.2	0.2
Weston	1059	949	109	1	89.6	10.3	0.1

Air Quality Design Values

Design values can be used to further evaluate the air quality for areas with poor air quality. A design value describes the air quality of a location with respect to the NAAQS and are typically used to classify Non-Attainment Areas (NAA) and evaluate progress towards meeting the NAAQS. The EPA annually publishes the most recently computed design values (EPA 2023). The PM2.5 , NO2, and O3 design values for Wyoming are presented in Table 3-14 - Table 3-18. Design values for PM10, CO, SOx, and lead are below the NAAQS and can be found on the EPA website (EPA, Air Quality Design Values 2023).

Table 3-14. County-level Design Value History for the PM2.5 Annual NAAQS (12 µg/m3)

County	2011-2013 µg/m^3	2012-2014 µg/m^3	2013-2015 µg/m^3	2014-2016 µg/m^3	2015-2017 µg/m^3	2016-2018 µg/m^3	2017-2019 µg/m^3	2018-2020 µg/m^3	2019-2021 µg/m^3	2020-2022 µg/m^3	Meets NAAQS
Albany	4.9	4.8	4.3	4.1	4.3	4.6	4.5	4.9	NA	NA	Yes
Campbell	NA	NA	4.2	4.7	4.8	4.5	3.3	NA	NA	NA	Yes
Fremont	7.8	7.4	6.9	6.6	6.8	7.2	7.2	7.2	2.4	2.0	Yes
Laramie	4.8	4.7	4.1	4.2	4.2	4.4	4.3	3.4	4.1	4.9	Yes
Natrona	4.8	4.8	4.6	4.7	4.9	5.0	4.7	4.7	NA	3.8	Yes
Park	4.6	4.4	4.1	3.8	4.3	4.3	4.0	3.8	4.3	4.9	Yes
Sheridan	7.6	7.2	6.9	7.0	7.3	7.2	7.0	6.5	6.3	NA	Yes
Sublette	NA	NA	5.0	5.0	5.1	5.3	4.7	3.8	3.5	3.6	Yes
Sweetwater	5.7	5.5	4.8	4.7	5.1	5.3	5.1	NA	NA	NA	Yes
Teton	5.3	5.2	4.7	4.5	4.6	4.8	4.5	4.5	4.4	4.5	Yes

Table 3-15. County-level Design Value History for the PM2.5 24-hour NAAQS (35 µg/m3)

County	2011-2013 µg/m³	2012-2014 µg/m³	2013-2015 µg/m³	2014-2016 µg/m³	2015-2017 µg/m³	2016-2018 µg/m³	2017-2019 µg/m³	2018-2020 µg/m³	2019-2021 µg/m³	2020-2022 µg/m³	Meets NAAQS
Albany	12	13	13	13	13	13	13	21	NA	NA	Yes
Campbell	NA	NA	16	14	19	19	15	NA	NA	NA	Yes
Fremont	28	27	25	23	23	24	25	28	NA	16	Yes
Laramie	12	13	16	17	15	11	11	18	15	24	Yes
Natrona	14	15	14	13	16	17	16	20	23	16	Yes
Park	14	14	15	17	23	22	17	20	22	25	Yes
Sheridan	20	18	24	26	24	23	21	24	27	NA	Yes
Sublette	NA	NA	13	13	16	20	18	17	18	19	Yes
Sweetwater	17	16	13	15	19	20	19	NA	NA	NA	Yes
Teton	16	16	13	13	15	18	19	24	30	32	Yes

Table 3-16. County-level Design Value History for the NO2 1-Hour NAAQS (100 ppb)

County	2011-2013 (ppb)	2012-2014 (ppb)	2013-2015 (ppb)	2014-2016 (ppb)	2015-2017 (ppb)	2016-2018 (ppb)	2017-2019 (ppb)	2018-2020 (ppb)	2019-2021 (ppb)	2020-2022 (ppb)	Meets NAAQS
Campbell	32	35	49	31	30	29	30	NA	NA	NA	Yes
Carbon	NA	NA	NA	NA	NA	29	29	29	30	27	Yes
Converse	NA	NA	NA	35	4	31	31	13	15	16	Yes
Fremont	5	5	5	5	35	4	4	4	4	4	Yes
Johnson	NA	NA	NA	NA	NA	NA	3	1	1	6	
Laramie	35	NA	NA	40	40	34	33	31	29	28	Yes
Natrona	NA	NA	NA	NA	NA	38	36	35	34	34	Yes
Sublette	30	22	19	20	24	24	24	19	18	18	Yes
Sweetwater	22	20	35	32	32	32	35	36	35	33	Yes
Uinta	12	12	12	12	13	13	14	NA	NA	NA	Yes

Table 3-17. County-level Design Value History for the NO2 Annual NAAQS (53 ppb)

County	2011-2013 (ppb)	2012-2014 (ppb)	2013-2015 (ppb)	2014-2016 (ppb)	2015-2017 (ppb)	2016-2018 (ppb)	2017-2019 (ppb)	2018-2020 (ppb)	2019-2021 (ppb)	2020-2022 (ppb)	Meets NAAQS
Campbell	9	10	7	4	5	5	4	1	1	1	Yes
Carbon	1	6	7	5	6	5	3	4	4	3	Yes
Converse	3	4	4	2	3	3	3	2	1	1	Yes
Fremont	1	2	1	1	0	1	1	1	1	1	Yes
Goshen	NA	NA	NA	4	NA	NA	1	NA	NA	NA	NA
Johnson	NA	NA	NA	NA	NA	NA	3	1	1	1	Yes
Laramie	4	4	4	4	4	4	4	3	3	3	Yes
Natrona	6	5	5	5	5	5	2	4	5	4	Yes

County	2011-2013 (ppb)	2012-2014 (ppb)	2013-2015 (ppb)	2014-2016 (ppb)	2015-2017 (ppb)	2016-2018 (ppb)	2017-2019 (ppb)	2018-2020 (ppb)	2019-2021 (ppb)	2020-2022 (ppb)	Meets NAAQS
Sublette	2	2	1	3	5	6	3	2	2	2	Yes
Sweetwater	4	3	3	4	3	3	1	3	3	3	Yes
Teton	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	Yes
Uinta	2	2	2	2	2	2	2	NA	NA	NA	NA

Table 3-18. County-level Design Value History for the Ozone 8-hr NAAQS (0.070 ppm)

County	2011-2013 (ppm)	2012-2014 (ppm)	2013-2015 (ppm)	2014-2016 (ppm)	2015-2017 (ppm)	2016-2018 (ppm)	2017-2019 (ppm)	2018-2020 (ppm)	2019-2021 (ppm)	2020-2022 (ppm)	Meets NAAQS
Albany	NA	0.068	0.066	0.064	0.064	0.066	0.067	0.067	0.067	0.068	Yes
Big Horn	NA	NA	0.059	0.060	0.063	0.061	0.060	0.059	0.060	0.060	Yes
Campbell	0.064	0.063	0.060	0.060	0.060	0.062	0.061	0.060	0.064	0.066	Yes
Carbon	0.062	0.062	0.060	0.059	0.061	0.063	0.064	NA	NA	NA	Yes
Converse	NA	NA	NA	NA	NA	NA	0.063	0.064	NA	0.066	Yes
Fremont	0.066	0.064	0.063	0.063	0.062	0.063	0.064	0.065	0.068	0.067	Yes
Johnson	NA	NA	NA	NA	NA	NA	NA	NA	0.066	0.065	Yes
Laramie	0.068	0.067	0.065	0.063	0.063	0.064	0.064	0.062	0.064	0.065	Yes
Natrona	NA	NA	0.062	0.060	0.061	0.063	0.062	0.063	0.065	0.065	Yes
Sublette	0.076	0.064	0.062	0.063	0.063	0.065	0.072	0.070	0.074	0.067	No
Sweetwater	0.066	0.064	0.067	0.066	0.067	0.066	0.066	0.065	0.066	0.065	Yes
Teton	0.065	0.063	0.061	0.060	0.061	0.062	0.062	0.063	0.064	0.062	Yes
Uinta	0.065	0.063	0.063	0.061	0.062	0.062	0.065	0.067	NA	NA	Yes
Weston	NA	NA	0.062	0.060	0.061	NA	NA	0.062	0.064	0.064	Yes

Monitoring Data

State, Federal, and Tribal agencies operate several air pollutant monitoring stations across the State of Wyoming. Air pollutant data from these stations is available on the EPA Air Data website (EPA 2022). Most air monitors are situated to measure air quality in both neighborhoods and industrial areas. A few stations are in rural areas by various Federal agencies to monitor air quality conditions and trends at National Parks and other public lands, and to identify background concentrations away from major emission sources. The WDEQ 2023 Network Plan shows air pollutant trends for state-operated monitoring stations (WDEQ 2023). Air monitoring data from the current year is not analyzed as data is incomplete for the year, in the process of being quality assured, and considered preliminary until May 1 of the following year.

Air Quality Related Values (AQRV)

Visibility

Pollution in the atmosphere can impair scenic views by degrading the contrast, colors, and distance an observer is able to see. Visibility can be assessed in terms of the distance that a person can distinguish a large dark object on the horizon and is measured as the standard visual range in miles. Visibility is monitored using methodologies established by the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program. The particulates

that contribute to haze are collected on filters at each IMPROVE site. Samples are then measured to determine how visibility is impacted over time and by which pollutants.

A deciview (dv) is a unit of measurement to quantify human perception of visibility. It is derived from the natural logarithm of atmospheric light extinction coefficient. A one deciview change is roughly the smallest perceptible change in visibility. Because visibility at any one location is highly variable throughout the year, it is characterized by three groupings: the clearest 20% days, average 20% days, and haziest 20% days. Visibility degradation is primarily due to sulfate, nitrate, and particulate matter in the atmosphere, with contributions from both anthropogenic and natural sources. Measuring progress in air pollution control can be challenging because natural sources largely beyond human control such as dust storms and wildfire smoke can produce significant visibility impairment over large areas for days to weeks at a time. Under the auspices of the 2017 Regional Haze Rule revisions, the EPA proposed a new visibility tracking metric– most impaired days – to better characterize visibility conditions and trends. The most impaired days are those with the most impairment from anthropogenic sources while the haziest grouping now better represents days with haze from natural sources. Total haze on the most impaired days is used to track progress toward Regional Haze Rule goals. Comparing trends in the 20% haziest days with the 20% most impaired days provides a method to assess impacts from episodic events, like wildfires, which have greatly affected visibility throughout the western United States in recent years (Burke, et al. 2021). More information about the EPA's impairment framework can be found at: http://vista.cira.colostate.edu/Improve/impairment/. Visibility information can be found at the Federal Land Managers Environmental Database (FLM 2019). Figure 3-2 - Figure 3-5 illustrate visibility trends based on air monitoring data from three Wyoming sites and one South Dakota IMPROVE site for the clearest, haziest, and most impaired categories. The haziest days have shown little improvement due to many years with large wildfire smoke episodes. However, most impaired days and clearest days for all monitoring sites slowly improve over several years.

Figure 3-1. National Parks, Wilderness Areas, and National Parks in and surrounding Wyoming

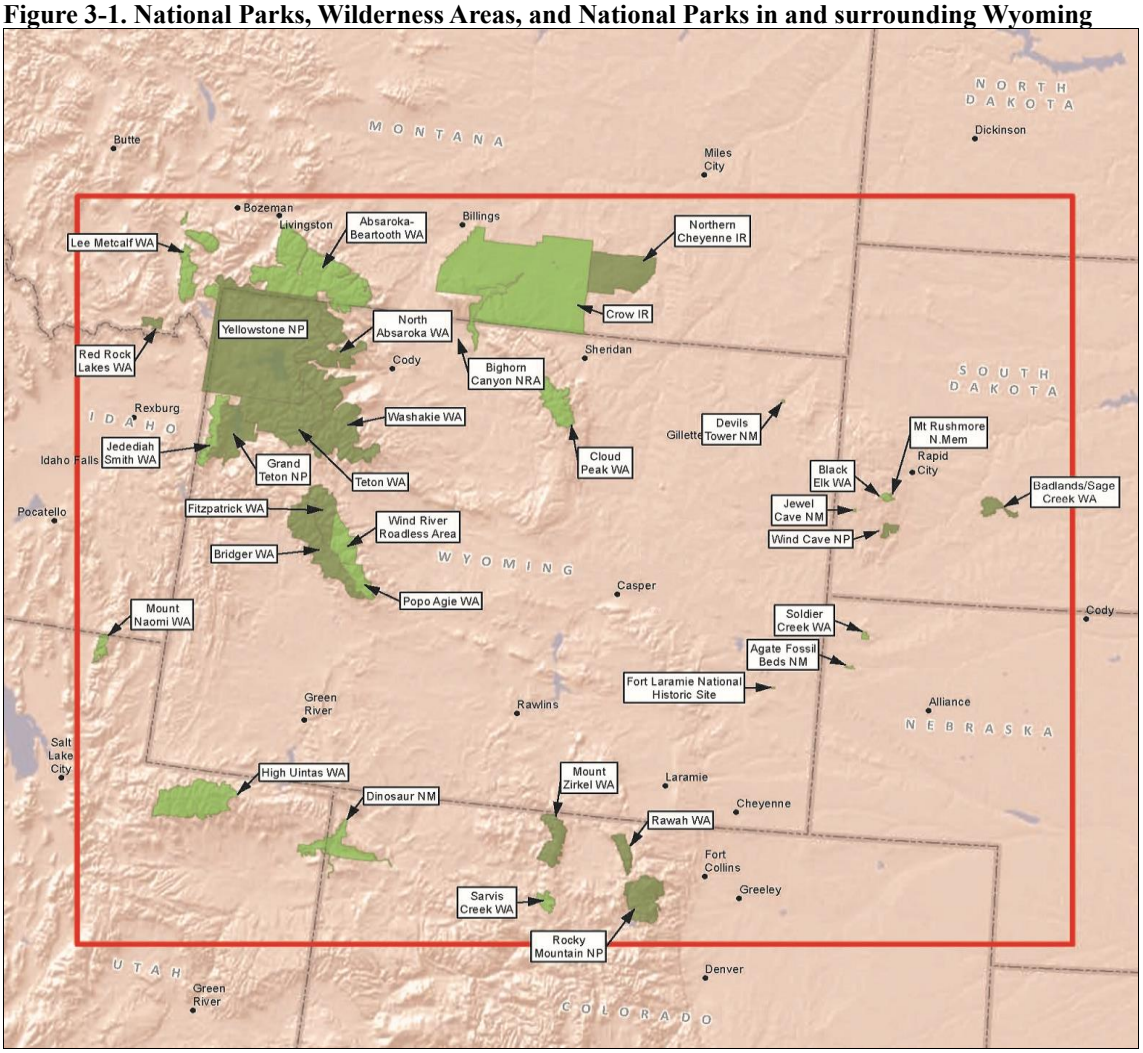


Figure 3-2. Visibility Trends at Yellowstone NP

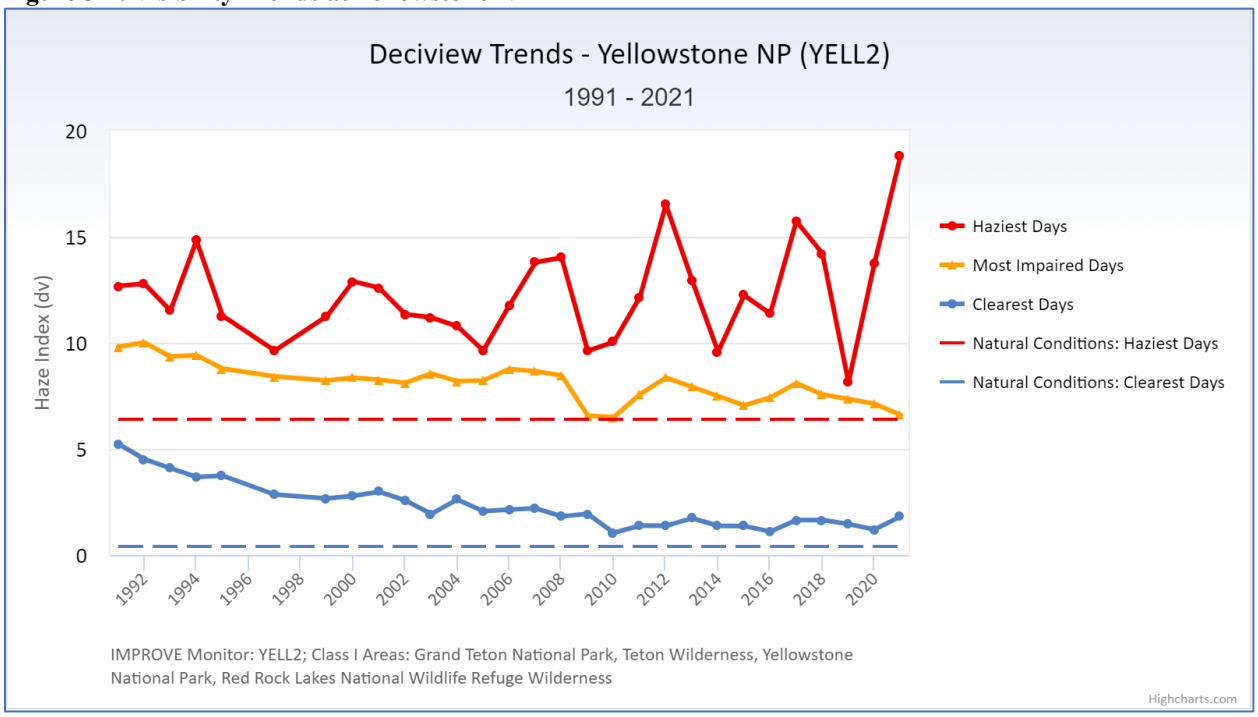


Figure 3-3. Visibility Trends at Bridger Wilderness

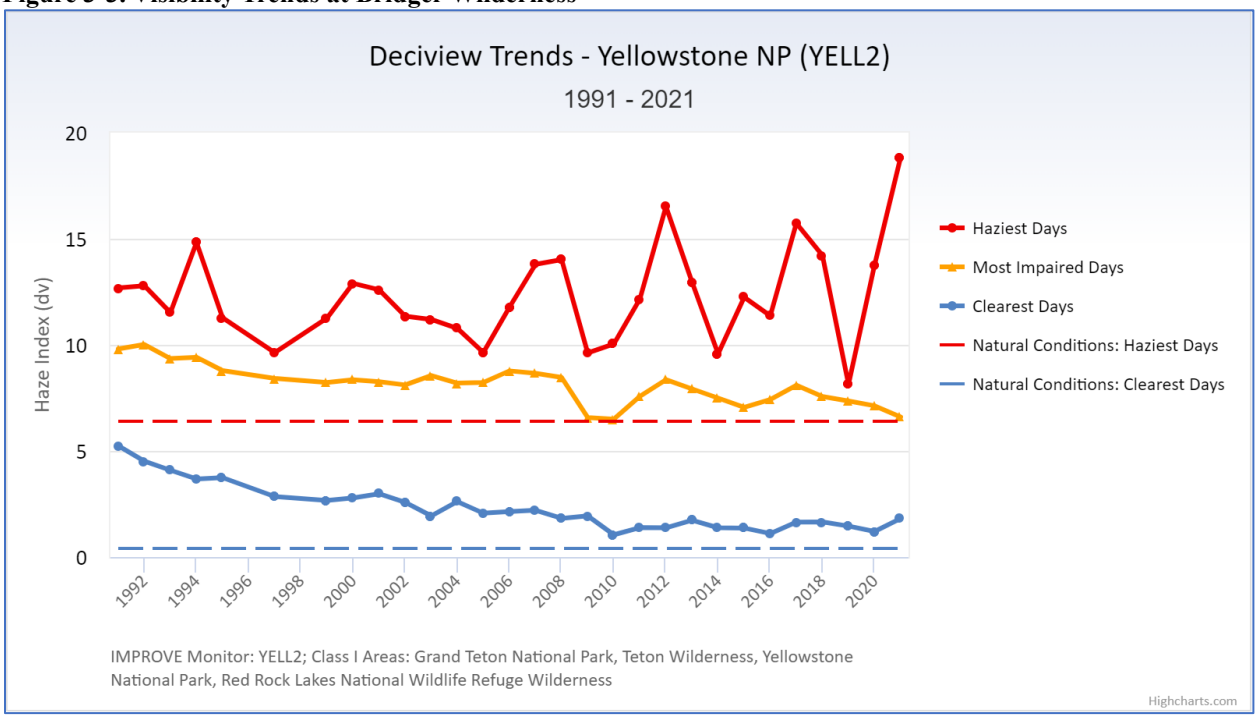


Figure 3-4. Visibility Trends at North Absaroka Wilderness Area

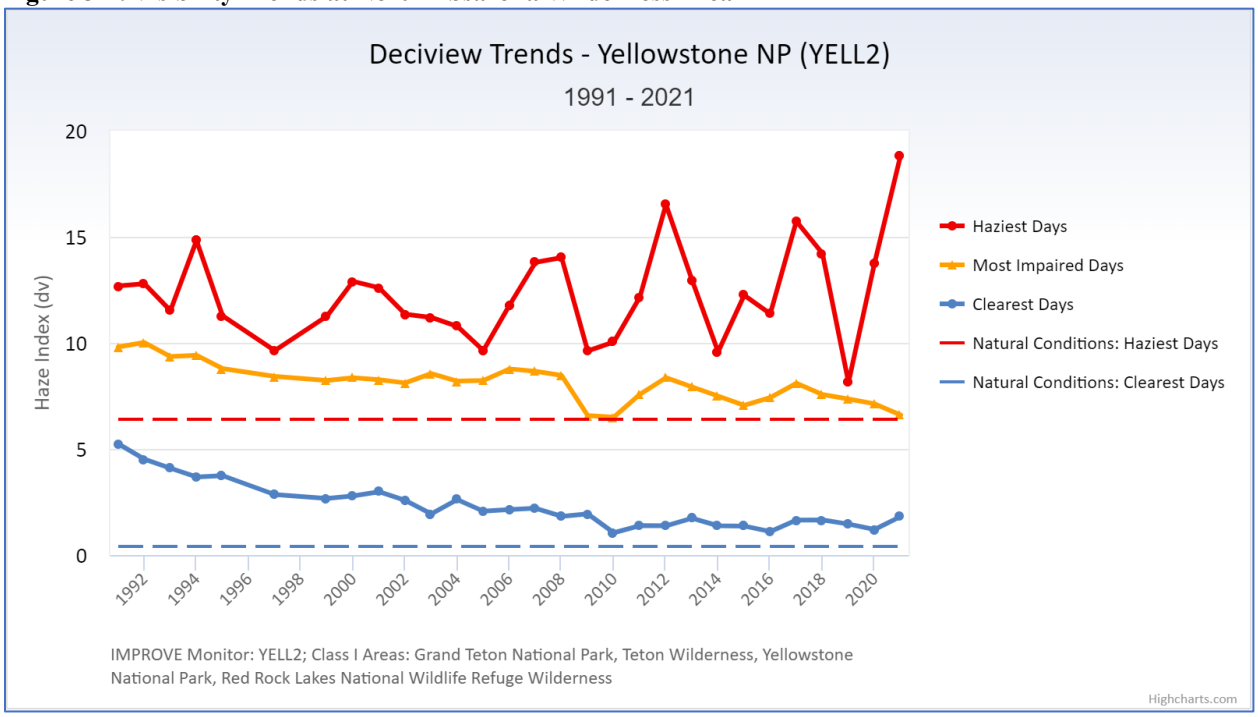
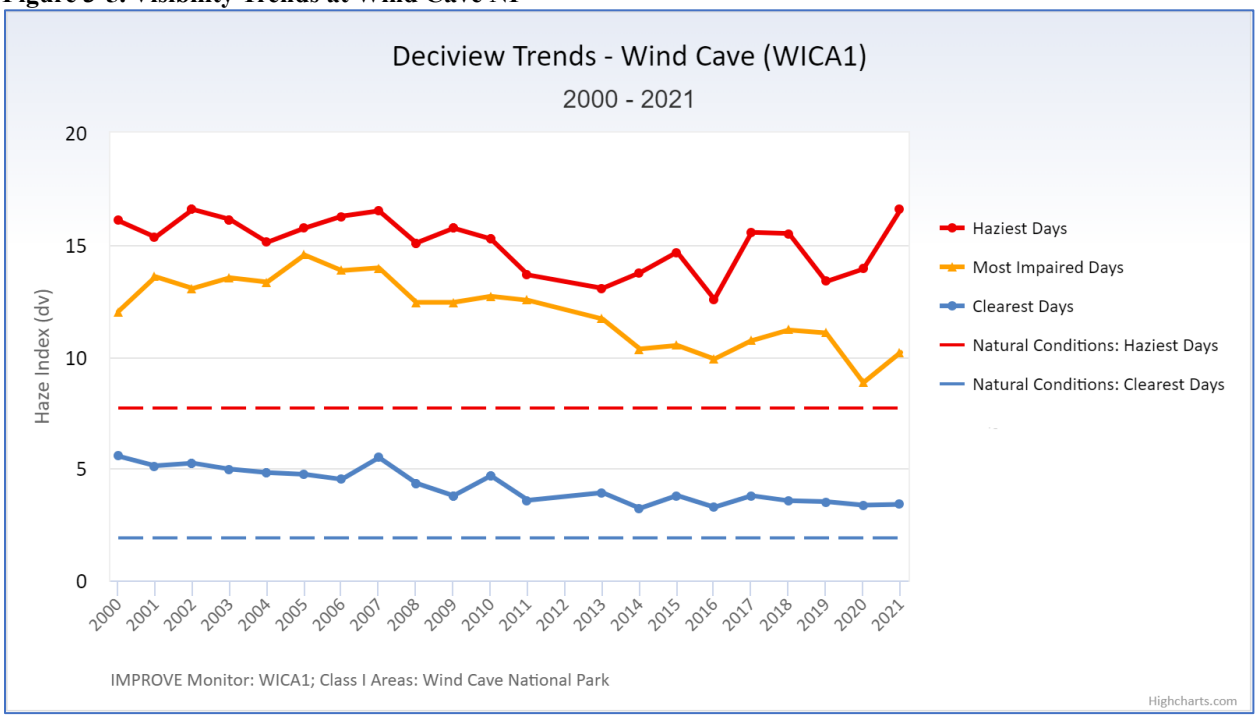


Figure 3-5. Visibility Trends at Wind Cave NP



BLM Monitoring Activities

BLM Wyoming conducts air monitoring to evaluate on-the-ground air resource conditions to determine trends. Existing air monitoring networks do not always adequately cover areas managed by the. BLM does not conduct air monitoring to determine attainment status of an area under the requirements of the CAA, that being a function of the appropriate federal, state, or tribal regulatory agency.

The Wyoming Air Resource Monitoring System (WARMS) network is an air quality monitoring network maintained by Bureau of Land Management, Wyoming State Office (BLM-WSO). There are seven stations scattered throughout Wyoming, see Figure 3.6. The WARMS network began operation in 2000 to measure air quality parameters and particulate concentrations according to Clean Air Status and Trends Network (CASTNET) protocols. The WARMS sites formally became a part of the CASTNET network in 2012 and began participating in the National Atmospheric Deposition Program (NADP) Passive Ammonia Monitoring Network (AMON) in 2015. The WARMS network provides relevant air quality data to:

- Assess existing conditions.
- Evaluate long term trends in air quality conditions.
- Evaluate the effectiveness of prescribed mitigation measures and adaptive management strategies.
- Inform management decisions on public lands, particularly in wilderness study areas and areas of critical environmental concern.
- Provide readily available access to air quality data for BLM staff, other federal, state, and tribal agencies, BLM contractors, the scientific community, and the public.

Figure 3-6. WARMS Monitor Locations

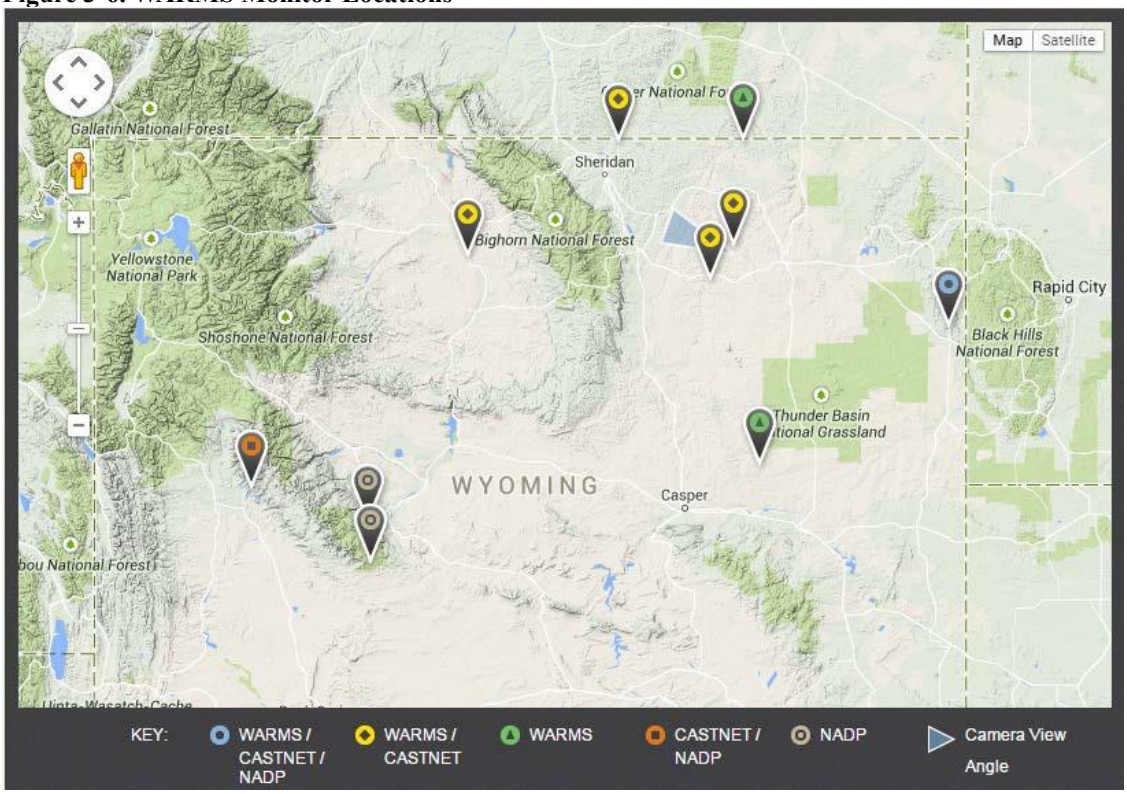
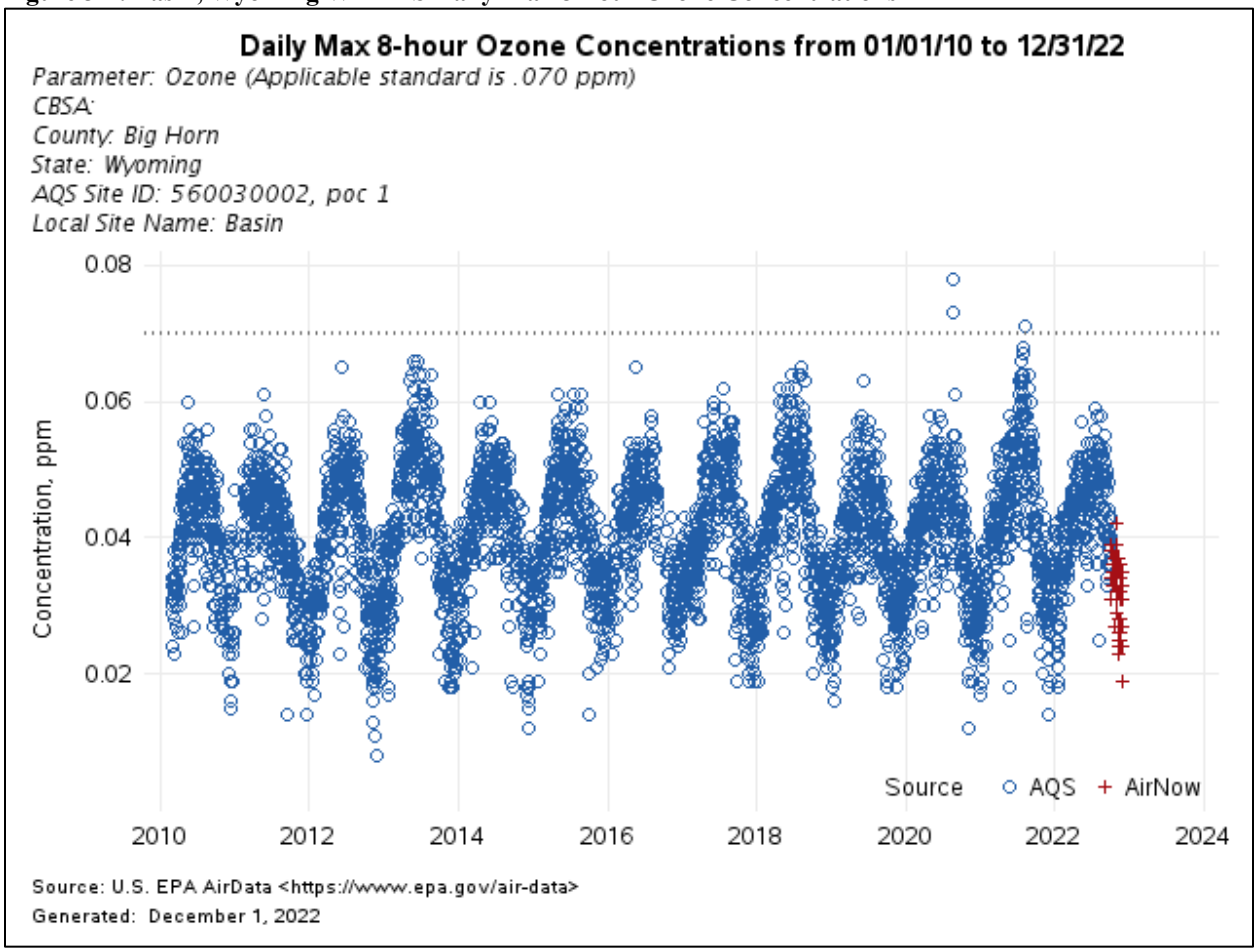


Figure 3-7. Basin, Wyoming WARMS Daily Max 8-hour Ozone Concentrations



3.2 Greenhouse Gas Emissions

The proposed leasing action could lead to emissions of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), the three most common greenhouse gases associated with oil and gas development. These GHG emissions would be emitted from leased parcels if developed, and from the consumption of any fluid minerals that may be produced. However, the BLM cannot reasonably determine at the leasing stage whether, when, and in what manner a lease would be explored or developed. The uncertainty that exists at the time the BLM offers a lease for sale includes crucial factors that would affect actual GHG emissions and associated impacts, including but not limited to the future feasibility of developing the lease, well density, geological conditions, development type (vertical, directional, or horizontal), hydrocarbon characteristics, specific equipment used during construction, drilling, production, abandonment operations, production and transportation, and potential regulatory changes over the 10-year primary lease term.

For the purposes of this analysis, the BLM has evaluated the potential effects of the proposed leasing action on climate change by estimating and analyzing potential GHG emissions from projected oil and gas development on the parcels proposed for leasing using estimates based on past oil and gas development and available information from existing development within the State.

Additional discussion of climate change science and predicted impacts as well as the reasonably foreseeable and cumulative GHG emissions associated with BLM's oil and gas leasing actions are included in the *BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (2021)*.

Climate change is a global process that is affected by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from a single proposed land management action cannot be accurately translated into its potential effect on global climate change or any localized effects in the area specific to the action. Currently, global climate models are unable to forecast local or regional effects on resources as a result of specific emissions. However, there are general projections regarding potential impacts on natural resources and plant and animal species that may be attributed to climate change resulting from the accumulation of GHG emissions over time. GHGs influence the global climate by increasing the amount of solar energy retained by land, water bodies, and the atmosphere. GHGs can have long atmospheric lifetimes, which allows them to become well mixed and uniformly distributed over the entirety of the Earth's surface no matter their point of origin. Therefore, potential emissions resulting from the proposed action can be compared to state, national and global GHG emission totals to provide context of their significance and potential contribution to climate change impacts.

Table 3-19 shows the total estimated GHG emissions from fossil fuels at the global, national, and state scales over the last five years. Emissions are shown in megatonnes (Mt) per year of carbon dioxide equivalent (CO2e). Chapter 3 of the Annual GHG Report contains additional information on GHGs and an explanation of CO2e. State and national energy-related CO2 emissions include emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed. Table 3-20 shows the calculated GHG emissions (in megatonnes of CO2e) for all federal fossil fuels (includes off-shore oil and gas production) based on current 2020 production data obtained from the Department of the Interior's Office of Natural Resources Revenue (ONRR), as well as the percent contribution from federal fossil fuels to total U.S. fossil fuel GHG emissions. Chapter 3 of the Annual GHG Report contains additional information on greenhouse gases and an explanation of CO2e. Table 3-21 shows GHG emissions data from the largest greenhouse gas emitting facilities as reported to the U.S. Environmental Protection Agency (EPA) through its Greenhouse Gas Reporting Program (GHGRP) for those states associated with this potential leasing action. Table 3-21 also shows energy- related CO2 emissions reported by the U.S. Energy Information Administration (EIA) in its annual State Energy- Related Carbon Dioxide Emissions Tables (EIA, 2021a). State energy-related CO2 emissions include emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed.

Additional information on current state, national, and global GHG emissions as well as the methodology and parameters for estimating emissions from BLM fossil fuel authorizations and cumulative GHG emissions is included in the Annual GHG Report (see Chapters 4, 5, and 6).

Table 3-19. Global and U.S. GHG Emissions 2016-2020 (Mt CO2/yr)

Scale	2016	2017	2018	2019	2020
Global	36,465.6	36.935.6	37,716.2	37,911.4	35,962.9
U.S.	5,077.0	5,005.5	5,159.3	5,036.0	4,535.3

Source: Annual GHG Report, Ch.6, Table 6-1 Mt (megatonne) = 1 million tons

The continued increase of anthropogenic GHG emissions over the past 60 years has contributed to global climate change impacts. A discussion of past, current, and projected future climate change impacts is described in Chapters 8 and 9 of the Annual GHG Report. These chapters describe currently observed climate impacts globally, nationally, and in each State, and present a range of projected impact scenarios depending on future GHG emission levels. These chapters are incorporated by reference in this analysis.

Table 3-20. 2020 Federal Fossil Fuel GHG Emissions and Percent Federal Contribution (Mt CO2e/yr)

	U.S. Total	Federal Total [1]	% Contribution of Federal Emissions
Coal	1,248.1	490.9	39.34
Oil	2,363.2	516.4	21.86
Gas	2,726.4	316.2	11.61
Total	6,337.7	1,324.3	20.9

[1] *Federal Total includes emission estimates for both on-shore and off-shore oil and gas production for 2020 based on current ONRR production data found in https://revenuedata.doi.gov/downloads/production/*

Table 3-21. State GHG Emissions: EPA – GHGRP Large Emitters (Mt CO2/yr)

State	Total Reported	Power Plants	Petroleum and Natural Gas Systems	EIA Energy-related CO2 Emissions (Mt/yr)
WY	54.5	39.1	5.2	63.6

Source: Annual GHG Report, CH. 6, Table 6-3; Energy Information Administration

3.2.1 Monetized Impacts from GHG Emissions

The "social cost of carbon", "social cost of nitrous oxide", and "social cost of methane" – together, the "social cost of greenhouse gases" (SC-GHG) are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year.

On January 20, 2021, President Biden issued E.O. 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.[2] Section 1 of E.O. 13990 establishes an Administration policy to, among other things, listen to the science; improve public health and protect our environment; ensure access to clean air and water; reduce greenhouse gas emissions; and bolster resilience to the impacts of climate change.[3] Section 2 of the E.O. calls for Federal agencies to review existing regulations and policies issued between January 20, 2017, and January 20, 2021, for consistency with the policy articulated in the E.O. and to take appropriate action.

Consistent with E.O. 13990, the Council on Environmental Quality (CEQ) rescinded its 2019 "Draft National Environmental Policy Act Guidance on Considering Greenhouse Gas Emissions" and issued interim NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change.[4] This guidance, effective upon publication, builds upon and updates the CEQ's 2016 Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. While CEQ works on updated guidance, it has instructed agencies to consider and use all tools and resources available to them in assessing GHG emissions and climate change effects including recommending that agencies provide additional context for GHG emissions through the use of social cost of GHG estimates.[5]

Regarding the use of Social Cost of Carbon or other monetized costs and benefits of GHGs, the 2016 GHG Guidance noted that NEPA does not require monetizing costs and benefits.[6] It also noted that "the weighing of the merits and drawbacks of the various alternatives need not be displayed using a monetary cost-benefit analysis and should not be when there are important qualitative considerations."[7]

Section 5 of E.O. 13990 emphasized how important it is for federal agencies to "capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account" and established an Interagency Working Group on the Social Cost of Greenhouse Gases (the "IWG"). [8] "). In February of 2021, the IWG published Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990 (IWG, 2021).[8] This is an interim report that updated previous guidance from 2016.

To further contextualize the GHG emissions analyzed in this EA, the BLM estimates SC-GHGs in Chapter 4.

3.2.2 Estimated GHG Emissions for Reasonably Foreseeable Environmental Trends and Planned Actions

The analysis of GHGs contained in this EA includes estimated emissions from those parcels being offered in this lease sale as described above. In addition to this lease sale, the BLM is offering parcels in four other BLM administrative units within the second quarter of 2024. The estimated GHG emissions from parcels being offered in

[2] 86 FR 7037 (Jan. 25, 2021).
[3] *Id*., sec. 1.
[4] 88 FR 1196 (January 9, 2023).
[5] *Id.*
[6] 2016 GHG Guidance, p. 32, available at: https://ceq.doe.gov/docs/ceq-regulations-and- guidance/nepa_final_ghg_guidance.pdf
[7] *Id.*
[8] E.O. 13990, Sec. 5.

each of those individual sales is contained in the associated EA for each sale. When analyzing the potential impacts from multiple lease sales, it is important to note that it is the actual production of fossil fuel commodities on leased parcels that generates GHG emissions and not the offering of acres or parcels for lease in a particular grouping of lease sales. Parcels offered in a lease sale may or may not be sold and sold parcels may or may not go into production for several years, if at all. Typically, lease sales in different BLM administrative units are not offered on the same date and each administrative unit has discretion to defer its sale or defer or add parcels as a result of scoping and protests. The dynamic nature of the lease sale process and independence of each administrative unit for constructing its lease sales, precludes an analysis of potential GHG emissions that could occur from other lease sales that might occur in the same quarter. In addition, combining all of the offered parcels from multiple lease sales that may occur over a 3-month period, assuming all acres will be sold and produce immediately, and estimating GHG emissions from development on the offered acreage based on these assumptions would result in an inflated, unrealistic, quantity of estimated emissions that would not be useful to the decision maker and would not accurately inform the public of the magnitude of probable cumulative emissions and impacts.

An assessment of GHG emissions from BLM's fossil fuel authorizations including coal leasing and oil and gas development is included in the BLM Specialist Report on Annual GHG Emissions (referred to as Annual Report, see Chapter 5). The Annual Report includes estimates of reasonably foreseeable GHG emissions related to BLM lease sales anticipated during the calendar year, as well as the best estimate of emissions from ongoing production, and development of parcels sold in previous lease sales. It is, therefore, an estimate of cumulative GHG emissions from the BLM fossil fuel leasing program based on actual production and statistical trends.

The Annual Report provides an estimate of short-term and long-term GHG emissions from lease sale activity across the BLM. The short-term methodology presented in the Annual Report includes a trends analysis of (1) leased federal lands that are held-by-production, (2) approved applications for permit to drill (APDs), and (3) leased lands from competitive lease sales occurring over the next annual reporting cycle (12 months), to provide a 30-year projection of potential emissions from Federal lease actions over the next 12 months. The long- term methodology uses oil and gas production forecasts from the Energy Information Administration (EIA) to estimate GHG emissions out to 2050 that could occur from past, present, and future oil and gas development. For both methodologies, the emissions are calculated using life-cycle-assessment (LCA) emissions and data factors.

These analyses are the basis for projecting GHG emissions from lease parcels that are likely to go into production during the analysis period of the Annual Report and represent both a review of GHG emissions from fossil fuel leasing and the best available estimate of reasonably foreseeable cumulative emissions related to any one lease sale or set of quarterly lease sales. Table 3-22 shows the cumulative estimated GHG emissions from the development of the projected lease sale acres in 2022 using the methodology described above. The 5-year lease averages include all types of oil and gas development related leases, including leases granted under the Mineral Leasing Act as well as other authorities, that have been issued over the last five years. As such the projections made from the 5-year averages represent the potential for all types of future potential oil and gas leasing activity, and although not at exact acreage levels, would account for the proposed action. However, they may also over-estimate the potential emissions from the 12-month cycle of competitive oil and gas leasing activities if the projected lease sale activity does not actually occur.

Table 3-22. Reasonably Foreseeable Projected Emissions

State (BLM Administrative Unit)	Annual Report Table 4-8 Projected Lease Acres 2022	Annual Report Figure 5-1 GHG Emissions from Projected Lease Acres 2022 (Mt CO_2e per year)
Alabama (ES)	1	0.00
Alaska	356,021	9.33
Arkansas (ES)	536	0.04
California	184	0.02
Colorado	67,268	10.21
Idaho	1,881	0.03
Kansas (ES)	287	0.02

State (BLM Administrative Unit)	Annual Report Table 4-8 Projected Lease Acres 2022	Annual Report Figure 5-1 GHG Emissions from Projected Lease Acres 2022 (Mt CO_2e per year)
Kentucky (ES)	37	0.01
Louisiana (ES)	9,334	2.59
Michigan (ES)	5,006	0.17
Mississippi (ES)	2,609	0.06
Montana	60,807	2.48
Nebraska (WY)	19	0.01
Nevada	155,583	0.29
New Mexico	38,926	22.90
North Dakota (MT)	2,477	0.07
Ohio (ES)	681	0.18
Oklahoma (NM)	2,052	0.05
South Dakota (MT)	1,543	0.02
Texas (NM)	1,602	0.09
Utah	141,832	9.13
West Virginia (ES)	42	0.01
Wyoming	562,985	88.87
Total	***1,411,713***	***146.56***

3.2.3 Mitigation Strategies

GHG emissions contribute to changes in atmospheric radiative forcing resulting in climate change impacts. GHGs act to contain solar energy loss by trapping longer wave radiation emitted from the Earth's surface and act as a positive radiative forcing component. The buildup of these gases has contributed to the current changing state of the climate equilibrium towards warming. Chapters 8 and 9 of the Annual Report provides a detailed discussion of climate change science, trends, and impacts. The relationship between GHG emissions and climate impacts is complex, but a project's potential to contribute to climate change is reduced as its net emissions are reduced. When net emissions approach zero, the project has little or no contribution to climate change. Net-zero emissions can be achieved through a combination of controlling and offsetting emissions. Emission controls (e.g., vapor recovery devices, no-bleed pneumatics, leak detection and repair, etc.) can substantially limit the amount of GHGs emitted to the atmosphere, while offsets (e.g., sequestration, low carbon energy substitution, plugging abandoned or uneconomical wells, etc.) can remove GHGs from the atmosphere or reduce emissions in other areas. Chapter 10 of the Annual Report provides a more detailed discussion of GHG mitigation strategies.

The Federal government includes several agencies that work responsibly in concert for implementing climate change strategies and meeting U.S. emissions reduction goals all while supporting U.S. oil and gas development and operations. The EPA is the Federal agency charged with regulation of air pollutants and establishing standards for protection of human health and the environment. EPA has issued regulations that will reduce GHG emissions from any development related to the proposed leasing action. These regulations include the New Source Performance Standard for Crude Oil and Natural Gas Facilities (49 CFR 60, subpart OOOOa) which imposes emission limits, equipment design standards and monitoring requirements on oil and gas facilities. A detailed discussion of existing regulations and Executive Orders that apply to BLM management of federal lands as well as current Federal and state regulations that apply to oil and gas development and production can be found in Chapter 2 of the Annual Report.

The majority of GHG emissions resulting from federal fossil fuel authorizations occur outside of the BLM's authority and control. These emissions are referred to as indirect emissions and generally occur off-lease during the transport, distribution, refining, and end-use of the produced federal minerals. The BLM's regulatory authority is limited to those activities authorized under the terms of the lease, which primarily occur in the "upstream" portions of natural gas and petroleum systems. This decision authority is applicable when development is proposed on public

lands and BLM assesses its specific location, design and proposed operation. In carrying out its responsibilities under NEPA, the BLM has developed Best Management Practices (BMPs) designed to reduce emissions from field production and operations. BMPs may include limiting emissions on stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions occurring on a lease parcel. Analysis and approval of future development may include application of BMPs within BLM's authority, as Conditions of Approval or Lease Stipulations, to reduce or mitigate GHG emissions. Additional measures proposed at the project development stage may be incorporated as applicant-committed measures by the project proponent or added to necessary air quality permits. Additional information on mitigation strategies, including emissions controls and offset options, are provided Chapter 10 of the Annual GHG Report.

3.3 Water Resources

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation, and vegetation. Anthropogenic factors that currently affect surface include livestock grazing management, private, commercial, and industrial development, recreational use, drought, and vegetation control treatments. Based on best available data, the vast majority of the nominated parcels are within the following HUC8 watersheds: Lower Wind, Lighting, Little Wind, Badwater, and Antelope HUC8 units. Specific water resource information for each of the parcels is shown in Table 3-22

Groundwater hydrology within the area of the parcels is influenced by geology and recharge rates. Groundwater quality and quantity can be influenced by precipitation, water supply wells and various disposal activities. Groundwater quality across the applicable field offices varies with depth from potable waters with low total dissolved solids (TDS) to highly saline, non-potable sources. Most of the groundwater in Wyoming is used for industrial, domestic and livestock/irrigation purposes. The information contained in Appendix 5.3, Hydraulic Fracturing White Paper (see section entitled Operational Issues/Water Availability and Consumption Estimates) is incorporated by reference.

The Wyoming State Geological Survey identifies groundwater aquifers and publishes public data on Wyoming aquifer characteristics. Based on this data the parcels nominated are within the following aquifers: Cody confining unit, Fort Union, Fox Hills, Mesaverde, Quaternary alluvial, Quaternary aeolian-deposit, undefined Fontenelle and New Forks, Wasatch, and Wind River aquifer. The rock type identified in these aquifers include alluvium, claystone, colluvium, dune sand, fine-grained mixed clastic, loess, mixed clastic/carbonate, mudstone, sandstone, shale, and siltstone. Usable water and geological formations vary throughout Wyoming making it difficult to provide specific data for each individual parcel analyzed within this EA. Usable water zones are those waters containing up to 10,000 mg/L of total dissolved solids (TDS) (43 CFR 3172.5). The EPA definition of underground sources of drinking water (40 CFR 144.3) is an aquifer or its portion which supplies any public water system, or contains a sufficient quantity of ground water to supply a public water system, and currently supplies drinking water for human consumption, or contains fewer than 10,000mg/l TDS and is not an exempted aquifer. Appendix 5.4 discusses general characteristics of the usable water zones and aquifer characteristics for the oil and gas basins where parcels have been nominated.

In addition to the above surface hydrology and aquifer information, BLM also reviewed each parcel for Active Water Wells identified by the Wyoming State Geological Survey (https://main.wsgs.wyo.gov/gis/gis-groundwater) as well as BLM GIS layers for Named Creeks and Major Lakes and Rivers. Active water well permits were reviewed within the parcel boundary and within 2 miles of the parcel boundary which is the average reach of a horizontal wellbore.

Table 3-23. Water Wells, Spring Developments, Major Lakes and Rivers within each Proposed Parcel

Parcel Number 2024-06-	Active Water Well Permits	Deepest Active Water Well (feet)	Inactive Water Wells Permits	Spring Development Permits	Active Water Well Permits (within 2 miles)	Deepest Active Water Well within 2 miles (feet)	Named Creeks (miles)	Major Lakes (acres) and Rivers (miles)
1770	2	5	3	-	6	5	-	-
1771	-	-	7	-	6	5	-	-
1786	1	N/A	-	-	129	3,382	Horse Creek (0.69)	-
1823	-	-	-	-	1	410	-	-
1824	-	-	-	-	3	395	Horse Creek (0.75)	-
1825	-	-	-	-	21	721	Walker Creek (0.85)	-
1828	-	-	-	-	1	320	-	-
1829	10	N/A	5	-	6	405	-	-
1832	-	-	-	-	-	-	-	-
1833	2	320	2	-	147	980	-	-
1834	-	-	-	-	5	1,000	Dry Creek (0.22)	-
1835	-	-	-	-	31	720	-	-
1836	-	-	-	-	2	180	-	-
1837	-	-	-	-	6	5	-	-
1838	2	987	2	-	55	1,205	-	-
1840	-	-	-	-	2	400	-	-
1841	-	-	-	-	18	545	-	-
7294	-	-	-	-	15	998	-	-
7295	2	180	3	-	12	500	-	-
7296	-	-	1	-	131	3,654	-	-

Several parcels (WY-2024-06-1786, 1824, 1833, 1835, 1838, 7294, 7295, 7296 and portions of WY-2024-06-1825, 1829 and 1834) contain land with private surface overlying federal minerals (i.e., split-estate). The private surface lands have or have the potential to contain private residences and associated facilities such as domestic or stock water supply wells. Lands used as rangeland can also have stock water supply wells.

3.4 Greater Sage-Grouse

Conservation of the Greater Sage-Grouse (Centrocercus urophasianus) and their habitats is a critical land-management issue for the BLM, the public, and the BLM's partner agencies across the West.

The Greater Sage-Grouse currently occupies approximately about one-half of their historic distribution. On October 2, 2015, the U.S. Fish and Wildlife Service (FWS) published its finding that listing of the Greater Sage-Grouse under the Endangered Species Act of 1973 was not warranted. The FWS's finding was based, in part, on the conservation strategies developed in Wyoming and other states which led the FWS to conclude that "the primary threats to greater sage-grouse have been ameliorated by conservation efforts implemented by Federal, State, and private landowners." (80 FR 59858, dated October 2, 2015). As the FWS also acknowledged (id. at page 59882):

> *The key component of the Wyoming Plan is the application of State's regulatory measures associated with the Wyoming Plan on all lands in Wyoming… The Federal Plans in the State incorporate the Wyoming strategy,[12] thereby ensuring implementation of the strategy on Federal land surfaces and subsurface regardless of the need for a State permit (see further discussion below). The completion of the Federal plans also facilitates greater coordination between the State and Federal agencies in implementing and monitoring the Wyoming Plan. This addition to the Wyoming Plan further increases the value of this effort in conserving sage-grouse by covering all lands in the State with a single regulatory framework to reduce affects to sage-grouse in the most important habitats in the State. Therefore, the strategy conserves sage-grouse through an effective regulatory mechanism for conservation.*

For BLM-administered public lands in Wyoming, the BLM incorporated the State's Greater Sage-Grouse conservation strategy by revising and amending its RMPs. The State of Wyoming's Core Area Protection strategy for Greater Sage-Grouse "is based on the principle that conservation of important habitat essential to the maintenance of Greater Sage-Grouse and activities important to the State's economy are not mutually exclusive." (State of Wyoming Governor's Executive Order 2019-3, at Appendix A, page 5). The important habitat areas referred to in Executive Order (EO) 2019-3 are the Core Population Areas (CPAs), Connectivity Areas and Winter Concentration Areas designed by the State of Wyoming's Sage-Grouse Implementation Team (SGIT). These CPAs encompass approximately 83% of the Greater Sage-Grouse population within the State (see 80 FR 59882) as identified by peak male lek attendance, and were mapped by the SGIT to:

> *...assimilate[] the highest sage-grouse density areas identified [in published conservation studies] as they were identified as the most productive habitats for sage-grouse in Wyoming. In addition, the mapping of Core Areas considered current and potential energy development and encapsulated areas historically low in production [citation omitted]…*

To assist in the implementation of the RMP management decisions, the BLM issued several Instruction Memorandums (IMs) to help provide guidance. One of these was Instruction Memorandum 2016-143 (IM-2016-143 - "Implementation of Greater Sage-grouse Resource Management Plan Revisions or Amendments -Oil & Gas Leasing and Development Sequential Prioritization") which was issued on September 1, 2016. On December 27, 2017, IM 2016-143 was rescinded and replaced with IM No. 2018-026 ("Implementation of Greater Sage-grouse Resource Management Plan Revisions or Amendments -Oil & Gas Leasing and Development Prioritization Objective"). On March 15, 2019, the Wyoming Greater Sage-Grouse Approved Resource Management Plan Amendment and Record of Decision was signed. Through a District of Idaho court decision (*Western Watersheds Project, et al v. Schneider*, 1:16-cv-00083-BLW) BLM was enjoined from implementing the 2019 BLM Sage-Grouse Plan Amendments for Idaho, Wyoming, Colorado, Utah, Nevada/Northeastern California, and Oregon, until such time as the Court can adjudicate the claims on the merits. The 2015 Plans remain in effect during this time. On February 27, 2020, a separate court decision from the District of Idaho (*Western Watersheds Project, et al v. Bernhardt*, 1:18-cv-00187-REB) enjoined certain provisions of the IM-2018-034 and replaced them with provisions from the IM-2010-117. Finally, a third case from the District of Montana (*Montana Wildlife Federation v. Bernhardt*, 4:18-cv-00069-BMM) vacated IM-2018-026. Due to these decisions, BLM WSO developed a new strategy to prioritize leasing within sage-grouse habitats, which is incorporated here and in chapter 4 of this EA.

For ease of discussion, BLM Wyoming categorized all parcels by habitat type using the following method:

1) Identify which parcels are wholly or partially within PHMA and assign an evaluation label of 'PHMA' to those parcels (if a parcel contains both PHMA and GHMA, the evaluation label becomes PHMA),
2) Identify parcels which are wholly or partially within GHMA and assign an evaluation label of 'GHMA' to those parcels (if a parcel contains both GHMA and Non-habitat, the evaluation label becomes GHMA),

3) Identify all parcels completely outside of sage-grouse habitat and assign an evaluation label of 'Non-habitat' to those parcels. **Error! Reference source not found.** describes each parcel, its designated habitat type(s) and provides the 'Evaluation Label' for prioritization purposes.

Table 3-24. Greater Sage-Grouse Parcels Evaluation Label

Parcel Number	Nominated Acres	Delete in Full	Delete in Part	Acres Available	Non-habitat (P1)	GHMA acres (P2)	PHMA acres (P3/P4/P5)	Evaluation Label
1770	2000.000	0.000	0.000	2000.000		2000.000		GHMA
1771	400.000	0.000	0.000	400.000		400.000		GHMA
1786	375.220	0.000	0.000	375.220		375.220		GHMA
1823	40.000	0.000	0.000	40.000		40.000		GHMA
1824	720.000	0.000	0.000	720.000			720.000	PHMA
1825	1330.030	0.000	0.000	1330.030		1330.030		GHMA
1828	320.000	0.000	0.000	320.000		320.000		GHMA
1829	855.680	0.000	0.000	855.680		855.680		GHMA
1832	501.840	0.000	0.000	501.840		501.840		GHMA
1833	72.200	0.000	0.000	72.200		72.200		GHMA
1834	1585.330	0.000	0.000	1585.330		1585.330		GHMA
1835	1117.300	0.000	0.000	1117.300		1117.300		GHMA
1836	40.000	0.000	0.000	40.000		40.000		GHMA
1837	40.000	0.000	0.000	40.000		40.000		GHMA
1838	400.000	0.000	0.000	400.000		400.000		GHMA
1840	640.000	0.000	0.000	640.000		640.000		GHMA
1841	480.000	0.000	0.000	480.000		480.000		GHMA
7294	238.860	0.000	0.000	238.860		238.860		GHMA
7295	59.760	0.000	0.000	59.760		56.021	3.739	PHMA
7296	34.330	0.000	0.000	34.330		34.330		GHMA

In the table above, the P1 though P5 are priority habitat criteria discussed in Appendix 5.5.

In addition, the BLM has identified those parcels that are located within 5.28 miles (8.5 kilometers) of an active or occupied Greater Sage-Grouse lek which is consistent with the Wyoming Core Area Strategy, which BLM incorporated into the 2015 ARMPA. For consistency, BLM also used this same 5.28-mile approach for parcels and active or occupied leks in GHMA and non-habitat. The following table indicates which parcels are located within 5.28 miles of an active or occupied Greater Sage-Grouse lek.

Table 3-25. Greater Sage-Grouse Lek Distance

2024-06 Parcel Num.	Habitat Evaluation Label	1 mile	2 miles	3 miles	4 miles	5.28 miles
1770	GHMA	-	-	X	X	X
1771	GHMA	-	-	X	X	X
1786	GHMA	-	-	-	-	-
1823	GHMA	-	-	X	X	X
1824	PHMA	-	-	X	X	X
1825	GHMA	-	-	-	-	-
1828	GHMA	-	-	-	X	X
1829	GHMA	-	X	X	X	X
1832	GHMA	-		X	X	X
1833	GHMA	-	X	X	X	X

2024-06 Parcel Num.	Habitat Evaluation Label	1 mile	2 miles	3 miles	4 miles	5.28 miles
1834	GHMA	-	-	X	X	X
1835	GHMA	-	-	-	X	X
1836	GHMA	-	-	-	-	-
1837	GHMA	-	-	-	X	X
1838	GHMA	X	X	X	X	X
1840	GHMA	-	-	X	X	X
1841	GHMA	-	X	X	X	X
7294	GHMA	-	-	-	-	X
7295	PHMA	-	X	X	X	X
7296	GHMA	-	-	-	-	-

The Wyoming Game and Fish Department 2021-2022 Greater Sage-Grouse Job Completion Report (JCR) discusses each Sage-Grouse Local Working Group (LWG) Area. BLM used the maps for each LWG and identified which parcels were in the respective LWG areas (Table 3-25). The 2021-2022 JCR has a discussion regarding lek monitoring, population trend, productivity, harvest, habitat, and disease. The 2021-2022 Greater Sage-Grouse Job Completion Report can be accessed at: https://wgfd.wyo.gov/Hunting/Job-Completion-Reports

Table 3-26. Parcel in Respective Greater Sage-Grouse Local Working Group Areas

2024-06 Parcel Num.	Sage-Grouse Local Working Group (LWG) Area
1770	Wind River/ Sweetwater Basin
1771	Wind River/ Sweetwater Basin
1786	Northeast
1823	Southcentral
1824	Northeast
1825	Northeast
1828	Wind River/ Sweetwater Basin
1829	Wind River/ Sweetwater Basin
1832	Wind River/ Sweetwater Basin
1833	Upper Green River Basin
1834	Wind River/ Sweetwater Basin
1835	Northeast
1836	Northeast
1837	Wind River/ Sweetwater Basin
1838	Northeast
1840	Wind River/ Sweetwater Basin
1841	Wind River/ Sweetwater Basin
7294	Northeast
7295	Wind River/ Sweetwater Basin
7296	Northeast

In general, the 2021-22 sage-grouse JCR indicates that statewide populations in Wyoming have been declining, as estimated by lek counts, since 2016 with a slight increase in average male per lek estimates in 2022 compared to 2021. Sage-grouse harvest data suggest that productivity, measured as the number of chicks per female in the fall harvest, has been below that needed for stable populations also since 2016. The WGFD estimate that >1.4 chicks/hen in the fall harvest generally result in stable to increasing sage-grouse populations, and productivity estimates since 2016 have been ≤1.2 chicks/hen. The data provided in the job completion reports for the conservation areas where most of the parcels being offered in this sale are located, suggest similar trends as those found statewide. According to the JCR, "Short-term trends in statewide populations are believed to be largely weather related. In the late 1990s, 2004-05, and again in 2014-15, timely precipitation resulted in improved habitat conditions allowing greater numbers of sage-grouse to successfully reproduce. Drought conditions throughout this decade are believed to have caused lower grouse survival leading to population declines. These trends are valid at the statewide scale but trends are more varied at the local scale. Sub-populations more heavily influenced by anthropogenic impacts (residential development, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, interstate highways, etc.) have experienced declining populations or localized extirpation."

3.5 Big Game

General information regarding wildlife species and impacts in the subject planning areas can be found at the following locations within the respective Field Office's RMP (see section 1.4)

Big Game Herd Units

The distribution and abundance of big game in the planning area is primarily a function of habitat quality and quantity, the availability of water, climate/weather, and the ability to move, or migrate between seasonal habitats.

The WGFD manages big game populations in herd units (HU). Herd unit boundaries generally do not match BLM field office boundaries, making analysis and correlation of resource data and big game population data difficult. The WGFD revises its population objectives for each big game species based on new habitat information, population trends, recreation demand, and public input.

The health of big game populations are generally inferred from population objectives set by the WGFD. Based on monitoring data, big game populations range greatly across the State when comparing these estimates to the herd unit population objectives. According to the WGFD's 2022 Job Completion Reports, pronghorn herd unit population estimates range between 32.37% above to 76.92% below objective, mule deer range from 9.38% below to 83.53% below objective and elk population estimates range from 171.3% above to 12.96% below herd unit objectives.

Mule Deer

Of the parcels evaluated, the vast majority are located in the following HU's: Beaver Rim (7, 1 parcel is shared with South Wind River), Cheyenne River (5), North Converse (3), and Southwest Bighorn (3). See Table 3-6 below for a list of HUs and parcel descriptions.

In general, the HUs that are located in WR/BBD that are below population objective have periodic disease outbreaks. In addition, the WR/BBD HUs have been subject to periods of drought which have helped depress populations. Scattered oil and gas development occurs throughout the WR/BBD HUs. Similarly, the HUs in the HPD which are below population objective predominantly overlap private lands. Across the parcels, major land uses in these HUs are traditional ranching and grazing with oil and gas and coal development. Periodic disease outbreaks (i.e. hemorrhagic diseases) are possible in some of these HUs and can contribute to population declines when environmental conditions are suitable.

Seven of the nominated parcels (35% of all nominated parcels) are within the Beaver Rim Herd Unit (Table 3-25). The herd unit population objective is set at 2,600 individuals. There is not an indication whether the population is above or below objective since this herd is managed for trophy mule deer with limited licenses and a high-quality recreational experience for a limited number of hunters. Given the more recent small number of licenses issued,

harvest mortality has likely had little impact on the overall deer population in the area for many years. That said, the population has been below objective for over 10 years. The 2022 WGFD JCR for the Lander Region indicates that environmental conditions in the area were quite harsh in both 2018 and 2019 resulting in poor fawn recruitment and survival. The summer of 2020 and 2021 was very dry throughout this herd unit and resulted in very poor vegetation production. The amount of moisture received in this past year was much needed and may contribute to better vegetation production than in the past. However, the winter of 2022-2023 has been quite harsh and persistent cold temperatures and snowpack will likely contribute to lower deer survival and continued population decline.

The 2022 WGFD JCR for the Casper Region indicates that the Cheyenne River mule deer herd unit is 65.2% below the population objective of 27,000 individuals. The CJR also indicates that this herd had excelletnt productivity and survival in 2014 and 2015. However, since 2016 productivity and survival have generally declined, and Epizootic Hemorrhagic Disease (EHD) and Blue Tongue Virus (BTV) outbreaks have increased adult mortality, especially in 2021 and likely in 2022 as well. Consequently, this population has dropped since 2018.

For example, the WGFD Sublette Mule Deer Herd 2022 JCR states, “Since 2016, this herd has seen little growth until the past couple years and remains below the population objective range of 25,600 to 38,400 deer, although the buck ratio objective (range of 30-45 bucks:100 does) continues to be achieved. The winter of 2022-23 was extremely severe on most winter ranges for the Sublette herd, resulting in considerable deer mortality.” “During the past 10 years, this deer herd experienced three winters that resulted in above average fawn mortality (> 50% loss). Winter conditions experienced in 2018-19 resulted in winter fawn loss of 50+% and the winter of 2016-17 resulted in considerable mortality when fawn loss was estimated near 85% and adult mortality near 35%. During the winter of 2010-11, fawn mortality estimates exceeded 70%. The 2022-23 winter was the most severe winter in the past 30+ years. Above average snow levels persisted and blanketed most sagebrush throughout all winter ranges, and temperatures were well below normal. These 2022-23 winter conditions resulted in above average winter deer mortality with an estimated fawn loss at or above 70%, and estimated adult female mortality ranging above 40% on most winter ranges down to 20% on southern winter ranges northeast of Rock Springs in the Red Desert.”” These conditions were in addition to gas development on the Pinedale Anticline. Exceptions for crucial winter range timing limitations were initially authorized in 2005and were made permanently available for the life of the project in accordance with the Pinedale Anticline ROD. The vast majority of the Mesa within the northern Pinedale Anticline field is within crucial winter range for Mule Deer. See ARMPA pages 4-423- 4-425 for a discussion of research results emanating from studying this herd during a period of intensive development. Recent data suggests that while these initial study results were accurate, to date, mule deer are not habituating even as large parts of the field are being reclaimed. To date, the PFO has not recommended any changes through the adaptive management process for this project. Additional study and coordination with the WGFD and local partners, is continuing.

But, as noted in the Pinedale RMP DEIS, pg. 146 (1986): “Mule deer populations in the planning area have a history of severe fluctuation. Most of the drastic population declines are attributable to severe winter conditions. Mortality may reach 30-50 percent of the population under certain conditions.” Historic information regarding population objectives and estimated populations can be found in these documents: (Pinedale RMP DEIS, pg. 144 (1986), Green River RMP DEIS pg. 427 (1992), and the Medicine Bow DEIS RMP pg. 197-199 (1987).

Table 3-27. Mule Deer Herd Units

DISTRICT OFFICE	FIELD OFFICE	HERD UNIT	WGFD 2021 Population Objective	WGFD Population Estimate, 2021	Status meeting Objective	# Parcels within	# Overlap
WR/BBD	LFO	Beaver Rim	N/A	N/A	54% below	7	1 Overlaps South Wind River
HPD	NFO, BFO, CFO	Cheyenne River	27,000	22,543	16.5% Below	5	
HPD	CFO	North Converse	9,000	6,901	23.3% Below	3	

DISTRICT OFFICE	FIELD OFFICE	HERD UNIT	WGFD 2021 Population Objective	WGFD Population Estimate, 2021	Status meeting Objective	# Parcels within	# Overlap
HDD, WR/BBD	LFO, RSFO, PFO	South Wind River	11,000	7,874	28.4% below	1	1 Overlaps Beaver Rim
HPD, WR/BBD	LFO, RSFO, WFO	Southwest Bighorn	16,000	11,514	28.0% Below	3	
HDD, WR/BBD	PFO, RSFO	Sublette	32,000	21,103	34.1% Below	2	

Designated Migration Corridors

None of the parcels are located within designated migration corridors, as designated in the Wyoming Governor's Executive Order (EO) 2020-1. In addition, the Wyoming Game and Fish Department (WGFD) did not raise migration corridors as an issue during their review. Therefore, big game migration corridors will not be discussed further within this EA.

3.6 Lands with Wilderness Characteristics (LWCs)

Wilderness characteristics are resource values that include naturalness, outstanding opportunities for solitude, or outstanding opportunities for primitive and unconfined recreation. Areas evaluated for wilderness characteristics generally occur in undeveloped locations of sufficient size (typically greater than 5,000 contiguous acres) to be practical to manage for these characteristics.

The BLM Land Use Planning Handbook (H-1601-1) states that the BLM must consider the management of lands with wilderness characteristics during the land use planning process. The criteria used to identify these lands are essentially the same criteria used for determining wilderness characteristics for WSAs. However, the authority set forth in Section 603(a) of FLPMA to complete the three-part wilderness review process (inventory, study, and report to Congress) expired on October 21, 1993; therefore, FLPMA does not apply to new WSA proposals and consideration of new WSA proposals on BLM-administered public lands is no longer valid. The BLM is still required under Section 201 of FLPMA to "...maintain on a continuing basis an inventory of all public lands and their resource and other values...." This includes reviewing lands to determine if they possess wilderness characteristics (see Appendix 5.8).

The parcels listed in Table 3-7 qualify as LWCs because they are within units which contain at least 5000 contiguous acres of roadless lands, the imprint of man's work is substantially unnoticeable, they have outstanding opportunity for solitude or primitive recreation and they contain natural features of scientific, education, scenic or historical value. The remaining parcels were not found to contain LWCs. If a parcel is not within a 5000 acre area, they are not reviewed further in accordance with BLM policy contained in Manual 6310. Those parcels which have been determined to have lands with wilderness characteristics are available for oil and gas development under their respective RMPs. A complete list of all parcels and the LWC review can be located in Appendix 7.3.

Table 3-28. Lands with Wilderness Characteristics

Parcel WY-2024-06-	ACRES	WY LWC NUMBER	NAME	MANAGED FOR LWC
1833	72.2	WYD01-6300-100	Pinedale Anticline	No

3.7 Socioeconomics and Environmental Justice

3.7.1 Socioeconomics

Please refer to the applicable RMP FEISs for additional discussion on resource socioeconomics across the total project area.

The counties within which the proposed parcels are located collectively make up the socioeconomic analysis area in which potential socioeconomic impacts of the proposed lease sale are considered. The local customs, culture, and history of communities within Wyoming are entwined with the lands and mineral estates administered by the BLM. People derive a wide range of values from their access, use, development, and enjoyment of natural landscapes administered by each field office. These values contribute to the unique sense of place indicative to rural Wyoming, as well as to the social and economic well-being of households and communities across the analysis area. Just as BLM management actions can affect future access, use, development, and enjoyment of these natural landscapes, field office land use and leasing decisions can affect the social, cultural, and economic well-being of surrounding towns, cities, and rural areas. Wyoming has a long history in mineral development and accounted for more than 2% of U.S. total crude oil output and nearly 4% of U.S. marketed gas production in 2020 (U.S. EIA 2021c). Federal mineral royalties, severance taxes, sales and use taxes, and ad valorem taxes associated with mineral development historically comprise a significant amount of state and local revenues (WY LSO 2023). Specifically, these revenues from both federal and non-federal mineral production contribute significantly to respective General Funds for State and local government operations, public K-12 education coffers, and community colleges. Wyoming is in an additionally unique position where its tax and federal mineral royalty (FMR) revenues are supplemented with investment income derived from "legacy" benefits associated with historically garnered severance taxes, as well. Such revenue associated with Permanent Wyoming Mineral Trust Fund investment income and FMRs assist in reducing the tax burden on current Wyoming residents to support the range of government and public services residents currently receive (WY LSO 2023). While the estimated number of oil and natural gas producers across WY totaled about 584 in 2022, this amount is about 20% less than the total population of producers statewide in 2017. Converse County lead the state in total amount of crude oil and lease condensate value, subject to severance tax, or the reduced severance rate, and ad valorem tax produced in 2022. Sublette County lead the state in total natural gas value of both processed and unprocessed gas for calendar year 2022 (WY DOR 2023).

Table 3-29a. Production Year 2022 Wyoming Fluid Minerals [1] (Federal and Non-Federal) -- A Summary

Commodity	Taxable Valuation (Total State Assessed Valuation)	Est. Ad Valorem (Property) Taxes	Est. Mineral Severance Taxes	# of Producers (Federal and Non-Federal)
Oil	$7,667,800,744	$485,844,982	$460,068,045	389
Natural Gas	$6,256,097,281	$393,975,948	$375,365,837	195
% of State Total	80.5%	80.5%	79.8%	72.8%

Source: WY Department of Revenue 2023 Annual Report

[1] From both federal and non-federal production across Wyoming counties.

Table 3-29b. Calendar Year 2022 WY Federal Oil and Gas Mineral Royalty Collections and Associated Disbursements back to Wyoming State and Local Governments

Commodity	FMRs Collected	Federal Mineral Revenue Disbursements back to Wyoming[1]
Oil	$ 618,617,084	$302,322,149
Natural Gas	$565,500,932	$332,571,243
Total	$ 1,184,118,016	$634,893,392

Source: DOI Office of Natural Resources Revenue (ONRR 2023)

[1] Disbursement amounts also reflect revenues from bonuses and rents, however, estimated disbursements fluctuate primarily according to royalty revenues as royalties represent the largest source of funds disbursed back to states (Congressional Research Service 2020). The Wyoming oil and gas sector relies on both ongoing operational activities (development of existing leases) and new development opportunities (acquisition and development of new leases) to continue to provide local and regional jobs, income, and revenue on a sustained basis. Oil and gas lease sales contribute to employment for area residents, continued demand for oil and gas industry–related goods and services, and continued demand for industry support goods and services that generate additional indirect and induced economic contributions (such as sales and use tax revenue and employment from industries that supply goods and services to the oil and gas industry, like drilling equipment). More specifically, industry support goods and services contribute value in the form of employment and labor income associated with where fluid mineral development and operations personnel, and those who work in the oil and gas industry's supply chain, spend their income, such as restaurants and retail stores.

Thus, this demand continuity as promulgated by oil and gas lease sales also contributes to employment stability in sectors outside of, or within the economic ripple effect, of the Wyoming oil and gas industry.

The socioeconomic analysis area is characteristically rural, with sparse and fragmented residential populations speckled across the state. While the oil and gas industries of WY are embedded in the functionalities and livelihoods of the state's communities, WY residents also deeply value the aesthetic, recreational, and overall environmental and ecological health of these lands; such diverse interests must be delicately balanced and considered equitably when analyzing the impacts of any specific land use(s).

3.7.2 Environmental Justice

Environmental Justice (EJ) refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies (CEQ 1997). Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations, states "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" (Executive Order 12989). Executive Order 12898 also fully applies to indigenous populations, including the importance of determining any tribal presence in a given plan or project area. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or indigenous populations that may experience common conditions of environmental exposure or effects associated with a plan or project. BLM policy, as contained in BLM Land Use Planning Handbook H-1601-1 (BLM 2005) Appendix C, provides direction on how to fulfill agency responsibilities for Executive Order 12898.

The Council on Environmental Quality (CEQ) has developed guidance to assist federal agencies with their NEPA procedures so that EJ concerns are effectively identified and addressed. The guidance focuses on identifying communities of concern using census data. Low-income populations are defined as those living below twice the federal poverty rate (see Federal Interagency Working Group on Environmental Justice and NEPA Committee 2016; BLM EJ Implementation IM2022-059), as identified by the U.S. Census Bureau and Bureau of Land Management. Minority populations include the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997). A minority population is identified as a community of concern if either 1) the minority population of the area of analysis exceeds 50% of the population of the area of analysis, or 2) the minority population percentage of the area of analysis is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997:25). A minority population also exists "if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds" (CEQ 1997:26).

For this EA, the EJ analysis area is defined as all US Census block groups surrounding the associated parcels proposed to be offered for sale in each Alternative. Parcels offered for sale span across Wyoming. If a parcel is located on or near more than one block group, all proximal and/or immediately adjacent block groups were also included in the analysis. This analysis area was selected to represent geographies proximal to the management area, associated potential transportation and access routes, and to be inclusive of regional rural and indigenous landscapes.

The population in this analysis area is estimated to total 9,604 people (USCB 2022). The reference area is the State of Wyoming for all parcels; reference areas smaller than the state of Wyoming are not suitable for this analysis due to the rural composition and resultingly sparse demographic data available at a consistent county level. Baseline EJ screening results for block groups surrounding all parcels are displayed in Section 4.6 *Environmental Consequences - Socioeconomics and Environmental Justice.* Of the 20 parcels proposed for lease, six associated Census block groups meet BLM and CEQ criteria for environmental justice consideration (BLM IM2022-059).

Recall that the socioeconomic analysis area is characteristically rural, with sparse and fragmented residential populations speckled across the state. Block groups are often thousands, if not millions, of acres in surface area due to this rurality and the associated population density. Proposed parcel acreage takes up a small fraction of these vast block groups, so, while an entire block group might meet EJ screening criteria, one cannot assume EJ populations represented in the block group are proximal enough to the parcel to experience associated adverse and

disproportionate impacts. However, *e*nvironmental justice populations identified within the analysis area block groups do constitute those at risk for disproportionately adverse impacts from federal oil and gas management decisions, including but not limited to disproportionately adverse socioeconomic and health-related impacts discussed in Section 4.6 *Environmental Consequences,* depending on a given rural population's density and proximity to a proposed parcel. Such impacts discussed in Section 4.6 do not supersede existing applicable socioeconomic- and public health-related conditions characterized in Sections 3.1, 3.2, 3.7.1, and 3.7.3; rather, such information should be considered simultaneously when characterizing the potential for disproportionate adversity faced by identified environmental justice populations.

3.7.3 Public Health and Safety

Within the 62.5-million-acre management area of BLM WY there are 205,327 existing active well bores of all well types across all land jurisdictions (BLM 2022a). Such a level of development has previously been linked to the following public health and safety–related risks: occasional fire starts; spills of hazardous materials, hydrocarbons, produced water, or hydraulic fracturing fluid (refer to Section 5.3) and corresponding potential contamination of air, soil, or water; exposure to naturally occurring radioactive material (NORM) in drill cuttings or produced water (refer to Section 5.3); traffic congestion and collisions from commercial vehicles and heavy use; infrequent industrial accidents; presence of hydrogen sulfide (H2S); or increased levels of fugitive dust particulate matter equal to or less than 10 microns in diameter [PM10] and particulate matter equal to or less than 2.5 microns in diameter [PM2.5]), other criteria pollutants, VOCs, and hazardous air pollutants (HAPs). Refer to the air quality analysis in Section 3.1.1 for projected levels of criteria pollutants, HAPs, GHG emissions, and VOC and NOX emissions that contribute to ozone (O3) formation, as well as NAAQS.

As further described in Section 3.7.3 and the Air Resources Technical Report (BLM 2022a), future potential development of the nominated lease parcels would result in emissions of air pollutants that can lead to human health effects depending on the level and duration of exposure. The distance that air pollutants can travel depends on a multitude of environmental factors which vary geographically (e.g., climate, topography, land use) and temporally (e.g., time of day, meteorological conditions), making it inexact to predict the spatial extent of potential human health effects associated with future potential development of the lease parcels. In addition, there is no single distance from oil and gas wells that has been accepted across the scientific community as conveying health effects to human populations. However, several studies have found that residents living at varying distances within less than 1.25 miles of active oil and gas wells are at greater risk for experiencing health effects from air pollution than those living beyond 2000 m (Adgate et al. 2014; Czolowski et al. 2017; Haley et al. 2016; Kroepsch et al. 2019). If such residents were to also belong to a population meeting environmental justice criteria, the risk of experiencing health effects from air pollution is further magnified at a disproportionate rate.

HAPs are known or suspected to cause cancer or other serious health effects, such as compromises to immune and reproductive systems, birth defects, developmental disorders, or adverse environmental effects resulting from either chronic (long-term) and/or acute (short-term) exposure, and/or adverse environmental effects. Breathing O3 can trigger a variety of health problems, including coughing and sore or scratchy throat; difficulty breathing deeply and vigorously and pain when taking deep breaths; inflammation and damage to the airways; increased susceptibility to lung infections; aggravation of lung diseases such as asthma, emphysema, and chronic bronchitis; and an increase in the frequency of asthma attacks. Some of these effects have been found even in healthy people, but effects are more serious in people with lung diseases such as asthma. Breathing air with a high concentration of carbon monoxide (CO) reduces the amount of oxygen that can be transported in the blood stream to critical organs like the heart and brain. At very high levels, which are possible indoors or in other enclosed environments, CO can cause dizziness, confusion, unconsciousness, and death. Very high levels of CO are not likely to occur outdoors. However, when CO levels are elevated outdoors, they can be of particular concern for people with some types of heart disease. Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. PM is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. PM is measured and regulated according to particle size. Smaller particles are associated with more negative health effects, including respiratory and cardiovascular problems, because they can become more deeply embedded in the lungs and may even get into the bloodstream (BLM 2022a).

The following links provide additional information on air pollution health effects:

Criteria Pollutants:

- Ozone (https://www.epa.gov/ground-level-ozone-pollution) (EPA 2022a)
- Particulates (https://www.epa.gov/pm-pollution/particulate-matter-pm-basics) (EPA 2022b)
- Nitrogen dioxide (https://www.epa.gov/no2-pollution/basic-information-about-no2) (EPA 2022c)
- Carbon monoxide (https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#Effects) (EPA 2022d)
- Lead (https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution#health) (EPA 2022e)
- Sulfur dioxide (https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects) (EPA 2022f)
- Hazardous air pollutants (https://www.epa.gov/haps/health-effects-notebook-hazardous-air-pollutants) (EPA 2021a)

4 Environmental Consequences

This chapter describes the impacts that may occur upon the implementation of the considered alternatives. This chapter is organized by resource topics, with the impacts of all alternatives combined under each resource and analyzed in terms of direct, indirect, and cumulative effects (40 CFR 1508.1(g)). Any proposed protective requirements determined to be appropriate through analysis in this document would be carried forward as stipulations to an approved authorization. For the analyses below, BLM assumed the average surface disturbance for a single vertical well to be 5 acres. Multiple wells can be centralized on one large pad which reduces the overall surface disturbance. The majority of wells on centralized pads are drilled horizontally and could reach up to two miles from the surface hole locations. For these centralized multi-well pads, BLM assumed an average pad size of 20 acres with 8 horizontal wells on each multi-well location. The majority of new site-specific Applications for Permit to Drill (APDs) submitted in Wyoming fall into this category. If 8 wells are located on a 20 acre well pad, each well would require approximately 2.5 acres of surface disturbance. For both vertical and horizontal well bores, BLM is assuming 40 wells could be drilled and completed for Alternative 2 (Proposed Action) resulting in 100-200 acres of disturbance and 36 wells for Alternative 3 (Modified Proposed Action) resulting in 90-180 acres of disturbance. Over the past five years, the majority (approximately 97%) of the wells drilled have been directional or horizontal from multi-well locations.

4.1 Air Resources

4.1.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, the parcel(s) would not be leased, and no new foreseeable oil and gas development would occur on the subject lease parcels. Although no new GHG emissions from the development of these lease parcels would occur under the No Action Alternative, recent projections indicate that U.S. production levels are expected to remain static or even increase in the short-term.

The most recent short-term energy outlook (STEO) published by the EIA (https://www.eia.gov/outlooks/steo/) (EIA, 2023) predicts that the world's oil and gas supply and consumption will increase over the next 18-24 months. The latest STEO projections are useful for providing context for the No Action discussion as the global forecast models used for the STEO are not dependent on whether the BLM issues onshore leases but are based on foreseeable short-term global supply and demand and include oil and gas development /operations on existing U.S. onshore leases. The most recent STEO includes the following projections for the next two years:

- U.S. liquid fuels consumption is projected to increase to 20.45 million barrels per day (b/d) in 2023 up from 20.28 million b/d in 2022 and further increase to 20.76 million b/d in 2024.
- U.S. crude oil production is expected to average 11.9 million b/d in 2022 and to rise to 12.4 million b/d in 2023 and 12.63 b/d in 2024.
- U.S natural gas consumption is expected to average 86.4 Bcf/d in 2023, decreasing from 88.5 Bcf/d in 2022.
- U.S. LNG exports are expected to increase from 10.59 billion cubic feet/day (Bcf/d) in 2022 to 12.07 Bcf/d in 2023 and 12.73 Bcf/d in 2024.

- U.S. Coal production is expected to total 552 million short tons (MMst) in 2023 and 502.6 MMst in 2024 and decrease to 17% of total U.S. electricity generation in 2023 compared to 20% in 2022 driven by on-going retirement of coal-fired generating plants.
- Generation from renewable sources will make up an increasing share of total U.S. electricity generation, rising from 22% in 2022 to 24% in 2023 and 26% in 2024.

Recent events, both domestically and internationally, have resulted in abrupt changes to the global oil and gas supply. EIA studies and recent U.S. analyses (associated with weather impacts, etc.) regarding short-term domestic supply disruptions and shortages or sudden increases in demand demonstrate that reducing domestic supply (in the near-term under the current supply and demand scenario) will likely lead to the import of more oil and natural gas from other countries, including countries with lower environmental and emission control standards than the United States (EIA, 2021). Recent global supply disruptions have also led to multiple releases from the U.S. Strategic Petroleum Reserve in order to meet consumer demand and curb price surges.

The EIA 2023 Annual Energy Outlook (https://www.eia.gov/outlooks/aeo/) projects energy consumption increases through 2050 as population and economic growth outweighs efficiency gains. As a result, U.S. production of natural gas and petroleum and liquids will rise amid growing demand for exports and industrial uses. U.S. natural gas production increases by 15% from 2022 to 2050. However, renewable energy will be the fastest-growing U.S. energy source through 2050 as electricity generation shifts to using more renewable sources, domestic natural gas consumption for electricity generation is expected to decrease by 2050 relative to 2022. As a result, energy-related CO2 emissions are expected to fall 25% to 38% below 2005 level, depending on economic growth factors. Further discussion of past, present and projected global and state GHG emissions can be found in Chapter 6 of the Annual Report.

Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad" (January 27, 2021), directs the executive branch to establish policies or rules that put the United States on a path to achieve carbon neutrality, economywide, by no later than 2050. This goal is consistent with IPCC's recommendation to reduce net annual global CO emissions between 2020 and 2030 in order to reach carbon neutrality by mid-century. Federal agencies are still in the process of developing policies that align with a goal of carbon neutrality by 2050. In the short-term, the order has a stated goal of reducing economy-wide GHG emissions by 50 to 52% relative to 2005 emissions levels no later than 2030.

Carbon budgets are an estimate of the amount of additional GHGs that could be emitted into the atmosphere over time to reach carbon neutrality while still limiting global temperatures to no more than 1.5°C or 2°C above preindustrial levels. The IPCC Special Report on Global Warming of 1.5ºC is the most widely accepted authority on the development of a carbon budget to meet the goals of the Paris Agreement. None of the global carbon budgets or pledges that countries have committed to stay within as part of the Paris Agreement are binding. Carbon budgets were originally envisioned as being a convenient tool to simplify communication of a complex issue and to assist policymakers considering options for reducing GHG emissions on a national and global scale. Carbon budgets have not yet been established on a national or subnational scale, primarily due to the lack of consensus on how to allocate the global budget to each nation, and as such the global budgets that limit warming to 1.5 ºC or 2.0 ºC are not useful for BLM decision making, particularly at the lease sale stage, as it is unclear what portion of the budget applies to emissions occurring in the United States.

However, stakeholders and members of the public have requested that the BLM consider comparing its predicted emissions in the context of global carbon budgets. Table 7-4 in the 2021 BLM Specialist Report provides an estimate of the potential emissions associated with BLMs fossil fuel authorizations in relation to IPCC carbon budgets. Total Federal fossil fuel authorizations including coal, natural gas and oil represents approximately 1.75 % of a suggested global carbon budget of 400-500 GtCO2 needed to limit global warming to 1.5 C.

While continued fossil fuel authorizations will occur over the next decade to support energy demand and remain in compliance with the leasing mandates in the Inflation Reduction Act (IRA) passed in 2022, the U.S. Energy Information Administration International Energy Outlook expects renewable energy consumption to double between 2020 and 2050 and nearly equal liquid fuels consumption by 2050. The U.S. has committed to the expansion of renewable energy through infrastructure investments in clean energy transmission and grid upgrades include in the

Bipartisan Infrastructure Investment and Jobs Act as well as clean energy investments and incentives included in the Inflation Reduction Act. The Department of Energy's Office of Policy developed a preliminary assessment that finds the IRA and BIL, in combination with past actions, are projected to reduce 2030 economy wide GHG emissions to 40% below 2005 level, even with continued oil and gas leasing in the near term. (https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf).

4.1.2 Alternative 2 – Proposed Action

Any potential effects to air quality from the sale of lease parcels would occur at such time that any issued leases are developed and not at the leasing stage itself. The Proposed Action does not authorize or guarantee the number of wells analyzed herein. If leased, drilling of wells on a lease would not be permitted until the BLM approves an APD. Any APD received would be subject to site-specific NEPA review. However, development assumptions have been made in this EA to better inform the decision maker and the public of potential impacts to air quality if the leases are developed.

There are four general phases of post-lease development that would generate air pollutant emissions: 1) well development (well site construction, well drilling, and well completion), 2) well production operations (extraction, separation, gathering), 3) mid-stream (refining, processing, storage, and transport/distribution), and 3) end-use (combustion or other uses) of the fuels produced. While well development and production operation emissions (phases 1 and 2) occur on-lease and the BLM has program authority over these activities, mid-stream and end-use emissions (phases 3 and 4) typically occur off-lease where the BLM has no program authority.

During well development, there could be emissions from earth-moving equipment, vehicle traffic, drilling, and completion activities. NO2, SO2, and CO would be emitted from vehicle tailpipes. Fugitive dust concentrations would increase with additional vehicle traffic on unpaved roads and from wind erosion in areas of soil disturbance. Drill rig and fracturing engine operations would result mainly in NO2 and CO emissions, with lesser amounts of SO2. These temporary emissions would be short-term during the drilling and completion phases, which is expected to last between 30 to 60 days.

During well production and operations there could be continuous emissions from separators, condensate storage tanks, flares or combustors, and tailpipe and fugitive dust emissions from operations traffic. During the operational phase of a well, NO2, CO, VOC, and HAP emissions would result from the long-term use of storage tanks, pumps, separators, and other equipment. Additionally, dust (PM10 and PM2.5) would be produced by wind erosion on well pads and roads, and by vehicles servicing the wellsite infrastructure.

Emissions were estimated using the BLM Lease Sale Emissions Tool based on the total acreage of the lease parcels and the 5-year average of the number of lease acres held by production divided by the total acres leased. This method results in a greater number of wells per parcel (20 wells for Alternative 2) and correspondingly higher emissions estimates as shown in Table 4-1.

Actual development of individual lease parcels may result in higher or lower emissions for various reasons including differences with geologic formations, proximity to existing support infrastructure, differences in pace of development, different development methods and control technology used by a lessee, and other reasons. A lessee has 10 years to establish production on a lease and if production is not attempted within the 10-year timeframe, the lease will be terminated with no development or emissions occurring.

Table 4-1. Estimated Max Year and Average Year Criteria and Hazardous Air Pollutant Emissions from Development of Alternative 2 Lease Parcels (tons/year)

Activity	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	HAPs
Max Year	292.1	34.5	181.5	110.4	51.3	0.010	29.395
Average Year	188.7	21.6	137.5	45.2	29.9	0.006	22.540

*Applies statistical held-by-production rate and multiplies by the wells per acre

Emissions of criteria air pollutants would also occur outside the impact analysis area from transport, processing, distribution, and end-use of produced oil and gas. Because there are potentially tens to hundreds of thousands of mid-stream and downstream emissions sources, the BLM is not able to quantify air quality and health impacts from these sources. Downstream combustion, whether in stationary facilities and motor vehicles/airplanes are regulated by the EPA, other Federal agencies, or delegated state agencies. This regulatory process is designed to avoid downstream impacts to regional and local air quality.

At the leasing stage it is not possible to accurately estimate potential air quality impacts by modeling due to the variation in emission control technologies as well as construction, drilling, and production technologies applicable to oil versus gas production and utilized by various operators. Should development on the parcels be proposed, and prior to authorizing specific proposed projects on the subject leases, precise emission inventories would need to be developed. Nearfield air quality modeling may also be required depending on the level of development proposed in order to address direct and cumulative impacts and demonstrate compliance with the NAAQS as well as impacts to AQRVs (i.e., deposition, visibility) if development is proposed near Class I areas (some National Parks and Wilderness areas).

4.1.2.1 Greenhouse Gas (GHG) Emissions

While the leasing action does not directly result in development that will generate GHG emissions, emissions from potential future development of the leased parcels are reasonably foreseeable and can be estimated for the purposes of this lease sale. There are four general phases of post-lease development that would generate GHG emissions: 1) well development (well site construction, well drilling, and well completion), 2) well production operations (extraction, separation, gathering), 3) mid-stream (refining, processing, storage, and transport/distribution), and 4) end-use (combustion or other uses) of the fuels produced. While well development and production operation emissions occur on-lease and the BLM has program authority over these activities, mid-stream and end-use emissions typically occur off-lease where the BLM has no program authority.

Emissions inventories at the leasing stage are imprecise due to uncertainties including the type of mineral development (oil, gas, or both), scale, and duration of potential development, types of equipment (drill rig engine tier rating, horsepower, fuel type), and the mitigation measures that a future operator may propose in their development plan. In order to estimate reasonably foreseeable on-lease emissions at the leasing stage, the BLM uses estimated well numbers based on State data for past lease development combined with per-well drilling, development, and operating emissions data from representative wells in the area. The amount of oil or gas that may be produced if the offered parcels are developed is unknown. For purposes of estimating production and end-use emissions, potential wells are assumed to produce oil and gas in similar amounts as existing nearby wells. While the BLM has no authority to direct or regulate the end-use of the products, for this analysis, the BLM assumes all produced oil or gas will be combusted (such as for domestic heating or energy production). The BLM acknowledges that there may be additional sources of GHG emissions along the distribution, storage, and processing chains (commonly referred to as midstream operations) associated with production from the lease parcels. These sources may include emissions of methane (a more potent GHG than CO2 in the short term) from pipeline and equipment leaks, storage, and maintenance activities. These sources of emissions are highly speculative at the leasing stage, therefore, the BLM has chosen to assume that mid-stream emissions associated with lease parcels for this analysis will be similar to the national level emissions identified by the Department of Energy's National Energy Technology Laboratory (NETL, 2009) (NETL, 2019).

The emission estimates calculated for this analysis were generated using the assumptions previously described above using the BLM Lease Sale Emissions Tool. Emissions are presented for each of the four phases of post-lease development described above.

- Well development emissions occur over a short period and may include emissions from heavy equipment and vehicle exhaust, drill rig engines, completion equipment, pipe venting, and well treatments such as hydraulic fracturing
- Well production operations, mid-stream, and end-use emissions occur over the entire production life of a well, which is assumed to be 30 years for this analysis based on the productive life of a typical oil/gas field

- Production emissions may result from storage tank breathing and flashing, truck loading, pump engines, heaters and dehydrators, pneumatic instruments or controls, flaring, fugitives, and vehicle exhaust
- Mid-stream emissions occur from the transport, refining, processing, storage, transmission, and distribution of produced oil and gas. Mid-stream emissions are estimated by multiplying the estimated ultimate recovery (EUR) of produced oil and gas with emissions factors from NETL life cycle analysis of U.S. oil and natural gas. Additional information on emission factors can be found in the Annual GHG report (Chapter 4, Table 4-7 and 4-9)
- For the purposes of this analysis, end-use emissions are calculated assuming all produced oil and gas is combusted for energy use. End-use emissions are estimated by multiplying the EUR of produced oil and gas with emissions factors for combustion established by the EPA (Tables C-1 and C-2 to Subpart C of 40 CFR § 98). Additional information on emission factors and EUR factors can be found in the Annual GHG Report (Chapter 4)

Table 4-2 lists the estimated direct (well development and production operations) and indirect (mid-stream and end-use) GHG emissions in metric tons (tonnes) for the subject leases over the average 30-year production life of the lease.

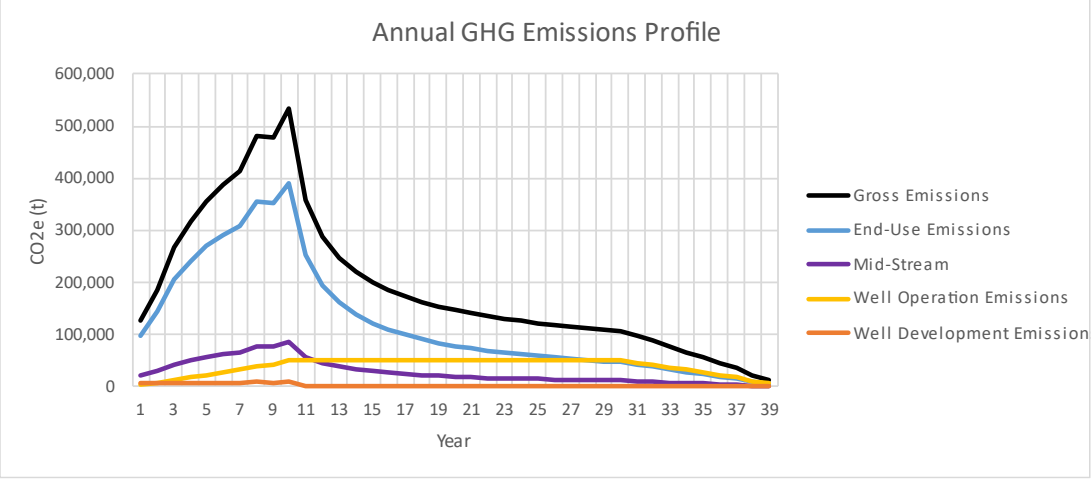
Table 4-2. Alternative 2 (Proposed Action) Estimated Life of Lease Emissions (On-Site) from Well Development and Production Operations (Metric tonnes)

Activity	CO_2	CH_4	N_2O	CO_2e (100-yr)	CO_2e (20-yr)
Well Development	288,080	164.31	2.288	293,601	302,260
Production Operations	4,225,654	59,979.34	8.162	6,015,266	9,176,178
Mid-Stream	3,242,690	38,405.68	46.969	4,400,002	6,423,981
End Use	19,423,586	491.32	72.687	19,458,071	19,483,964
Total	27,180,010	99,040.65	130.106	30,166,940	35,386,382

Source: BLM Lease Sale Emissions Tool

GHG emissions vary annually over the production life of a well due to declining production rates over time. Figure 4-1 Shows the estimated GHG emissions profile over the production life of a typical lease including well development, well production operations, mid-stream, end-use, and gross (total of well development, well production, mid-stream, and end-use) emissions.

Figure 4-1. Alternative 2 (Proposed Action) Estimated Annual GHG Emissions Profile Over the Life of a Lease



Source: BLM Lease Sale Emissions Tool

To put the estimated GHG emissions for this lease sale in a relatable context, potential emissions that could result from development of the lease parcels for this sale can be compared to other common activities that generate GHG emissions and to emissions at the state and national level. The EPA GHG equivalency calculator can be used (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator) to express the potential average year GHG

emissions on a scale relatable to everyday life. For instance, the projected average annual GHG emissions from potential development of the subject lease are equivalent to 40,909 gasoline-fueled passenger vehicles driven for one year, or the emissions that could be avoided by operating 52 wind turbines as an alternative energy source or offset by the carbon sequestration of 225,975 acres of forest land. Table 4-3 compares emission estimates over the 30-year life of the lease compared to the 30-year projected Federal emissions in the state and nation from existing wells, the development of approved APDs, and emissions related to reasonably foreseeable lease actions.

Table 4-3. Alternative 2 (Proposed Action) Comparison of the Life of Lease Emissions to other Federal Oil and Gas Emissions

Reference	Mt CO2e[1] (Per Year)	Life of Lease % of Reference
Lease Sale Emissions (Life of Lease)	7.403	100.000%
WY Reasonably Foreseeable Short-term Federal (O&G)[1]	1,487.65	0.498%
WY EIA Projected Long-term Federal (O&G)[2]	4,028.10	0.184%
U.S. Short-term Federal (O&G)	4,614.81	0.160%
U.S. Long-term Federal (O&G)	13,560.24	0.055%

Source: U.S. and Federal emissions from BLM Lease Sale Emissions Tool and Annual GHG Report Tables 5-17 and 5-18.
[1] Short-term foreseeable is estimated Federal emissions from existing producing wells, approved APDs, and one year of leasing.
[2] Long-term foreseeable are estimated Federal emissions to meet EIA projected energy demand.

Compared to emissions from other existing and foreseeable short-term Federal oil and gas development, the life of lease emissions for the Proposed Action is between 0.184% to 0.498% of Federal fossil fuel authorization emissions in the state and between 0.055% to 0.160% of Federal fossil fuel authorization emissions in the nation (EPA 2022). In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 7.403 MT CO2e over the life of the lease.

As detailed in the Annual GHG Report (BLM, 2022), which BLM has incorporated by reference, the BLM also looked at other tools to inform its analysis, including the MAGICC model (see Section 7.0 of the Annual GHG Report). This model run suggests that "30-plus years of projected federal emissions would raise average global surface temperatures by approximately 0.0158 °C., or 1% of the lower carbon budget temperature target."

4.1.2.2 Monetized Impacts from GHG Emissions

The "social cost of carbon", "social cost of nitrous oxide", and "social cost of methane" – together, the "social cost of greenhouse gases" (SC-GHG) are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year. Such analysis should not be construed to mean a cost determination is necessary to address potential impacts of GHGs associated with specific alternatives. These numbers were monetized; however, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document SC-GHG is provided only as a useful measure of the benefits of GHG emissions reductions to inform agency decision-making. For Federal agencies, the best currently available estimates of the SC-GHG are the interim estimates of the social cost of carbon dioxide (SC-CO2), methane (SC-CH4), and nitrous oxide (SC-N2O) developed by the Interagency Working Group (IWG) on the SC-GHG. Select estimates are published in the Technical Support Document (IWG 2021) and the complete set of annual estimates are available on the Office of Management and Budget's website.

The SC-GHGs associated with estimated emissions from future potential development of the lease parcels are reported in Table 4-4. These estimates represent the present value (from the perspective of 2023) of future market and nonmarket costs associated with CO2, CH4, and N2O emissions from potential well development and operations, and potential end-use, as described in Subsection 1.2.1. Estimates are calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and BLM's estimates of emissions in each year.

They are rounded to the nearest $1,000. The estimates assume development will start in 2023 and end-use emissions complete in 2062, based on experience with previous lease sales.

Table 4-4. Alternative 2 (Proposed Action) Social Cost of GHGs Associated with Development and Operations, all years (2023$)

	Average Value, 5% discount rate	Average Value, 3% discount rate	Average Value, 2.5% discount rate	95th Percentile Value, 3% discount rate
Development and Operations	$22,822,000	$81,296,000	$120,835,000	$238,494,000
End-Use	$88,436,000	$326,990,000	$491,880,000	$986,608,000
Total	$111,258,000	$408,286,000	$612,715,000	$1,225,102,000

Source: BLM Lease Sale SC-GHGs Calculator

4.1.3 Alternative 3 – Modified Proposed Action

4.1.3.1 Greenhouse Gas (GHG) Emissions

The emissions for Alternative 3 are presented in Table 4-5 and are calculated using the same methodology as described for Alternative 2 emissions. Potential GHG emissions from this Alternative could result in GHG emissions of 6.663 Mt CO2e over the life of the lease. Compared to emissions from other existing and foreseeable short-term Federal oil and gas development, the life of lease emissions for the Proposed Action is 0.448% of Federal fossil fuel authorization emissions in the state and 0.144% of Federal fossil fuel authorization emission in the nation. If "long-term" Federal oil and gas development and production remains a constant percentage of EIA projected energy demand, then the estimated emissions from the life of leases in the Proposed Action 0.165% Federal fossil fuel authorization emissions in the state and 0.049% of Federal emissions in the nation over the next 30 years. The projected average annual GHG emissions from expected development following the proposed lease sale are equivalent to 36,818 gasoline-fueled passenger vehicles driven for one year, or the emissions that could be avoided by operating 46 wind turbines as an alternative energy source or offset by the carbon sequestration of 203,377 acres of forest land.

Table 4-5. Alternative 3 (Modified Proposed Action) Estimated Life of Lease Emissions (On-Site) from Well Development and Production Operations (Metric tonnes)

Activity	CO2	CH4	N2O	CO2e (100-yr)	CO2e (20-yr)
Well Development	63,625	36.29	0.505	64,844	66,757
Production Operations	933,273	13,246.97	1.803	1,328,525	2,026,640
Mid-Stream	716,177	8,482.24	10.373	971,780	1,418,793
End Use	4,289,872	108.51	16.054	4,297,488	4,303,207
Total	6,002,947	21,874.01	28.735	6,662,637	7,815,397

Source: BLM Lease Sale Emissions Tool

Emissions were estimated using the BLM Lease Sale Emissions Tool based on the total acreage of the lease parcels and the 5-year average of the number of lease acres held by production divided by the total acres leased. This method results in a greater number of wells per parcel (18 wells for Alternative 3) and correspondingly lower emissions estimates as shown in Table 4-6.

Table 4-6. Estimated Max Year and Average Year Criteria and Hazardous Air Pollutant Emissions from Development of Alternative 3 Lease Parcels (tons/year)

Activity	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	HAPs
Max Year	256.5	30.2	163.0	92.4	44.5	0.009	26.443
Average Year	169.8	19.4	123.8	40.7	26.9	0.005	20.286

*Applies statistical held-by-production rate and multiplies by the wells per acre

Figure 4-2 shows the estimated annual GHG emissions profile for Alternative 3 over the production life of a typical lease including well development, well operation, end-use, and gross (total of well development, well production, and end-use) emissions.

Figure 4-2. Alternative 3 (Modified Proposed Action) Estimated Annual GHG Emissions Profile Over the Life of a Lease

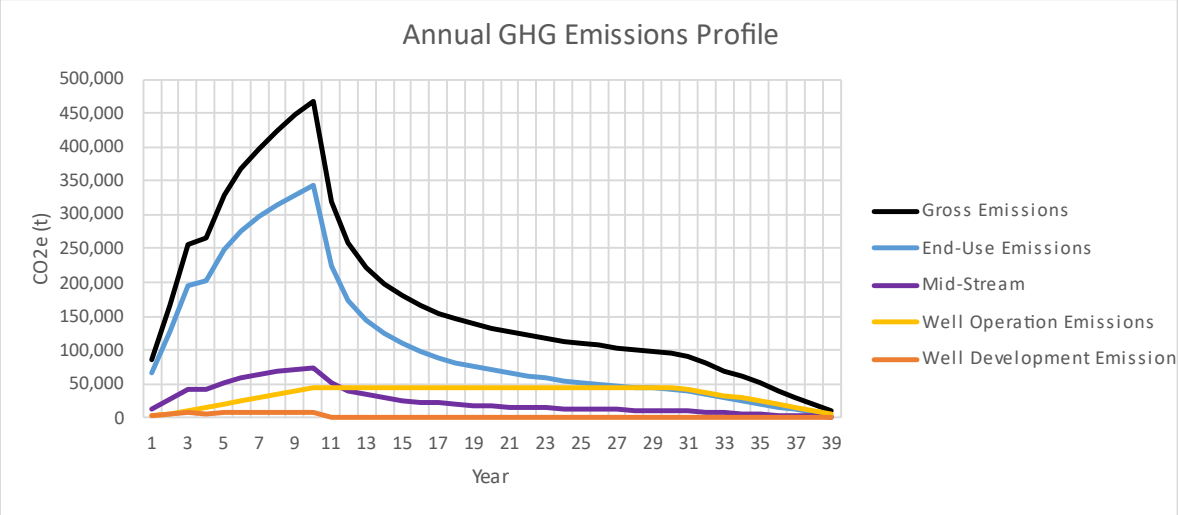


Table 4-7. Comparison of the Life of Lease Emissions to Other Federal Oil and Gas Emissions from Existing Wells, Development of Approved APDs, and Other Leasing Actions in the State and Nation

Reference	Mt CO_2e[1] (Per Year)	Life of Lease % of Reference
Life of Lease	6.663	100.000%
WY Reasonably Foreseeable Short- Term Onshore Federal (O&G)	1,487.65	0.448%
WY Projected Long-Term Onshore Federal (O&G)	4,028.10	0.165%
U.S. Reasonably Foreseeable Short-Term Onshore Federal (O&G)	4,614.81	0.144%
U.S. Projected Long-Term Onshore Federal (O&G)	13,560.24	0.049%
Life of Lease	6.663	100.000%

[1] Foreseeable R=Federal short-term and long-term emissions comer from the BLM Specialist Report on Annual Greenhouse Gas Emissions Tables ES-3, ES-4 and Figure 5-1
[2] Short-term projections are based on existing production, approved permits and potential new leases
[3] Long-term projections are based on the projections from the U.S. Energy Information Administration energy Outlook
Source: U.S. and Federal emissions from BLM Lease Sale Emissions Tool and Annual GHG Report Tables 5-17 and 5-18

4.1.3.2 Monetized Impacts from GHG Emissions

The SC-GHGs associated with estimated emissions from future potential development of the lease parcels under this Alternative are reported in Table 4-8. These SC-GHG estimates are calculated using the same methodology as described for the Proposed Action. SC-GHG estimates displayed in Table 4-8 are slightly less than those displayed for the GHG emissions of Alternative 2, as two fewer parcels would be offered for lease.

Table 4-8. Alternative 3 (Modified Proposed Action) SC-GHGs Associated with Future Potential Development

	Average Value, 5% discount rate	Average Value, 3% discount rate	Average Value, 2.5% discount rate	95th Percentile Value, 3% discount rate
Development and Operations	$20,532,000	$73,155,000	$108,738,000	$214,614,000
End-Use	$79,561,000	$294,241,000	$442,633,000	$887,824,000
Total	$100,093,000	$367,396,000	$551,371,000	$1,102,438,000

Source: BLM Lease Sale SC-GHG Calculator

4.1.4 Cumulative Emissions

The analysis of GHGs contained in this supplemental EA includes estimated emissions from those leases as described above. An assessment of GHG emissions from other BLM fossil fuel authorizations including coal leasing and oil and gas leasing and development is included in the BLM Specialist Report on Annual GHG Emissions (referred to as Annual Report, see Chapter 5). The Annual Report includes estimates of reasonably foreseeable GHG emissions related to BLM lease sales anticipated during the fiscal year, as well as the best estimate of emissions from ongoing production, and development of parcels sold in previous lease sales. It is, therefore, an estimate of cumulative GHG emissions from the BLM fossil fuel leasing program based on actual production and statistical trends.

The Annual Report provides an estimate of short-term and long-term GHG emissions from activities across the BLM's oil and gas program. The short-term methodology presented in the Annual Report includes a trends analysis of (1) leased federal lands that are held-by-production, (2) approved applications for permit to drill (APDs), and (3) leased lands from competitive lease sales occurring over the next annual reporting cycle (12 months), to provide a 30-year projection of potential emissions from Federal oil and gas lease actions over the next 12 months. The long-term methodology uses oil and gas production forecasts from the Energy Information Administration (EIA) to estimate GHG emissions out to 2050 that could occur from past, present, and future development of Federal fluid oil and gas. For both methodologies, the emissions are calculated using life-cycle-assessment emissions and data factors. These analyses are the basis for projecting GHG emissions from lease parcels that are likely to go into production during the analysis period of the Annual Report and represent both a review of GHG emissions from oil and gas leasing and the best available estimate of reasonably foreseeable cumulative emissions related to any one lease sale or set of quarterly lease sales.

Table 4-9 shows the aggregate GHG emissions estimate that would occur from Federal leases, existing and foreseeable, between the years 2022 and 2050, using the methodology described above. The 5-year lease averages include all types of oil and gas leases, including leases granted under the Mineral Leasing Act as well as other authorities, that have been issued over the last five years. As such the projections made from the 5-year averages represent the potential for all types of future oil and gas development activity, and although not at exact acreages, include emissions that would be associated with the subject leases. However, they may also over-estimate the potential emissions from the 12-month cycle of competitive oil and gas leasing activities if the projected lease sale or development activity does not actually occur or is less than estimated.

Table 4-9. Reasonably Foreseeable Projected Emissions from Federal Lease Development

State (BLM Administrative Unit)	GHG Emissions from Past, Present, and Foreseeable Federal Lease Development (Mt CO2e per year)*
Alabama (ES)	9.34
Alaska	136.90
Arkansas (ES)	9.34
California	51.49
Colorado	243.10
Idaho	0.17
Illinois	0.31
Kansas (ES)	3.32

State (BLM Administrative Unit)	GHG Emissions from Past, Present, and Foreseeable Federal Lease Development (Mt CO2e per year)*
Kentucky (ES)	0.19
Louisiana (ES)	43.29
Michigan (ES)	1.95
Mississippi (ES)	2.89
Montana	58.82
Nebraska (WY)	0.21
Nevada	2.74
New Mexico	1,939.52
New York	0.01
North Dakota (MT)	379.63
Ohio (ES)	0.37
Oklahoma (NM)	20.43
Pennsylvania	0.46
South Dakota (MT)	2.31
Texas (NM)	49.55
Utah	187.84
Virginia	0.15
West Virginia (ES)	0.45
Wyoming	1,487.65
Total	4,614.81

*Emissions obtained from 2021 Annual Report, Figure 5-1

Past and present actions that have affected and would likely continue to affect air quality in the analysis areas include surface disturbance resulting from ongoing oil and gas development and associated infrastructure, mining, ranching and livestock grazing, range improvements, recreation (including OHV use), authorization of ROWs for utilities and other uses, and road development. Past and present actions that have affected and would likely continue to affect air quality are too numerous to list but would include the development or conversion of power plants; the development of energy sources such as oil, gas, and coal, solar and wind; and the development of various industries that emit pollutants. These types of actions and activities can reduce air quality through emissions of criteria pollutants (including fugitive dust), VOCs, and HAPs, as well as contribute to deposition impacts and to a reduction in visibility.

Emissions in the oil and gas sector roughly parallel oil and gas production. Future trends in oil and gas production growth for the Rocky Mountain region are used from the U.S. Energy Information Administration (EIA) 2023 Annual Energy Outlook (AEO) (EIA, 2023) to provide an estimate of the change in emissions from oil and gas sources. U.S. production of natural gas and petroleum and liquids is projected to rise by 15% from 2022 to 2050 amid growing demand for exports and industrial uses. Similarly, oil and gas related emissions from existing and foreseeable wells, plus development of lease parcels, are anticipated to rise due to increasing production.

4.1.4.1 Mitigation Measures and Residual Effects

The BLM can mitigate pollutants via lease stipulations and notices and further NEPA actions throughout the leasing and permitting processes. Stipulations and notices would be applied to leases when issued to notify the operator of what would be required (stipulation) and what could potentially be required (notice) at the APD stage. This informs the potential lessee, at the time of bidding on the parcel, of the range of requirements that could be expected when lease rights are exercised. Additional air quality control measures may be warranted and imposed at the APD stage (such as mitigation measures, BMPs, and an air emissions inventory). By applying stipulations and notices, the BLM can further minimize the impact on air quality from development activities. At the APD stage, further conditions of approval (COAs) can be applied based on the environmental analysis for the APD. These control measures would be informed by regional modeling studies or other analysis or changes in regulatory standards. Application of these notices would be sufficient to notify the lease holder of additional air quality control measures

that are necessary to ensure protection and maintenance of the NAAQS. Also, any future development in nonattainment areas would be subject to the conformity process of the Clean Air Act which may require additional mitigation or offsets.

4.1.4.2 Greenhouse Gases and Climate Change

Future development of the lease parcels under consideration could lead to emissions of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), the three most common greenhouse gases associated with oil and gas development. These GHG emissions would be emitted from leased parcels if developed, and from the consumption of any fluid minerals that may be produced. However, the BLM cannot reasonably determine at the leasing stage whether, when, and in what manner a lease would be explored or developed. The uncertainty that exists at the time the BLM offers a lease for sale includes crucial factors that would affect actual GHG emissions and associated impacts, including but not limited to the future feasibility of developing the lease, well density, geological conditions, development type (vertical, directional, or horizontal), hydrocarbon characteristics, specific equipment used during construction, drilling, and production, abandonment operations, product transportation, and potential regulatory changes over the 10-year primary lease term. Actual development on a lease is likely to vary from what is analyzed in this EA and is evaluated through site-specific NEPA analysis when an operator submits an APD or plan of development to the BLM.

For the purposes of this analysis, the BLM has evaluated the potential effects of the proposed leasing action on climate change by estimating and analyzing potential GHG emissions from projected oil and gas development on the parcels proposed for leasing using estimates based on past oil and gas development and available information from existing development within the State.

Further discussion of climate change science and predicted impacts, as well as the reasonably foreseeable and cumulative GHG emissions associated with BLM's oil and gas leasing actions, are included in the BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM, 2022) (hereinafter referred to as the Annual GHG Report). This report presents the estimated emissions of greenhouse gases attributable to development and consumption of fossil fuels produced on lands and mineral estate managed by the BLM. The Annual GHG Report is incorporated by reference as an integral part of this analysis and is available at https://www.blm.gov/content/ghg/2021/.

4.2 Water Resources

4.2.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, the Proposed Action or alternatives would not be authorized and BLM Wyoming would not offer any of the 20 parcels nominated. Ongoing oil and gas development, ranching, recreation, and other activities on BLM-administered lands would continue.

4.2.2 Alternative 2 – Proposed Action

Surface Water Quality and Quantity

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to watersheds. Indirect impacts from future development of a lease may result in long- and short-term alterations to the hydrologic regime depending upon the intensity and context of a specific proposal. Flows of perennial streams, ephemeral, intermittent rivers and streams could be directly affected in the short term by an increase in impervious surfaces resulting from the construction of the well pad and road. An increase in impervious surfaces provides for reduced infiltration which can then cause overland flow to move more quickly causing peak flow to potentially occur earlier, have a higher flow velocity and/or a larger volume then the channels are equipped for. Increased velocity and volume of peak flow can cause bank erosion, channel widening, downward incision, and disconnection from the floodplain. The potential hydrologic effect to low flow is reduced surface storage and groundwater recharge, which can then result in reduced base flow to perennial rivers and/or streams and potentially causing intermittent channels to become ephemeral. The direct impact would be that hydrologic processes may be altered where the perennial, ephemeral, and intermittent

river and stream system responds by changing physical parameters, such as channel configuration. These changes may in turn impact water quality and ultimately the aquatic ecosystem through eutrophication, changes in water temperature, and/or a change in the food structure.

Minor long-term impacts to the watershed and hydrology could continue for the life of surface disturbance from water discharge from roads, road ditches, and well pads, but would decrease once all well pads and road surfacing material has been removed and reclamation of well pads, access roads, pipelines, and powerlines have taken place. Interim reclamation of the portion of the well pad not needed for production operation, re-vegetating the portion of the pad that is not needed for production operations, as well as re-vegetating road ditches and utility corridors would reduce this long-term impact. Short-term impacts to the watershed and hydrology from access roads that are not surfaced with impervious materials would occur and would likely decrease in time due to reclamation efforts.

None of the proposed parcels, based on best available data, contain riparian or wetlands habitat, or perennial water sources. Several of the parcels do contain water wells that are known to provide source water for stock operations or are classified as miscellaneous; miscellaneous wells typically supply groundwater for resource extraction purposes. These water wells, if they are improperly cased and cemented could be at risk from contamination from point or non-point releases should future operations result in fluid releases which migrate into the ground water table. Four parcels are located within one mile of a perennial surface water. These waters could potentially be impacted if there was a large and uncontrolled release of fluids during the drilling, completion or production process. Operators are required to address all waste management operations in their APD. These APDs would be reviewed to ensure that there is also adequate emergency response procedures in place.

Groundwater Quality and Quantity

Groundwater in general, could be affected by multiple factors, including industrial, domestic, or agricultural activities through withdrawal, injection (including chemical injection), or mixing of materials from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in the quality or quantity of the remaining groundwater. Based on an evaluation of statewide groundwater availability, and the total projected number of wells to be drilled/completed on BLM administered lands, adequate water supplies are available and would not result in significant impacts on a regional basis even during drought conditions. Exploration, development, and production of traditional oil and gas resources typically do not significantly deplete ground water on a regional basis but may have a limited, short-duration, near-well bore drawdown around the water supply well depending upon length and intensity of pumping activity. Oil and gas resources are often developed from geological reservoirs that do not contain significant amounts of freshwater with the exception of some CBM developed formations; however, the development and production of oil and gas can affect adjacent or nearby aquifers in the short term. Loss of a permitted source of groundwater supply due to drawdown would be considered a significant impact if it were to occur. The potential for long-term dewatering would be assessed at the development stage should a parcel be offered and a lease issued and subsequent development proposed. The drilling of horizontal wells, versus directional and vertical wells may initially appear to require a greater volume of water for drilling/completion purposes. However, a horizontal well develops a much larger area of the reservoir than a directional and/or vertical well and results in a lesser volume of fluids being required. Water depletions connected hydrologically potentially affecting the Colorado or Platte River drainages may affect T&E aquatic species or their designated critical habitats and would therefore require consultation with USFWS. Applicable point-source discharges would require permits under the National Pollution Discharge Elimination System (NPDES) and approval by the BLM prior to disposal of water produced from federal oil and gas leases; potential impacts would be mitigated at that time.

Several techniques may be used in exploration and development operations to increase or enhance the flow of oil and gas. They include hydraulic fracturing and acid introduction to dissolve the formation matrix and create larger void space(s).

Information contained in Appendix 5.3, Hydraulic Fracturing White Paper, Section III, Potential Impacts to Usable Water zones (Appendix pages 139- 142), is incorporated by reference. The information being incorporated by reference is generally summarized below. Impacts to the quality of groundwater, should they occur, would likely be limited to a near well bore location due to inferred groundwater flow conditions in the area of the parcels and based on studies completed in the Pinedale Anticline. Impacts to near well groundwater could occur from poor casing

and/or cementing practices and the use of potentially hazardous materials within those formations containing freshwater and/or usable water zones.

Potential impacts result from the creation of artificial pathways between oil and gas reservoirs and adjacent aquifers. Modification of ground water flow paths may cause fresh groundwater to contact oil or gas. In addition, improper disposal of waste waters (brine, storm runoff), drilling/completion fluids, and other wastes can impact the quality of underlying ground water (U.S EPA 1987).

A high risk of fluid migration exists along the vertical pathways created by inadequately constructed wells and unplugged inactive wells. Brine or hydrocarbons can migrate to overlying or underlying aquifers in such wells. Since the 1930s, most States have required that multiple barriers be included in well construction and abandonment to prevent migration of injected water, formation fluids, and produced fluids. These barriers include (1) setting surface casing below all known aquifers and cementing the casing to the surface, and (2) extending the casing from the surface to the production or injection interval and cementing the interval. Barriers that can be used to prevent fluid migration in abandoned wells include cement or mechanical plugs. They should be installed (1) at points where the casing has been cut, (2) at the base of the lowermost aquifer, (3) across the surface casing shoe, and (4) at the surface. Individual states, including Wyoming, and the BLM have casing programs for oil and gas wells to limit cross contamination of aquifers. Any proposed drilling/completion activities would have to comply with 43 CFR § 3172, 43 CFR § 3160 regulations, and not result in a violation of a Federal and/or State law. If these conditions were not met, the proposal would be denied. As such, no significant impacts to groundwater from the proposed action are expected.

Information was previously submitted by the public raising concerns with wells in the Powder River Basin that have sections of the well bore that are cased but not cemented ("Tisherman Study"). As background, the Tisherman study states: "The sale of these parcels for further oil and gas development could impact groundwater resources in Wyoming. The BLM Onshore Oil and Gas Order No. 2 states, 'The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones…Determination of casing setting depth shall be based on all relevant factors, including: presence/absence of hydrocarbons; fracture gradients; usable water zones…All indications of usable water shall be reported' (U.S. Bureau of Land Management, 1988). Usable water, according to the BLM Onshore Order No. 2 is 'generally those waters containing up to 10,000 ppm (mg/L) of total dissolved solids (TDS).' It is assumed then that for wells constructed on these proposed parcels: 1) the depth of usable water needs to be known and 2) the constructed wells need to have cemented casing at all depths of usable water."

The stated goal of this study is: 1) identify zones of usable water (TDS < 10,000 mg/L) around the proposed parcels and 2) determine if current federal wells are actively protecting usable water in the same areas.

The study utilized information from the USGS to identify principal aquifers within 3000' of ground surface to identify "usable water" aquifers. This information was then compared with information from well completion reports to the top of cement and bottom of surface casing for active federal well construction logs to assess and determine if the federal wells in their study area are protecting usable water zones near proposed parcel areas in the WY June 2022 lease sale environmental assessment. For each well, the bottom of the surface casing and top of cement was extracted from the well completion report, and the uncemented interval was calculated by taking the difference of these two depths.

The study alleges that "[F]or any well, if a gap exists between the surface casing and top of cement in a usable water zone, the well is endangering groundwater resources. Moreover, if existing wells have been approved by BLM without protecting all usable water zones as required by Onshore Order No. 2, it appears likely that oil and gas wells also will be approved in the future on the proposed lease parcels without requiring them to be constructed to protect groundwater resources."

The study looked specifically at 62 wells in the Powder River Basin. The report concludes that:

- Among these 62 identified wells, 36 have a gap between the bottom of surface casing and the top of cement (Figure 7). The length of these gaps' ranges from 275 to 7,714 ft with an average gap length of 2,653 ft.

The average depth of surface casing in well with gaps is 2,196 ft bls (minimum 444 ft and maximum 3,550 ft). The average depth of top of cement in well with gaps is 4,850 ft bls (minimum 2,060 ft and maximum 9,970 ft).

- These gaps cross usable water zones. Seventeen of the wells have an uncemented gap occurring at less than 3,000 feet below surface (Table 5). This gap is located within the Lower Tertiary principal aquifer, which primarily contains usable water (TDS <10,000 mg/L) (Figures 5 and 7). Therefore, these seventeen wells have a gap in cement and surface casing that is threatening usable water and thus may not be in compliance with Onshore Oil and Gas Order No. 2.

- Nineteen of the wells have an uncemented gap occurring more than 3,000 ft bls (Figure 7). These gaps cross the lower Tertiary and upper Cretaceous aquifers. The lower Tertiary aquifer system may be as thick as 7,180 feet in the Powder River Basin so all but 4 of the wells with gaps could be threatening the usable water in that aquifer.

- Below the lower Tertiary aquifer system is the upper Cretaceous aquifer, which contains the Lance and Fox Hills formations. While this aquifer system is more than 3,000 ft bls, it also contains usable water. Previous studies found that mean TDS levels estimated from oil and gas wells and produced water records found that water from 3,000-7,000 ft bls in the Powder River basin are all below <10,000 mg/L (Table 5) (Taboga et al., 2018). In wells installed between 1,000-6,000 ft bls, 95% had TDS levels <10,000 mg/L, while 83% of wells installed 6,000-7,000 ft bls had TDS levels <10,000 mg/L (Taboga et al., 2018). Thus, the nineteen wells with uncemented gaps occurring more than 3,000 ft bls are likely also in usable water aquifers.

Relevant Federal regulations pertaining to protection of freshwater and usable water zones include:

- 43 CFR 3162.5-2(d) requires: The operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less of dissolved solids and other mineral-bearing formations and protect them from contamination.

- Onshore Order #2 was codified at 43 CFR 3170 and all subparts. 43 CFR 3172.5 defines usable water as: generally those waters containing up to 10,000 parts per million (ppm) of total dissolved solids.

- 43 CFR 3172.7(a) requires that: The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use.

- 43 CFR 3172.7(b)(1) requires that all casing, except the conductor casing, shall be new or reconditioned and tested casing and (b)(8) requires that all casing strings are tested to a sufficient pressure after they are set and cemented.

While the regulations at 43 CFR 3172.7(a) require usable water zones to be protected and/or isolated, this provision works in concert with the requirement to isolate other identified resources or formation conditions. The goal of casing and cementing is to protect the wellbore from potentially harmful downhole conditions, allow for safe drilling and production operations, protect other potentially valuable mineral deposits from produced fluids and/or gases, and to ensure that produced fluids are not allowed to enter non-producing formations – including those containing usable water. Adequate casing and cementing of the production formation isolates other formations along the well bore from mixing production fluids with other formation fluids. Relatedly, surface casing is cased and cemented to protect freshwater supplies, and to assist in wellbore integrity; surface deposits tend to be unconsolidated or contain soft and more porous geologic materials a.

While the Tisherman study alleges that uncemented sections of a wellbore are not protective of usable water zones in violation of Onshore Order #2 (43 CFR 3172), where uncemented sections of a well bore are approved at the APD stage, it is because during the geological and engineering review it was determined that cement is not necessary to inhibit fluid flow and mixing between those zones and the deeper production zone that contains hydrocarbons and/or

saline water (or helium in the case of Montana). It may also be true that although a certain interval may contain usable water, there is no active flow of fluids in that section, or the usable water interval is not prevalent throughout the formation. Lack of fluid flow generally does not require cementing for isolation purposes. See Flow-Zone-Isolation, API Standard 65- Part 2 (2010) at page 21. The surface casing depth is chosen to find a competent formation with a fracture gradient in excess of known pore pressures in deeper horizons. This allows the operator to increase mud weight to safely continue drilling to the next casing point. Once the secondary casing point is reached, another casing string will be run into the hole. Where casing and cementing plans include a proposal to leave a section cased but not cemented, the BLM considers the following during geologic review: formation fluids (including water), confining layers, minerals, pressures, and temperatures. In many cases, it is not necessary to cement the secondary casing back to the surface in order to provide the required level of isolation. See API recommended Practice 100-1: 5.4.2. As part of the geologic evaluation, formation properties such as porosity, permeability, water salinity, fracture gradient, and pore pressure are considered as part of the review process. The goal is to ensure that the drilling plan has appropriately placed the casing points in competent formations, and determine which zones are acceptable to allow to remain open behind the casing string. The uncemented casing string allows the operator to reenter the wellbore and reclaim large portions of pipe when the well is eventually plugged.

BLM further protects usable water zones by ensuring that compatible drilling fluids are used (i.e. not allowing the use of oil-based mud in zones that are identified as having freshwater or usable water zones).

If the proposed parcels are leased, and the lessee submits an APD, the proposed well-bore and site-specific casing, cementing and mud program will be reviewed, and the proposal's adequacy in protecting and/or isolating usable will be determined at that time, as part of the APD review process. The operator is given the opportunity to correct any deficiencies that are found prior to review of the APD; if the operator cannot correct the deficiency(s) in accordance with Onshore Order No 2 (codified at 43 CFR 3172), the APD will be denied.

In accordance with 43 CFR 3162 and Onshore Order #1, the APD drilling plan must include site specific information including geologic formations, casing weights and grades, casing depths, casing conditions, cement properties, cement volumes, expected pore pressures, planned mud weights and types, blowout prevention, and all testing that will be performed. The engineering and geologic review compares this data against existing well information to ensure usable water zones are isolated from potential hydrocarbons and saline waters. Isolated in this instance, does not necessarily mean the zone will be cemented behind pipe for the aforementioned reasons. Uncemented but cased zones are still isolated as long as there is sufficient cement above and below the zone in the annular space of the wellbore. Casing is also a valid means of isolating formations when the bottom of the casing is cemented.

While some target formations for production may contain "usable waters" (less than 10,000 TDS), production from that target formation is going to be authorized consistent with lease rights granted, assuming the APD is compliant with regulation. If an application is submitted that would produce from a formation that contains usable water and is an underground source of drinking water, additional development restrictions may be necessary including the use of non-toxic drilling and completion fluids (such as in the case of coal bed methane where the wells are drilled and completed with freshwater). Before BLM could grant an APD, review of the drilling plan would have to confirm that those specific resources would be protected. As to the wells identified in the Tisherman Study, BLM is unaware that any impacts to usable water zones have been reported. The State of Wyoming Oil and Gas Conservation Commission requires pre and post water quality testing. Specifically, Chapter. 3: Operational Rules, Drilling Rules: Section 46. Groundwater Baseline Sampling, Analysis and Monitoring, Part (a) states, "All operators are required to submit a groundwater baseline sampling, analysis and monitoring plan with an Application for Permit to Drill or Deepen a Well (Form 1). The groundwater monitoring program will consist of initial baseline water sampling and testing followed by a series of subsequent sampling and testing after setting the production casing or liner. This Rule will not apply to an existing oil or gas well that is converted to an injection well for enhanced recovery or disposal purposes." In general, the potential for negative impacts to groundwater caused from completion activities such as hydraulic fracturing, have not been confirmed but based on its history of use are not likely. A recent study completed on the Pinedale Anticline did not find a direct link to known detections of petroleum hydrocarbons to the hydraulic fracturing process. Groundwater contamination investigations have also been conducted at the Pavillion gas field and according to a November 7, 2016, fact sheet from the Wyoming Department of Environmental Quality, it is

unlikely that the hydraulic fracturing activities have caused impacts to water supply wells (https://deq.wyoming.gov/water-quality/groundwater/investigations/pavillion-area-investigation/#1814069153).

The results from the November 2016 study were affirmed in the December 23, 2019, Final Pavillion, Wyoming Gas Field Domestic Water Wells Report on Recommendations for Further Investigation (https://deq.wyoming.gov/water-quality/groundwater/investigations/pavillion-area-investigation/). The 2019 report considered findings in a publication by DiGuilio and Jackson which posited that hydraulic fracturing may have been the source of detected organic compounds. Adequate isolation of zones containing usable water from the production zone(s), is confirmed through the use of completion reports and well logs. Where adequate isolation is not confirmed, remedial measures will be required.

For the parcels included in this lease sale, based on existing well production in the area, future wells are not expected to produce from zones that contain usable water zones and are being used as a source of drinking water or supporting agriculture. Without a discrete development proposal, a finer level of analysis cannot be completed.

Assuming 40 wells would be developed under the lease sale RFD, based on a maximum of 3 million gallons per well completion job, total water needs is estimated to be approximately 120 million gallons. According to the water availability information contained in the Hydraulic Fracturing white paper, adequate water supplies are available to support future development. The exact source of water and groundwater availability will be further reviewed at the time an APD is submitted. The BLM encourages the use of recycled water for completion operations when possible, rather than relying on freshwater sources for oil and gas extraction.

Monitoring and Mitigation

Underground waste disposal is regulated under the Underground Injection Control (UIC) program, which was authorized under the Safe Drinking Water Act. If a drilling/completion proposal is found to not be protective of usable water zones, as required by 43 CFR § 3162.5-2(d) and 3172, the proposal could be denied by the BLM. Requirements for groundwater monitoring have been instituted throughout Wyoming by the WOGCC. This monitoring will add a level of certainty regarding the impacts of oil and gas drilling/completion activities on groundwater in Wyoming.

The use of practices such as, but not limited to, closed-loop mud systems or lined reserve pits would reduce or eliminate seepage of waste fluids into the soil from eventually reaching groundwater. The casing and cementing requirements imposed on proposed wells would reduce or eliminate the potential for groundwater contamination from drilling/completion/production fluids and other surface sources. Additionally, the use of closed-loop or semi-closed loop drilling systems may be required by the BLM (see BLM-Wyoming Instruction Memorandum WY-2012-007, “Management of Oil and Gas Exploration and Production Pits”).

Stormwater Pollution Prevention Plans (SWPPs) are required by the State of Wyoming before any surface disturbance associated with construction actions greater than one acre in size. Prior to authorization of surface disturbance on a lease, the BLM will require a Surface Use Plan of Operations be submitted to the BLM; the BLM authorized officer may require additional erosion control measures to reduce the volume of surface runoff and subsequent sediment transport. Upon abandonment of the wells and/or when access roads are no longer in service, the BLM will require surface reclamation of the disturbed areas as described in Standard Lease Term No. 6 and in accordance with the approved APD or Sundry Notice.

All parcels are subject to Standard Lease Notice No. 1 which requires at a minimum 500’ offset from perennial surface waters. Site-specific analysis could require a greater offset requirement if site-specific impact analysis finds that it is warranted. Several parcels also contain specific stipulations for water resources (see Appendix 5.1).

4.2.3 Alternative 3 – Modified Proposed Action

Under implementation of Alternative 3 impacts would be similar to those described for Alternative 2. Two fewer parcels would be offered (leaving 10,155.33 acres for the remaining 18 parcels) resulting in a reduction of potential impacts to groundwater resource supply from well development. The two parcels not being offered under this

alternative would also result in likely fewer overall impacts to surface water from surface disturbance and well development.

4.2.4 Cumulative Impacts

Surface disturbance from ongoing oil and gas development, residential development, farming, ranching, and recreational activities would continue to result in disturbances to water resources. The act of leasing would have negligible impacts to water resources. Alternatives 2 and 3 are not expected to have foreseeable impacts to water resources or contribute to trends in the area that may impact water resources. Based on information contained in the Hydraulic Fracturing White Paper, adequate water supply to support well development exists in the state.

4.3 Greater Sage-Grouse

4.3.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, the Proposed Action or alternatives would not be authorized, and BLM Wyoming would not offer any of the 20 parcels nominated. Ongoing oil and gas development, ranching, recreation, and other activities on BLM-administered lands would continue.

4.3.2 Alternative 2 – Proposed Action

Under Alternative 2, the field office staff reviewed the potential parcels and recommended which lands need to be removed from further consideration (e.g. lands unavailable for lease due to RMP decisions) and which leasing stipulations to apply based on RMP decisions. The District Offices sent a compiled list back to the WSO. The WSO received input from the WGFD regarding habitats or populations that may be impacted by the lease and used that information to verify the appropriate stipulations were attached to each parcel. Under Alternative 2 all 20 parcels would be available for lease.

As stated in the beginning of Chapter 4, Environmental Consequences, BLM is assuming 40 wells would be drilled in Alternative 2. Overall surface disturbance for these 40 wells could range between 90-200 acres depending if these were all vertical wells (each with an average of 5 acres of disturbance per well pad) or directional/horizontal wells (each with an average of 2.5 acres of disturbance per well pad). At most, BLM estimates there would be approximately 200 acres of sage-grouse habitat loss from these 40 wells.

Responses of individual birds and populations, coupled with variability in land-use patterns and habitat conditions, contribute to variability in the response of sage-grouse to development (Manier et al. 2014). As in Section 3.4, Table 3-25 (which identifies which parcels are within a specific distance of a lek), BLM identified which parcels are within 2 miles and 3.1 miles of PHMA using the minimum buffer distance in published research (Manier et al. 2014) along with the 2-mile timing limitation stipulation described in the ARMPA and the Wyoming Governor's Executive Order 2019-03.

Table 4-10. Parcels Near PHMA Habitat

WY-2024-06-Parcel Num.	Habitat Type (Section 3.4, Table 3-24)	Within 3.1 miles of PHMA	Within 2 miles of PHMA	Prox. to Restoration Area	Connect	Existing Develop (within 5 miles)	Comment	Recommend
1770	GHMA	X	X	-	-	X	HWY 135 runs through parcel	Lease

WY-2024-06-Parcel Num.	Habitat Type (Section 3.4, Table 3-24)	Within 3.1 miles of PHMA	Within 2 miles of PHMA	Prox. to Restoration Area	Connect	Existing Develop (within 5 miles)	Comment	Recommend
1771	GHMA	X	X	-	-	X	Within 1 mile of HWY 135	Lease
1786	GHMA	-	-	-	-	X	Within highly developed area	Lease
1823	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1824	PHMA	X	X	-	-	X	Within PHMA, habitat trigger tripped	Lease
1825	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1828	GHMA	X	X	-	-	X	Over 1 mile from existing infrastructure, could negatively influence GSG habitat	Lease
1829	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1832	GHMA	X	X	-	-	X	Within I mile of HWY 20/26	Lease
1833	GHMA	X	X	-	-	X	Within highly developed area	Lease

WY-2024-06-Parcel Num.	Habitat Type (Section 3.4, Table 3-24)	Within 3.1 miles of PHMA	Within 2 miles of PHMA	Prox. to Restoration Area	Connect	Existing Develop (within 5 miles)	Comment	Recommend
1834	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1835	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1836	GHMA	X	X	-	-	X	Within 1 mile of existing development, natural area limits utility of habitat use by GSG	Lease
1837	GHMA	X	X	-	-	X	Within 1 mile of HWY 135	Lease
1838	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1840	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
1841	GHMA	X	X	-	-	X	Non-contiguous parcel; Northern portion over 1 mile from infrastructure; Southern portion within 1 mile of existing development	Lease

WY-2024-06-Parcel Num.	Habitat Type (Section 3.4, Table 3-24)	Within 3.1 miles of PHMA	Within 2 miles of PHMA	Prox. to Restoration Area	Connect	Existing Develop (within 5 miles)	Comment	Recommend
7294	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease
7295	PHMA	X	X	-	-	X	Partially within PHMA, habitat trigger tripped and genetic corridor; within 1 mile of high density development and HWY 20/26	Lease
7296	GHMA	-	-	-	-	X	Development would not influence high value GSG habitat	Lease

It is reasonable to assume that leks within 3.1 miles of a well could experience negative impacts (NTT 2011) and that impacts as measured by the number of males attending leks are most severe near the lek, remain discernible out to >4 miles. This information suggests that the development of 15 parcels that are within 4 miles of a lek could negatively impact GRSG populations, with development of 5 of those parcels that are within 2 miles of a lek potentially having substantial impact, including the potential for resulting in the abandonment of those leks (see Section 3.4, Table 3-25). Habitats in PHMA have been identified by the BLM and the State as being the most important for maintaining sage-grouse populations statewide. Parcel WY-2024-06-1824 is located within PHMA. In this particular PHMA, a habitat trigger has been tripped (in other words, the loss of sage-grouse habitat in this PHMA is higher than expected given statewide variability in habitat loss and average habitat loss in the other PHMAs in the State as described in Appendix D of the ARMPA, suggesting that further loss of habitat in this area could further impact sage-grouse populations). A Causative Factor Analysis for this trigger has not been completed. Impacts from leasing this parcel and authorizing future development without the CFA being completed could result in more severe impacts to populations at the local and statewide levels.

Direct and indirect impacts could be observed to PHMA by developing the identified parcels. For example, habitat loss and degradation from construction of a well pad and associated infrastructure (when and if the BLM receives a site-specific development proposal), vehicle collisions, or the potential for increased predation which could lead to localized population declines. Male sage-grouse could be displaced away from traditional leks near development to less suitable lek location to avoid noise, traffic, habitat fragmentation, and other human disturbance. Female grouse may be displaced from highly desirable nesting and brood-rearing habitats into less desirable habitats for the same reasons as male displacement.

Some of these impacts are reduced during the construction and drilling phases by implementing the appropriate timing, and/or surface use stipulations (see Appendices 5.1 and 5.2). However, these direct and indirect impacts could remain once a well is producing oil and/or gas. These impacts would remain until the well is plugged and the location is reclaimed. Based upon nesting habitat requirements, impacts could be observed 20-50 years after a well pad is reclaimed depending on site-specific factors (i.e. soil type, precipitation, etc.). All leases authorized in PHMA are subject to a Controlled Surface Use Stipulation that mandates specific disturbance and density restrictions. If these disturbance and density restrictions are exceeded at the time an APD is submitted, the APD would be denied. While development in GHMA does not have the same CSU stipulation, the BLM may, based on site specific analysis expand the size of the Timing Limitation Stipulation beyond 2 miles. Further, in both PHMA and GHMA, BLM may if determined necessary through site-specific analysis, control production and maintenance operations if unanticipated impacts are foreseeable.

The majority of the new wells drilled within the past five years are horizontal or directional. As an example, parcel 1833 is located west-southwest of Pinedale. This parcel is almost completely encumbered by existing industrial development (i.e. lumber mill, storage rental units, a propane supplier, etc.). After reviewing aerial photography, the BLM would assume access to the minerals would be through directional or horizontal drilling from an existing, nearby well pad. Using this type of scenario (horizontal or directional) direct impacts from habitat loss would be minimized (200 acres of direct habitat loss for vertical wells compared to 100 acres for directional or horizontal wells). However, there could still be direct loss of individuals from the population due to vehicle collisions or from potential increased predation. Indirect impacts would be similar to those described above.

4.3.3 Alternative 3 – Modified Proposed Action

Under Alternative 3, the field office staff reviewed the potential parcels and recommended which lands need to be removed from further consideration (e.g. lands unavailable for lease due to RMP decisions); which lands need to be deferred (potential conflicts that may have arisen); and which leasing stipulations to apply based on RMP decisions. The District Offices sent a compiled list back to the WSO. The WSO received input from the WGFD regarding habitats or populations that may be impacted by the lease and used that information to verify the appropriate stipulations were attached to each parcel. BLM Wyoming also reviewed/evaluated the parcels based on the criteria outlined in IM 2023-007. The State Director (SD) and the District Managers (DMs) coordinated and discussed the results from all reviews and parcel recommendations. The SD concurred on which potential parcels, or portions of parcels, move forward for analysis and inclusion in Alternative 3.

Using the prioritization screening process (outlined in Appendix 5.5), the WY BLM Resource Policy and Management division (WY930) reviewed the two PHMA parcels nominated for the 2024 Second Quarter lease sale and recommends that one of these parcels (WY-2024-06-1824) be deferred. The recommendation is based on: the nominated parcel is situated in PHMA (core area) with a tripped habitat trigger (the Thunder Basin core area exceeded both habitat triggers as described in Appendix 5.5 in 2021), the nominated parcel is not influenced by existing anthropogenic development, and the nominated parcel is located in important nesting/early brood-rearing habitats for 3 PHMA leks (2 occupied and 1 unoccupied). Although the other nominated parcel (WY-2024-06-7295) is situated partially in PHMA with tripped population and habitat triggers and in a genetic connectivity corridor, only the edge of the parcel is in PHMA (most of the parcel is in GHMA). The parcel is also generally co-located with existing disturbance as it is situated within 1 mile of substantial high density anthropogenic development and US

Highway 26. While BLM would strive to locate new disturbance if proposed, in GHMA, indirect impacts to sage grouse in PHMA are discussed in section 4.3.2 (see Alternative 2, page 80).

WY-2024-06-Parcel Num.	Status	Core Area	Population Trigger[1]	Habitat Trigger[1]	Prox. To Restoration Area	LHS Status[2]	Connect[3]	Existing Develop[4]	Recommend
1824	PHMA	Thunder Basin	N	Y	N	Unevaluated	N	N	Defer
7295	PHMA	Greater South Pass	Y	Y	N	N/A	Y	Y	Lease

[1] 2021 adaptive management analysis considered; 2022 data unavailable
[2] If one or more of the allotments overlapping the parcel did not meet LHS, the nominated parcel did not meet LHS
[3] Established as areas identified as the top 10% cumulative connectivity as estimated by Cross et al. (2023; reference Fig. 4; Royal Society Open Science 10:220437)
[4] Established from 2019 NAIP imagery

Table 4-10. Parcel evaluation and recommendation:

WY-2024-06-Parcel Num.	**Law or Reg. (i.e. drainage) (P3)**	**Unit (P3)**	**Existing EIS or MLP (P3)**	**Area of High Development Potential (P3)**	**Adjacent to Existing Lease (P3)**	**Area of Prioritized Restoration Project (P4)**	**Land Health Standards (P4)**	**No Criteria Met (P4)**	**Adaptive Mgmt. Metrics (P5)**	**Initial Recommendation to SD**
1770	-	X	-	X	X	-	-	-	-	Lease-
1771	-	-	-	X	X	-	-	-	-	Lease-
1786	-	-	-	X	X	-	-	-	-	Defer-Active Coal Lease
1823	-	-	-	X	-	-	-	-	-	Lease-
1824	-	X	X	X	X	-	-	-	X	Defer-GSG Prioritization
1825	-	X	-	X	X	-	-	-	-	Lease-
1828	-	-	-	X	-	-	-	-	-	Lease-
1829	-	-	-	X	X	-	-	-	-	Lease-
1832	-	-	-	X	X	-	-	-	-	Lease-
1833	-	-	-	X	X	-	-	-	-	Lease-
1834	-	-	-	X	X	-	-	-	-	Lease-
1835	-	X	-	X	X	-	-	-	-	Lease-
1836	-	X	-	X	X	-	-	-	-	Lease-
1837	-	-	-	X	X	-	-	-	-	Lease-
1838	-	-	-	X	X	-	-	-	-	Lease-
1840	-	-	-	X	X	-	-	-	-	Lease-
1841	-	-	-	X	X	-	-	-	-	Lease-
7294	-	-	-	X	X	-	-	-	-	Lease-
7295	-	-	X	X	-	-	-	-	-	Lease-
7296	-	-	-	X	X	-	-	-	-	Lease-

Deferral of one parcel due to GSG prioritization (WY-2024-06-1824) would reduce impacts to sage-grouse and their habitat within the Thunder Basin PHMA. There would potentially be between 5 and 10 fewer acres of potential disturbance and habitat loss (horizontal compared to vertical drilling, assuming 2 wells could be drilled for this

parcel), in addition to a reduction in noise and collisions with vehicles. Deferral of WY-2024-06-1786, which is already disturbed by an active coal mine, could also have a positive impact on sage-grouse. Development of the fluid minerals for this parcel would most likely be from an off-lease location and accessed by horizontally drilling a well. Deferral would reduce any off-lease habitat disturbance associated with development of the lease, similar to parcel 1824. All other impacts would be similar to those described in Alternative 2.

4.3.4 Cumulative Impacts

Due to the uncertainties from a lease development standpoint, it is difficult to predict exactly what impacts may occur. However, impacts from development of the Reasonably Foreseeable Development Scenario contemplated in the ARMPAs, such as the anticipated noise, permanent and temporary facilities, and traffic, are discussed in the individual field office RMP, the 2015 ARPMA, and above.

To minimize impacts, all parcels offered in this sale include Standard Lease Notice 3 (see Appendix 5.1). Standard Lease Notice 3 indicates that an operator may be required to implement specific measures to reduce impacts of oil and gas operations on the Greater sage-grouse populations and habitat quality (see Appendix 5.2 for exact language). Such measures shall be developed during the Application for Permit to Drill (APD) on-site and environmental review process. In addition, individual lease stipulations if a lek is located within a certain distance (e.g. Timing Limitation Stipulations [TLS]) or if a lek is located within the parcel itself (e.g. CSU or NSO) are attached to specific parcels as appropriate.

There are approximately 15,854,692 acres of PHMA in the State of Wyoming, which is equivalent to the areas identified as Core Areas under the Governor's Executive Order. The new leasing rights would be subject to timing limitation stipulations (TLS), and no surface occupancy (NSO) stipulations for sage-grouse leks and habitat (as appropriate) within Greater Sage-Grouse habitats. Using the maximum amount of acres that could be disturbed, 200 acres under Alternative 2 and 180 under Alternative 3, there could be an overall reduction in habitat of 0.0012% or 0.0011% statewide from approval of Alternative 2 or 3. Impacts beyond those analyzed in the underlying RMP FEIS' and the ARMPA FEIS, are not expected due to the continual expiration of existing federal leases whether because they lack production in paying quantities or are never explored. Additional coordination with WGFD will occur for all projects proposed in Greater Sage-Grouse habitats as determined necessary, and in accordance with the BLM-WGFD interagency MOU.

4.4 Big Game

4.4.1 Alternative 1 – No Action Alternative

Under Alternative 1, none of the parcels would be offered and impacts would be similar to those described in each FO RMPs.

4.4.2 Alternative 2 – Proposed Action

Of the parcels evaluated in Alternative 2, two parcels (approximately 280 acres) fall within designated mule deer crucial winter range (CWR); four parcels (approximately 837.97 acres) contain designated pronghorn crucial winter range; and none of the parcels designated intersect elk crucial winter range or managed parturition habitat. None of the nominated parcels are within elk feed grounds.

Table 4-11. Alternative 2 (Proposed Action) Mule Deer Crucial Winter Range and Migration Corridors

Parcel Number (WY-2024-06-)	Acres	Pronghorn (PH) CWR Acres	Mule Deer (MD) CWR Acres	Elk CWR Acres	Migration Corridor	Migration (High Use Acres)	Migration (Stopover Acres	Recom-mendation
1770	2,000.00	-	-	-	-	-	-	Lease
1771	400.00	-	-	-	-	-	-	Lease
1786	375.22	-	-	-	-	-	-	Lease

Parcel Number (WY-2024-06-)	Acres	Pronghorn (PH) CWR Acres	Mule Deer (MD) CWR Acres	Elk CWR Acres	Migration Corridor	Migration (High Use Acres)	Migration (Stopover Acres	Recom-mendation
1823	40.00	-	-	-	-	-	-	Lease
1824	720.00	-	-	-	-	-	-	Lease
1825	1,330.03	-	-	-	-	-	-	Lease
1828	320.00	0.08	-	-	-	-	-	Lease
1829	855.68	-	-	-	-	-	-	Lease
1832	501.84	-	-	-	-	-	-	Lease
1833	72.20	72.20	72.20	-	-	-	-	Lease
1834	1,585.33	585.90	207.80	-	-	-	-	Lease
1835	1,117.30	-	-	-	-	-	-	Lease
1836	40.00	-	-	-	-	-	-	Lease
1837	40.00	-	-	-	-	-	-	Lease
1838	400.00	-	-	-	-	-	-	Lease
1840	640.00	98.51	-	-	-	-	-	Lease
1841	480.00	81.27	-	-	-	-	-	Lease
7294	238.86	-	-	-	-	-	-	Lease
7295	59.76	-	-	-	-	-	-	Lease
7296	34.33	-	-	-	-	-	-	Lease
Total	11,250.55	834.96	280.00	-	-	-	-	

As discussed in section 4, under the Alternative 2, the BLM is assuming 100-200 acres of surface disturbance resulting in big game habitat loss. Oil and gas related disturbance can result in wildlife populations shifting their foraging or reproductive behaviors from utilizing high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations." (ARMPA, 4-426) Over utilization can occur as a result, further limiting the productive nature of the land and sustaining the population at hand. The effects can be more pronounced when additional restrictions on access occurs either through fences or other man-made intrusions, other land uses are competing for the same range resources, or when conditions, such as drought or other climatic occurrences, affect growth and/or vegetation regeneration rates, including fire (Rawlins RMP 4-455, 4-456).

Information regarding impacts expected from development to big game and big game habitats, including Crucial Winter Range and Migration, can be found in the respective offices' RMP. Migration of big game were specific issues raised by the public and addressed in the Pinedale and Rawlins RMP EIS development process. Migration was also a specific consideration in the Green River RMP EIS.

Offering parcels in Mule Deer, Pronghorn or Elk CWR is not expected to result in new impacts beyond those identified in the base RMPs cited above. Development on these parcels could contribute to additional habitat fragmentation, activity, and noise; depending upon the proposal and status of existing development if/where present, and the level of activity. Introduction of weeds, invasive or noxious vegetation, or invasive annuals, can result in establishment of populations. These new species or populations can outcompete native vegetation, degrading the quality of big game habitat up to decreasing the carrying capacity of the land, which can then cause loss of genetic viability if sustained over long periods of time.

Development of parcels located in big game habitats can result in negative impacts. Whether occurring in a movement corridor or in other seasonal habitats, oil and gas related disturbance can result in wildlife populations shifting their foraging or reproductive behaviors from utilizing high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations." (ARMPA, 4-426) Over utilization can occur as a result, further limiting the productive nature of the land and sustaining the population at hand. The effects can be more pronounced when additional restrictions on access occurs either through fences or other man-made intrusions, other land uses are

competing for the same range resources, or when conditions, such as drought or other climatic occurrences, affect growth and/or vegetation regeneration rates, including fire (Rawlins RMP 4-455, 4-456).

While multiple, overlapping timing stipulations can provide benefit to wildlife resources by preventing sustained disruptive activity, the Pinedale RMP FEIS, p 4-60 (2006), also notes "[W]hen areas with greater sage-grouse nesting restrictions overlap areas with big game crucial winter range restrictions, the oil and gas operator would potentially be restricted to a 3-and-a-half-month construction, drilling, and well completion season. This short drilling and development window in areas such as the Pinedale Anticline has led to accelerated operations, which results in congested traffic on primary access roads and a potential overload on local service and emergency resources. It also causes a yearly bust-and-boom cycle for the local communities as crews move in during the open development window then leave when the seasonal restrictions are invoked." This situation can be exacerbated when lease development is further reduced by other seasonal restrictions, including those for raptors.

Direct and indirect impacts to big game could remain once a well is producing oil and/or gas. These impacts would remain until vegetation is established after the well is plugged and the location is reclaimed. Based on habitat requirements, impacts could be observed 20-50 years after a well pad is reclaimed depending on site-specific factors (i.e. soil type, precipitation, etc.).

4.4.3 Alternative 3 – Modified Proposed Action

The parcels and acres of big game crucial winter range habitat are identical between Alternative 2 and 3. The difference between the two alternatives is the deferral of one parcel due to sage-grouse prioritization and the other for an active coal lease. Neither of these proposed parcels contains designated big game crucial winter range habitat but likely contain seasonal habitat.

Table 4-12. Alternative 3 (Modified Proposed Action) Mule Deer Crucial Winter Range and Migration Corridors

Parcel Number (WY-2024-06-)	Acres	Pronghorn (PH) CWR Acres	Mule Deer (MD) CWR Acres	Elk CWR Acres	Migration Corridor	Migration (High Use Acres)	Migration (Stopover Acres	Recom-mendation
1770	2,000.00	-	-	-	-	-	-	Lease-
1771	400.00	-	-	-	-	-	-	Lease-
1786	375.22	-	-	-	-	-	-	Defer-Coal Lease By Application
1823	40.00	-	-	-	-	-	-	Lease-
1824	720.00	-	-	-	-	-	-	Defer-GSG Prioritization
1825	1,330.03	-	-	-	-	-	-	Lease-
1828	320.00	0.08	-	-	-	-	-	Lease-
1829	855.68	-	-	-	-	-	-	Lease-
1832	501.84	-	-	-	-	-	-	Lease-
1833	72.20	72.20	72.20	-	-	-	-	Lease-
1834	1,585.33	585.90	207.80	-	-	-	-	Lease-
1835	1,117.30	-	-	-	-	-	-	Lease-
1836	40.00	-	-	-	-	-	-	Lease-
1837	40.00	-	-	-	-	-	-	Lease-
1838	400.00	-	-	-	-	-	-	Lease-
1840	640.00	98.51	-	-	-	-	-	Lease-
1841	480.00	81.27	-	-	-	-	-	Lease-
7294	238.86	-	-	-	-	-	-	Lease-
7295	59.76	-	-	-	-	-	-	Lease-
7296	34.33	-	-	-	-	-	-	Lease-

Parcel Number (WY-2024-06-)	Acres	Pronghorn (PH) CWR Acres	Mule Deer (MD) CWR Acres	Elk CWR Acres	Migration Corridor	Migration (High Use Acres)	Migration (Stopover Acres	Recom-mendation
Total	10,155.33	834.96	280.00	-	-	-	-	

Impacts to big game crucial winter range habitat would be the same in Alternative 3 (Modified Proposed Action) as described in Alternative 2 and each FO RMP.

4.4.4 Cumulative Impacts

Whether occurring in a corridor or in other seasonal habitats, disturbance associated with oil and gas development can result in wildlife moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations." (ARMPA, pg. 4-426)

The intensity of development and resultant impacts will be considered in combination with the context of the proposed action at the time development is proposed.

There are over 16.6 million acres of big game crucial winter range (CWR) in the State of Wyoming. Of this amount, approximately 6,335,000 acres is Mule Deer CWR, 5,973,000 acres is Antelope CWR, and 4,361,359 acres is Elk CWR. Under Alternative 2, 11,250.55 would be offered for lease. Under Alternative 3, 10,155.33 total acres would be offered for lease. The amount of those total acres that fall within CWR is the same for both alternatives, with 834.96 acres within Antelope CWR and 280.0 acres within Mule Deer CWR. Based on the assumptions described at the beginning of Chapter 4, the BLM is assuming that two wells will be developed per parcel. Five parcels have CWR, equating to the potential of 10 wells developed within CWR. With the estimated assumption of five acres of disturbance per well for vertical wells, and 2.5 acres disturbance for horizontal wells, the potential disturbance to occur within CWR is 25-50 acres. RMPs dictate that CWR will be avoided, when possible, thereby decreasing the likelihood of development occurring within CWR. Any development that does occur within CWR will be mitigated through the stipulations outlined in Appendices 5.1 and 5.2. Daily operations from developed wells that go into production will still pose the potential to disrupt big game populations from noise and potential vehicle collisions.

Oil and gas development causes surface disturbance through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on wildlife habitat and fisheries; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. Overall impacts would likely be greater where mineral development is more intense, in areas where development overlaps with crucial and winter wildlife ranges, and on state and private lands because of the lack of protections afforded to natural resources in these areas. If development expands, the ability of big game and other wildlife species to disperse into alternate habitats could become limited. This may create isolated populations in areas where habitats remain intact. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. Because of this pace of development (whether federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands) as wildlife is displaced from the disturbances.

It is well known that CWR is important to the viability of big game. Persistent disturbance in sensitive habitats would shift the areas of use and weaken the tendency of the animals to return to the disturbed area. If animals don't return to disturbed habitat, populations could be lower as herds and individuals to move into native and unpredictable habitats that may not support the increased use by local and newly arrived, displaced populations. Mineral development activities would likely cause displacement of animals and selection of alternative habitats and would likely inhibit big game movement between winter ranges and birthing areas. The displacement of big game, and specifically mule deer, from high-use to low-use areas has the potential to influence survival and reproduction

(Sawyer et al. 2006). It is likely that negative effects (both in the short-term and potentially in the long-term) from displacement of big game from these habitats would occur.

Where parcels are not located within approved project area EIS boundaries, and even to a certain extent those that are, as more reservoir data is gathered through exploratory drilling, the likelihood for sustained economic production should increase, and a decrease in dry holes should occur consistent with other types of field development. BLM is unaware of any new concentrated field developments beyond what is currently proposed and undergoing review.

See ARMPA FEIS pg. 4-509–- 4-579, the Buffalo RMP FEIS pg. 871, 1167 and 1660-1665, Bighorn RMP FEIS pg. 4-642–- 4-674, and Lander RMP FEIS pg. 1276-1332 for more information on what activity was considered in the RMP cumulative impacts analysis.

In particular, in its analysis of impacts of impacts from oil and gas development, the ARMPA at page 4-508, concludes:

> *Loss of vegetation from development activities would degrade habitat and increase forage competition among grazing animals. Livestock grazing practices would further increase cumulative impacts through direct competition for forage, water, and space, and by limiting the ability to manage vegetation for fish and wildlife needs. These impacts would also reduce the capability to maintain current population objectives.*
>
> *Oil and gas development would cause the greatest amount of surface disturbance through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on wildlife habitat and fisheries; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. Cumulative impacts would likely be greater where mineral development is more intense, in areas where development overlaps with crucial and winter wildlife ranges, and on state and private lands because of the lack of protections afforded to natural resources in these areas. Protection of non-federally listed species on private and state lands may not occur, resulting in potentially significant impacts on these species. As development expands throughout southwestern Wyoming, the ability of big game species to disperse into habitats outside of the planning area may become limited. This may create isolated populations in areas where habitats remain intact. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. Because of this pace of development (whether federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands) as wildlife is displaced from the disturbances.*
>
> *Impacts on wildlife would likely occur under all alternatives because of the loss of habitat. The success of disturbed land reclamation, both short- and long-term, would determine the duration of impacts. Given the constancy of all other stressors, the potential for cumulative impacts would be greatest under Alternative A because of anticipated increases in development and fewer restrictions on such activity on public lands.*

There are no pending APD actions for any of the proposed parcels. Potentially significant impacts to migration and big game habitats were forecast to occur as a result of development in the approved project areas. These parcels would contribute and potentially expand the environmental effects. Within the Green River RMP FEIS (at 462) impact analysis indicates that “the capability of habitat to meet herd unit objective levels would likely be significantly affected” in the Sublette HU. Development of parcels in combination with other existing and/or future development could contribute to these significant impacts.

Where parcels are located outside of approved project areas, and if they are developed, an increase in exploratory activity could occur if conditions are favorable. Due to the scattered nature of the parcels, this activity could occur where there is little to no development currently. Due to the fractured nature of the fluid mineral estate in the HPD and in SE WY, most development is being sited on private or state lands resulting in off-lease federal production. In these cases, the State of Wyoming has primary jurisdiction for ensuring operations are compliant with state rules for the protection of surface lands.

The likelihood of an increase in activity in the HDD is likely low while continued exploratory and some development activity increases in the HPD. Exploratory and development activity could increase in the WR/BBD due to the number of previously nominated parcels, however, it is unknown as to what extent. Typically, less than 50% of all leases issued are explored. Further information concerning BLM leasing statistics can be located at: https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics. Results of this lease sale are expected to be consistent. To the extent that existing oil and gas development is affecting big game herds, those impacts are expected to continue. New development is likely to be consistent with current projections in the RMPs and are not expected to be at a level that would cause significant impacts beyond those reflected in the RMP FEIS'. Impacts from other risk factors are expected to continue. In addition, the parcels are not in an area containing existing or proposed renewable energy projects and as such would not contribute cumulative impacts.

Best management practices will be considered and where required by stipulation, a mitigation plan will be developed to ensure that RMP objectives are achieved. Lease Notices and coordination with State Agencies will ensure cooperation and coordination across jurisdictions, increasing the consistency in application of mitigation and consideration of cumulative impacts. Master development plans will be considered as appropriate. Conditions at the time an APD is submitted will be assessed for significance; the need for additional mitigation will also be determined at the time development is proposed. All future projects will under-go site-specific review, and preparation of an environmental record of review will occur in accordance with Federal law, regulation, and policy.

All oil and gas projects in the state are subject to State of Wyoming rules and require approval of an Application for Permit to Drill by both agencies if the proposal involves production of the Federal mineral estate.

Monitoring and the use of adaptive management will continue in accordance with any applicable decision. As data is collected and made available, it will be considered at the time development is proposed, if a parcel is sold, a lease is issued and development proposed.

Additional information on cumulative impacts to big game and big game habitats are provided in the ARMPA at pages 4-423 – 4-427, 4-562, 4-508; the Pinedale RMP FEIS 4-294 – 296, and the GR RMP FEIS 462.

In consideration of the above, no significant cumulative impacts are expected from the offering of the parcels located in mule deer or pronghorn CWR.

4.5 Lands with Wilderness Characteristics

4.5.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, the Proposed Action or alternatives would not be authorized and BLM Wyoming would not offer any of the 20 parcels nominated. Ongoing oil and gas development, ranching, recreation, and other activities on BLM-administered lands would continue.

4.5.2 Alternative 2 – Proposed Action

Under Alternative 2, one parcel (WY-2024-06-1833) is located either wholly or partially within a LWC area. Development of this parcel could result in the loss of wilderness characteristics in a portion of the LWC unit. In addition, this area is not managed for LWC. None of the parcels are proposed in the Citizen Proposed Wilderness areas (CWPs). See section 3.6 for more information regarding this parcel.

4.5.3 Alternative 3 – Modified Proposed Action

Alternative 3 is similar to Alternative 2.

4.5.4 Cumulative Impacts

Cumulative impacts to LWCs are described in each Field Office RMP.

4.6 Socioeconomics and Environmental Justice

4.6.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, where none of the leases would be offered and subsequently sold, the employment, revenue, and purchasing opportunities associated with developing and producing wells on these leases would be foregone, as would the opportunity to provide oil and gas resources from these lease parcels to aid in meeting associated energy demands. None of the proposed parcels would be offered for lease, resulting in reduced bonus bid revenues and rentals. Since not leasing these minerals would prevent private entities from exploring and developing these minerals, subsequent associated oil and gas production and generation of royalty revenues would not occur. The State of Wyoming, as well as many counties and communities within, rely on oil and gas development as an important part of their economic base for funding a majority of public services and livelihoods. However, adverse impacts to quality of life associated with future potential lease developments, such as impacts to air quality, water quality, biodiversity, cultural resources, non-use values and recreation values, would also be foregone.

The most recent short-term energy outlook (STEO) published by the EIA (https://www.eia.gov/outlooks/steo/) (EIA, 2023) predicts that the world's oil and gas supply and consumption will increase over the next 18-24 months. The latest STEO projections are useful for providing context for the No Action discussion as the global forecast models used for the STEO are not dependent on whether the BLM issues onshore leases but are based on foreseeable short-term global supply and demand and include oil and gas development /operations on existing U.S. onshore leases. The most recent STEO includes the following projections for the next two years:

- U.S. liquid fuels consumption is projected to increase to 20.45 million barrels per day (b/d) in 2023 up from 20.28 million b/d in 2022 and further increase to 20.76 million b/d in 2024.
- U.S. crude oil production is expected to average 11.9 million b/d in 2022 and to rise to 12.4 million b/d in 2023 and 12.63 b/d in 2024.
- U.S natural gas consumption is expected to average 86.4 Bcf/d in 2023, decreasing from 88.5 Bcf/d in 2022.
- U.S. LNG exports are expected to increase from 10.59 billion cubic feet/day (Bcf/d) in 2022 to 12.07 Bcf/d in 2023 and 12.73 Bcf/d in 2024.
- U.S. Coal production is expected to total 552 million short tons (MMst) in 2023 and 502.6 MMst in 2024 and decrease to 17% of total U.S. electricity generation in 2023 compared to 20% in 2022 driven by on-going retirement of coal-fired generating plants.
- Generation from renewable sources will make up an increasing share of total U.S. electricity generation, rising from 22% in 2022 to 24% in 2023 and 26% in 2024.

Based on recent events both domestically and internationally that have resulted in abrupt changes to the global oil and gas supply, other EIA studies and recent U.S. analyses (associated with weather impacts, etc.) regarding short-term domestic supply disruptions and shortages or sudden increases in demand demonstrate that reducing domestic supply (in the near-term under the current supply and demand scenario) will likely lead to the import of more oil and natural gas from other countries, including countries with lower environmental and emission control standards than the United States (EIA 2021). Current global supply disruptions have also led to multiple releases from the U.S. Strategic Petroleum Reserve in order to meet consumer demand and curb price surges.

For more detailed, management area-specific discussions regarding the potential impacts of foregoing leasing, please refer to the applicable RMP FEISs, including Section 5.1.1 of the Wyoming Greater Sage-Grouse Proposed Land Use Plan Amendment and FEIS (beginning on page 4-134).

4.6.2 Alternative 2 – Proposed Action

4.6.2.1 Socioeconomics

At the lease sale stage, it is unknown where, or if, development would occur in any given nominated lease parcels; as specific types and locations of development are proposed, their specific effects would be analyzed and addressed in detail at the time of proposed lease development. However, in general, acquisition and development of new leases

provide short-term local and regional jobs and long-term revenue on a sustained basis. These may include employment opportunities related to the oil and gas and service support industries in the region, as well as federal, state, and county government revenue related to taxes, royalty payments, and other revenue streams.

Federal oil and gas leases generate a one-time lease bonus bid, as well as annual rents during the life the lease, or until hydrocarbon production begins on the leased parcel. Nominated parcels approved for leasing are offered quarterly by the BLM at auctions starting at a minimum bid of $10.00 per acre. If parcels do not receive the minimum competitive bid, they may be offered at a later sale or cancelled. In general, lease sales in Wyoming are highly competitive and parcels with high potential for oil and gas production regularly command bonus bids in excess of the minimum bid.

Lessee rent payments are equal to $3.00 an acre for the first two years and increase to $5.00 an acre for six further years of the lease. For any lease extending beyond the first eight years, rent payments increase to at least $15.00 per acre thereon. Typically, these leases expire after 10 years unless held by production. During this lease period, annual rental payments are paid on leased parcels until one or more wells are drilled that result in production, then the lessee begins paying annual royalties calculated as a percentage of the value of production from the parcel. For this sale, the BLM is updating the sale notice and including an attachment to the standard lease form applying a 16.67% royalty rate (see Section 1.1). 51% of federal mineral leasing revenues go to the Treasury Department, while approximately 49% are distributed back to the state in which the revenues were generated. In Wyoming, federal mineral receipts distributed back to the state follow a legislatively established, two-tier formula. The first tier covers total annual receipts up to $200 million and the second tier applies to receipts over $200 million per year. Based on the state's established two-tier formula, Wyoming allocates these revenues to public school districts, the highway and county road fund, cities and towns, the University of Wyoming, capital construction projects, and the state's budget reserve account (WY LSO 2022).

Although the economic activity associated with mineral development plays an important role in supporting the overall socioeconomic well-being of Wyoming communities and their public services, such resource development can have adverse impacts on other, equally valued socioeconomic indicators, such as recreation (including hunting, fishing, and wildlife viewing), cultural resource preservation (including traditional ecological knowledge sharing), livestock grazing, and public health factors such as air quality. Continued expansion of the oil and gas industry may be perceived as having a negative effect on quality-of-life values associated with these indicators. To the extent that additional oil and gas development affect recreational, tourism, agricultural, educational, or preservation opportunities in the area of the nominated lease parcels, there may be related direct and indirect regional economic effects to associated local industry suppliers and support services.

The total landscape-level surface disturbance associated with reasonably foreseeable environmental trends and planned actions would include activities that generate increased human activity, traffic, noise, dust, odor, light and air pollution, and visual effects. These activities have the potential to affect quality of life of any existing nearby residences or facilities, depending on the intensity of development activities and proximity of structures to a given parcel. While the majority of these impacts to any significantly proximal residences or facilities would be short term and cease during operations (e.g., increased human activity, traffic, noise, dust, and odor during drilling and completion phases), residences may continue to experience longer-term visual, air, or other impacts that have potential to affect quality of life if they are located in areas in which oil and gas development is not currently nearby or visible. However, with consideration of total lease acreage, topography, and resources present within the nominated lease parcels, there are opportunities for future potential development to be placed in portions of the nominated lease parcels that are less proximal to any associated residences and facilities.

Air pollution can also impact Air Quality Related Values through ambient exposure to elevated atmospheric concentrations, such as ozone effects to vegetation, impairment of scenic views by particulate matter in the atmosphere, and deposition of air pollutants, such as sulfur and nitrogen compounds, on the Earth's surface through dry and wet precipitation. Further discussion on Air Quality Related Values associated with the socioeconomic analysis area can be found in Section 3.1.1.

Regarding water quality, traditional oil and gas resource exploration, development, and production typically do not significantly deplete ground water on a regional basis but may have a limited, short-duration, near-well bore drawdown around the water supply well depending upon length and intensity of pumping activity. Oil and gas

resources are often developed from geological reservoirs that do not contain significant amounts of freshwater with the exception of some CBM developed formations; however, the development and production of oil and gas can affect adjacent or nearby aquifers. Potential impacts result from the creation of artificial pathways between oil and gas reservoirs and adjacent aquifers. Modification of ground water flow paths may cause fresh ground water to contact oil or gas. In addition, improper disposal of waste waters (brine, storm runoff), drilling/completion fluids, and other wastes can impact the quality of underlying ground water (U.S EPA 1987). The potential for negative impacts to groundwater caused from completion activities such as hydraulic fracturing, have not been confirmed but based on its history of use are not likely. A recent study completed on the Pinedale Anticline did not find a direct link to known detections of petroleum hydrocarbons to the hydraulic fracturing process. Groundwater contamination investigations have also been conducted at the Pavillion gas field and according to a November 7, 2016, fact sheet from the Wyoming Department of Environmental Quality, it is unlikely that the hydraulic fracturing activities have caused impacts to water supply wells (https://deq.wyoming.gov/waterquality/groundwater/investigations/pavillion-area-investigation/#1814069153). The 2019 "Final Pavillion, Wyoming Gas Field Domestic Water Wells Report on Recommendations for Further Investigation," (https://deq.wyoming.gov/water-quality/groundwater/investigations/pavillion-area-investigation/) conclusion states, "Data collected and evaluated as part of this 2019 Final Report confirm the conclusions drawn in the WDEQ 2016 Final Report." Authorization of the proposed projects would require full compliance with local, state, and federal directives and stipulations that relate to surface, and groundwater protection and the BLM would deny any APD who proposed drilling and/or completion process was deemed to not be protective of usable water zones as required by 43 CFR 3162.5-2(d). See section 4.2 for a comprehensive discussion on the potential environmental consequences associated with water resources.

Other economic or social indicators can also influence the general health risks of a population, such as poverty status, educational attainment, broadband access or language proficiency. The intensity, and likelihood, of potential impacts to public health and safety, including the quality of usable water aquifers, is directly related to proximity of the proposed action to domestic and/or community water supplies (wells, reservoirs, lakes, rivers, etc.) and/or agricultural developments. Groundwater resources are also regional in nature and water withdrawals are not anticipated to affect domestic water sources (see Section 3.3 and 4.2 for water resource discussions). Any impacts to local water wells (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic or agricultural use. Best Management Practices (BMPs) and Conditions of Approval (COAs) to an APD would be implemented to minimize this risk. Should a spill occur, the BLM would work with operators to immediately remediate spills in accordance with federal and state standards.

Due to the scattered nature and small area encompassed by the proposed parcels (as well as low population density and the presence of industrial safety programs, standards, and state and federal regulations) offering the proposed parcels is not expected to substantially increase health or safety risks to humans, wildlife, or livestock. Parcels that contain lands with private surface overlying federal minerals (i.e., split estate) have, or have the potential to, contain private residences and associated facilities such as domestic water supply wells. Several of these parcels may also be used for individual dispersed recreational activities which could expose these users to oil and gas-related activity, as mentioned previously.

4.6.2.2 Environmental Justice

For minority populations, the BLM generally defines “meaningfully greater” as 10 percent above the minority population size of the comparison geography. A low-income population is identified by the BLM as a community of concern if either 1) low-income populations of the area of analysis exceed 50% of the population, or 2) the low-income population is less than or equal to twice (200%) of the federal “poverty level.” Indigenous communities of concern are present if the percentage of the population identified as indigenous, including non-tribal-affiliated persons who identify as indigenous or a combination of indigenous and another ethnicity, is equal to or greater than that of the reference population(s) (see Federal Interagency Working Group on Environmental Justice and NEPA Committee 2016; BLM 2022). Based on such guidance, the BLM identified Census tract block groups containing proposed parcels and low income, minority, and/or indigenous populations in eight Wyoming counties (Table 4-13).

For this EA, the EJ analysis area is identified as all Census block groups surrounding the associated parcels proposed to be offered for sale in each Alternative. If a parcel is located on or near more than one block group, all proximal and/or immediately adjacent block groups were also included in the analysis. This analysis area was selected to represent geographies proximal to the project area, along potential transportation and access routes, and

to be inclusive of regional rural and indigenous landscapes. Parcels offered for sale span across all of Wyoming. The population in this analysis area totals 9,604 people (USCB 2022). The reference area is the State of Wyoming for all Wyoming parcels; reference areas smaller than the state of Wyoming are not suitable for this analysis due to the rural composition and resultingly sparse demographic data available at a consistent county level. Based on these criteria, potential communities of concern were identified in census block groups of the following counties:

Table 4-13. Alternative 2 Environmental Justice Screening Criteria Results

Parcel #	County	BG Meets Singular EJ Screening Criteria with State Reference	BG Meets Multiple EJ Screening Criteria with State Reference	Parcel Area (Acres)	US Census Block Group Area (Acres)
1770	Fremont	No	NA	2000	1,265,357
1771	Fremont	No	NA	400	1,265,357
1786	Campbell	No	NA	375	769,472
1823	***Sweetwater***	***Yes***	***Yes***	***40***	***3,882,327***
1824	Converse	No	NA	720	1,723,727
1825	Converse	No	NA	1330	1,723,727
1828	Fremont	No	NA	320	1,265,357
1829	***Fremont***	***Yes***	***Yes***	***856***	***414,479***
1832	Fremont	No	NA	502	1,265,357
1833	Sublette	No	NA	72	205,846
1834	***Fremont***	***Yes***	***Yes***	***1585***	***414,479***
1835	Converse	No	NA	1117	1,723,727
1836	Converse	No	NA	40	1,723,727
1837	Fremont	No	NA	40	1,265,357
1838	***Fremont***	***Yes***	***Yes***	***640***	***414,479***
1840	Fremont	No	NA	480	1,265,357
1841	Converse	No	NA	239	1,723,727
7294	Fremont	No	NA	60	1,265,357
7295	***Campbell***	***Yes***	***Yes***	***34***	***5,724***
7296	***Converse, Campbell***	***Yes***	***Yes***	***400***	***578,304***

Sources: BLM and Headwaters Economics Socioeconomic Profiling Tool (US DOC 2022), U.S. Census Bureau American Community Survey (USCB 2022)

Potential low-income, minority, and indigenous block group populations exist within the study area and may be disproportionately affected by project actions if proximal to a parcel that is then developed or employed (or supported) by oil and gas extractive industries and/or support industries. Some block group populations identify as more than one potential environmental justice community and warrant special attention, outreach, and meaningful involvement to investigate any past, present, or future disproportionalities that could be associated with an associated future APD. It is estimated that approximately 29% of the total study area population (i.e., the sum of all block group populations that contain proposed parcels) is identified as low-income. This is greater than the reference area low-income percentages of 26% for WY. It is estimated that approximately 13% of the study area population is identified as belonging to a minority population group. This is less than the reference area minority percentage of 16% for WY. It is estimated that approximately 0.6% of the study area population is identified as belonging to an indigenous population group. This is less than the reference area indigenous percentage of 2% for WY. Further, 31% of the total study area population is identified as belonging to both low-income and minority (or indigenous) populations.

It is important to note that Wyoming populations, even the identified Environmental Justice populations (EJ), rely heavily on economic contributions from the oil and gas industry--whether it be in the form of employment, funding for public services, or indirect funding of related industry support services. As such, economic fluctuations associated with oil and gas development decisions are also felt disproportionately by existing identified EJ populations.

Low-income, minority, and indigenous communities of potential concern within the analysis area constitute populations at risk for adverse health outcomes due to demographic and/or socioeconomic factors (Headwaters Economics 2022). The EPA has concluded that the most severe harms from climate change fall disproportionately upon underserved communities who are least able to prepare for, and recover from, heat waves and drought, poor air quality, flooding, wildfires and other impacts (EPA 2021b). Aside from ethnicity and poverty status, other factors contributing to increased risks for potential communities of concern in the analysis area include, but are not limited to, age, education, employment, broadband access, and language proficiency. Public health impacts described in Sections 4.1 and 4.6.2.3 would be similar in context but disproportionately adverse to EJ populations when compared to the total population being generally affected.

While the determination of potential adverse and disproportionate effects from specific actions may initially be the assessment of the BLM, this assessment should not be assumed to be the position of specific, potentially affected communities of concern. The BLM realizes that additional adverse impacts may be identified by local communities and Tribes as specific development locations and types are proposed. Therefore, identified communities of concern would be provided opportunities to identify any perceived adverse environmental impacts at the time of site-specific analysis during the APD stage. As a result, this discussion assesses only the effects for the issues identified by the BLM during scoping and public comment periods (see Sections 1.6 and 1.7). The BLM would continue to work with potentially affected communities of concern to identify and address additional EJ issues as they arise.

4.6.2.3 Public Health and Safety

While no formal human health risk assessments have been conducted specific to past and present development in the BLM WY management area, the results of EPA's 2019 Air Toxics Screening Assessment (AirToxScreen) indicate that cancer, neurological risks, and respiratory risks in the analysis area are all lower than national levels and are generally the same as state of Wyoming levels (EPA 2019) (refer to Sections 3.1 and 4.1).

While the 2019 AirToxScreen estimates the risk of cancer and/or other health impacts solely based on exposure to HAPs, other economic or social indicators can also influence the general health risks of a population, such as poverty status, educational attainment, or language proficiency. Headwaters Economics data for populations at risk (i.e., more likely to experience adverse health outcomes because of demographic or socioeconomic factors) show that most of the indicators for populations at risk are lower for the state of Wyoming compared with the nation as a whole. However, low-income, minority, and indigenous communities of potential concern within the analysis area (Section 4.6.2.2) constitute populations at risk for adverse health outcomes due to demographic and/or socioeconomic factors (Headwaters Economics 2022). Aside from ethnicity and poverty status, other factors contributing to increased risks for populations in the analysis area include, but are not limited to, age, education, employment, broadband access, and language proficiency. Human health risk assessments cannot be performed until project-specific details are known so that frequency, timing, and levels of contact with potential stressors may be identified (EPA 2022g). However, each of the reasonably foreseeable environmental trends and planned actions have been, or will be, subject to relevant rules and regulations regarding public health and safety. Ongoing and future potential development would continue to present aggregate risks to human health as detailed above. When wells reach the end of their useful life and are properly plugged and reclaimed, they would no longer contribute to air quality effects; however, depending on the level and duration of individual's exposure during well operation, some of the public health effects from air pollution may endure beyond the life of the wells (e.g., chronic respiratory problems such as asthma).

Future potential development on the nominated lease parcels is estimated to be 40 wells for this lease sale, based on emissions estimated using the BLM Lease Sale Emissions Tool based on the total acreage of the lease parcels and the 5-year average of the number of lease acres held by production divided by the total acres leased and discussed in Section 3.2.2. This is a 0.02% increase to the 205,327 existing active well bores of all well types across all land jurisdictions. Of the 20 nominated lease parcels, 4 parcels indicate building block footprints that occur within 0.5

miles of the parcel boundary; 12 parcels indicate building block footprints that occur within 1.25 miles of the parcel boundary and 16 parcels indicate building block footprints that occur within 2.5 miles of the parcel boundary. Residences that occur within 1.25 miles or less from oil and gas development are generally at a higher risk for experiencing air pollution effects (Adgate et al. 2014; Czolowski et al. 2017; Haley et al. 2016; Kroepsch et al. 2019) and residences within 0.5 miles or less from oil and gas development is where noise and odor effects may reach nuisance levels, depending on the phase of development (Adgate et al. 2014; Blair et al. 2018; Hays et al. 2017; Kroepsch et al. 2019). Three nominated lease parcels (parcels 4,7, and13) are 2.5 miles or greater from any observed building block foot prints and would be at lower risk for contributing health and safety related impacts from any future potential development. All identified building footprints occurring within 1.25 miles of parcel boundaries, while spatially proximal, are attributable to rural, remote, and sparsely populated US Census Bureau block groups whose actual building residency statuses or associated levels of use or access are unknown at this time.

When authorizing development, federal and state laws, regulations, and policy are applied to reduce effects or respond to incidents. These include the following:

- Federal, state, county, and municipal fire managers shall coordinate on fire response and mitigation.
- Developers who install and operate oil and gas wells, facilities, and pipelines are responsible for complying with the applicable laws and regulations governing hazardous materials and for following all hazardous spill response plans and stipulations. The Wyoming Oil and Gas Conservation Commission (WYOGCC) requires similar spill response measures after release of hydrocarbons, produced water, or hydraulic fracturing fluids (refer to the Water Support Document [BLM 2022b] for further information on spills).
- All well pads, vehicles, and other workplaces must comply with worker safety laws as stipulated by the Occupational Safety and Health Administration.
- Vehicular traffic and pipelines are regulated according to safety laws as stipulated by the Department of Transportation.
- Measures to lower risks related to H2S exposure include flaring or venting gas and the use of stock tank vapor recovery systems.

Fugitive dust is concentrated in the short-term during construction but may occur to a lesser degree in the long term because of increased vehicle use and ground disturbance. In addition to fugitive dust, refer to the air quality analysis in Section 3.1 and 4.1 for potential health effects of other air pollutants, including criteria pollutants, VOCs, and HAPs. Refer to Sections 4.2 and 5.3 for further information regarding potential surface and groundwater effects and relevant regulations, stipulations, and lease notices offering protections to groundwater and surface water quality.

4.6.3 Alternative 3 – Modified Proposed Action

4.6.3.1 Socioeconomics

Socioeconomic impacts under Alternative 3 are expected to be similar to those disclosed under Alternative 2. Alternative 3 would offer two fewer parcels than Alternative 2.

4.6.3.2 Environmental Justice

Environmental justice impacts under Alternative 3 are expected to be similar to those disclosed under Alternative 2. Alternative 3 would offer two fewer parcels (parcels 3 and 5), neither of which belongs to a Census block group meeting EJ criteria.

For this EA, the EJ analysis area is identified as all Census block groups surrounding the associated parcels proposed to be offered for sale in each Alternative. If a parcel is located on or near more than one block group, all proximal and/or immediately adjacent block groups were also included in the analysis. This analysis area was selected to represent geographies proximal to the project area, along potential transportation and access routes, and to be inclusive of regional rural and indigenous landscapes. Parcels offered for sale span across all of Wyoming. The population in this analysis area totals 9,604 people (USCB 2022). The reference area is the State of Wyoming for all Wyoming parcels; reference areas smaller than the state of Wyoming are not suitable for this analysis due to the rural composition and resultingly sparse demographic data available at a consistent county level of both states.

Based on these criteria, potential communities of concern were identified in census block groups of the following counties:

Table 4-14. Alternative 3 Environmental Justice Screening Criteria Results

Parcel #	County	BG Meets Singular EJ Screening Criteria with State Reference	BG Meets Multiple EJ Screening Criteria with State Reference	Parcel Area (Acres)	US Census Block Group Area (Acres)
1770	Fremont	No	NA	2000	1,265,357
1771	Fremont	No	NA	400	1,265,357
1786	***Sweetwater***	***Yes***	***Yes***	***40***	***3,882,327***
1823	Converse	No	NA	1330	1,723,727
1824	Fremont	No	NA	320	1,265,357
1825	***Fremont***	***Yes***	***Yes***	***856***	***414,479***
1828	Fremont	No	NA	502	1,265,357
1829	Sublette	No	NA	72	205,846
1832	***Fremont***	***Yes***	***Yes***	***1585***	***414,479***
1833	Converse	No	NA	1117	1,723,727
1834	Converse	No	NA	40	1,723,727
1835	Fremont	No	NA	40	1,265,357
1836	***Fremont***	***Yes***	***Yes***	***640***	***414,479***
1837	Fremont	No	NA	480	1,265,357
1838	Converse	No	NA	239	1,723,727
1840	Fremont	No	NA	60	1,265,357
1841	***Campbell***	***Yes***	***Yes***	***34***	***5,724***
7294	***Converse, Campbell***	***Yes***	***Yes***	***400***	***578,304***

Sources:, BLM and Headwaters Economics Socioeconomic Profiling Tool (US DOC 2022), U.S. Census Bureau American Community Survey (USCB 2022)

Potential low-income, minority, and indigenous populations exist within the study area and may be disproportionately affected by project actions. Some block group populations identify as more than one potential environmental justice community and warrant special attention, outreach, and meaningful involvement. It is important to note that Wyoming populations, even the identified Environmental Justice populations (EJ), rely heavily on economic contributions from the oil and gas industry--whether it be in the form of employment, funding for public services, or indirect funding of related industry support services. As such, economic fluctuations associated with oil and gas development decisions are also felt disproportionately by existing identified EJ populations.

Low-income, minority, and indigenous communities of potential concern within the analysis area constitute populations at risk for adverse health outcomes due to demographic and/or socioeconomic factors (Headwaters Economics 2022). The EPA has concluded that the most severe harms from climate change fall disproportionately upon underserved communities who are least able to prepare for, and recover from, heat waves and drought, poor air quality, flooding, wildfires and other impacts (EPA 2021b). Aside from ethnicity and poverty status, other factors contributing to increased risks for potential communities of concern in the analysis area include, but are not limited to, age, education, employment, broadband access, and language proficiency. Public health impacts described in Sections 4.1 and 4.6.2.3 would be similar in context but disproportionately adverse to EJ populations when compared to the total population being generally affected.

While the determination of potential adverse and disproportionate effects from specific actions may initially be the assessment of the BLM, this assessment should not be assumed to be the position of specific, potentially affected communities of concern. The BLM realizes that additional adverse impacts may be identified by local communities and Tribes as specific development locations and types are proposed. Therefore, identified communities of concern would be provided opportunities to identify any perceived adverse environmental impacts at the time of site-specific analysis during the APD stage. As a result, this discussion assesses only the effects for the issues identified by the BLM during scoping and public comment periods (see Sections 1.6 and 1.7). The BLM would continue to work with potentially affected communities of concern to identify and address additional EJ issues as they arise.

4.6.3.3 Public Health and Safety

Impacts to Public Health and Safety will be similar to those discussed in Alternative 2. Alternative 3 would offer two fewer parcels than Alternative 2, neither of which belongs to a Census block group meeting EJ criteria. Both deferred parcels indicate building block footprints within 1.25 and 2.5 miles of each parcel.

4.6.4 Cumulative Impacts

4.6.4.1 Socioeconomics

Overall impacts would likely be greater where mineral development is more intense, in areas where development overlaps with crucial and winter wildlife ranges, and on state and private lands because of the lack of protections afforded to natural resources in these areas. If development expands, the ability of big game and other wildlife species to disperse into alternate habitats could become limited. This may create isolated populations in areas where habitats remain intact. While multiple, overlapping timing stipulations can provide benefit to wildlife resources by preventing sustained disruptive activity, the Pinedale RMP FEIS, p 4-60 (2006), also notes "[W]hen areas with greater sage-grouse nesting restrictions overlap areas with big game crucial winter range restrictions, the oil and gas operator would potentially be restricted to a 3-and-a-half-month construction, drilling, and well completion season. This short drilling and development window in areas such as the Pinedale Anticline has led to accelerated operations, which results in congested traffic on primary access roads and a potential overload on local service and emergency resources. It also causes a yearly bust-and-boom cycle for the local communities as crews move in during the open development window then leave when the seasonal restrictions are invoked." This situation can be exacerbated when lease development is further reduced by other seasonal restrictions, including those for raptors.

Fugitive dust is concentrated in the short-term during construction but may occur to a lesser degree in the long term due to increased vehicle use and ground disturbance. In addition to fugitive dust, see Section 3.1 Air Resources for a comprehensive description of existing health and climate impacts and trends of other air pollutants, including criteria pollutants, VOCs, and HAPs. While any climate change-related effects from the future potential development of the parcels themselves would be minimal, climate change is the result of collective and global actions. Any climate change-related impact would be regional in nature but may still disproportionately affect individuals within potential communities of concern in the analysis area who are already vulnerable (EPA 2021b), in addition to the general population. Key weather and climate drivers of health impacts include increasingly frequent, intense, and longer lasting extreme heat, which worsens drought, wildfire, and air pollution risks; increasingly frequent extreme precipitation, intense storms, and changes in precipitation patterns that lead to drought and ecosystem changes.

Other economic or social indicators can also influence the general health risks of a population, such as poverty status, educational attainment, broadband access or language proficiency. The intensity, and likelihood, of potential impacts to public health and safety, including to the quality of usable water aquifers, is directly related to proximity of the proposed action to domestic and/or community water supplies (wells, reservoirs, lakes, rivers, etc.) and/or agricultural developments. Groundwater resources are also regional in nature and water withdrawals are not anticipated to affect domestic water sources (see Section 3.3 and 4.2 for water resource discussions). Any impacts to local water wells (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic or agricultural use. Best Management Practices (BMPs) and Conditions of Approval (COAs) to an APD would be implemented to minimize this risk. Should a spill occur, the BLM would work with operators to immediately remediate spills in accordance with federal and state standards.

The EIA 2023 Annual Energy Outlook (https://www.eia.gov/outlooks/aeo/) projects energy consumption increases through 2050 as population and economic growth outweighs efficiency gains. As a result, U.S. production of natural gas and petroleum and liquids will rise amid growing demand for exports and industrial uses. U.S. natural gas production increases by 15% from 2022 to 2050. However, renewable energy will be the fastest-growing U.S. energy source through 2050 as electricity generation shifts to using more renewable sources, domestic natural gas consumption for electricity generation is expected to decrease by 2050 relative to 2022. As a result, energy-related CO2 emissions are expected to fall 25% to 38% below 2005 level, depending on economic growth factors. Further discussion of past, present and projected global and state GHG emissions can be found in Chapter 6 of the Annual Report.

Continued expansion of the oil and gas industry may be perceived as having a negative effect on quality-of-life considerations for people who value undeveloped landscapes, opportunities for isolation, and activities such as cultural practices, wildlife viewing and other forms of recreation, or rangeland management. The total landscape-level surface disturbance associated with reasonably foreseeable environmental trends and planned actions would include activities that generate increased human activity, traffic, noise, dust, odor, light pollution, and visual effects. These activities have the potential to affect quality of life of any existing nearby residences or facilities, depending on the intensity of development activities and proximity of structures to a given parcel. While the majority of these impacts to any significantly proximal residences or facilities would be short term and cease during operations (e.g., increased human activity, traffic, noise, dust, and odor during drilling and completion phases), residences may continue to experience long-term visual or other impacts that have potential to affect quality of life if they are located in areas in which oil and gas development is not currently nearby or visible. However, with consideration of total lease acreage, topography, and resources present within the nominated lease parcels, there are opportunities for future potential development to be placed in portions of the nominated lease parcels that are less proximal to any associated residences, populations, and facilities, thereby minimizing potential associated quality of life impacts.

The BLM uses a number of stipulations and lease notices applied to the nominated lease parcels in the current sale that may mitigate potential effects on wildlife and other resources that in turn may mitigate effects on related concerns (see Appendices sections 5.1 and 5.2 for specific stipulations and lease notices applied to the nominated lease parcels, and individual stipulation and lease notice summaries). Under the authority granted in standard terms and conditions attached to each lease, measures to reduce or avoid impacts to resource values, land uses, or users would be attached as COAs to the associated APD. Site-specific avoidance, minimization, and/or mitigation measures would be determined at the time of proposed lease development. This could include measures to reduce noise, dust, odor, and light effects during construction and operations. As with reasonably foreseeable environmental trends and planned actions, effects to quality of life and other socioeconomic values from these trends and actions would be examined at the APD level with consideration of site-specific locational information and development of COAs to reduce identified effects as needed.

4.6.4.2 Environmental Justice

Cumulative health related impacts to potential environmental justice populations would be similar in context, but more disproportionate and adverse in nature, than those discussed in Sections 4.6.4.1 and 4.6.4.3.

It is important to note that Wyoming populations, even the identified Environmental Justice populations (EJ), rely heavily on economic contributions from the oil and gas industry--whether it be in the form of employment, funding for public services, or indirect funding of related industry support services. As such, economic fluctuations associated with oil and gas development decisions are also felt disproportionately by existing identified EJ populations. The federal government cannot dictate where oil and gas reserves may exist. Consequently, there may be instances where oil and gas activities disproportionately and adversely affect communities of concern due to development proximity and associated factors discussed in Section 4.6.4.1. Oil and gas exploration activities can be active for variable amounts of time. For example, a typical horizontal well averages from 30 to 60 days from start of drilling to completion and may have a greater effect (increased dust, traffic, etc.) on resident populations in close proximity to such drilling operations while the drilling operations are ongoing. These kinds of exploration activities may result in impacts that are adverse to communities of concern; however, the BLM does not know exactly where drilling operations may take place until lease development is proposed, if a nominated lease parcel is developed at all. Additional analysis would be conducted at the time of proposed lease development, accompanied by an associated EJ determination. Standard terms and conditions attached as COAs to the APD could include measures to

reduce effects on nearby communities of concern. Under the Oil and Gas Leasing Regulation for Surface Use Rights (43 CFR 3101-1-2), such reasonable measures may include modification to siting or design of facilities, including relocation of proposed operations up to 656 feet (200 m). These measures could minimize potential impacts that could be adverse and disproportionate to members of communities of concern, as well as the general population.

BLM Wyoming uses stipulations and COAs to minimize effects to nearby populations, including communities of concern, during construction and operations, to the extent practicable. Note that any residence, community facility or gathering space in an area with a community of concern has the chance of being significant to that community; however, no such places have been identified within the nominated lease parcels. Additionally, no specific Native American resource concerns have been identified on the subject lease parcels; however, Tribal consultation and EJ meaningful involvement are considered ongoing, where issues or concerns previously unknown could be brough forward at any time. Currently, impacts to potential communities of concern are more likely to be indirect and may incrementally contribute to impacts associated with reasonably foreseeable environmental trends and planned actions. Cumulative health related impacts to potential environmental justice populations would be similar in context, but more disproportionate and adverse in nature, than those discussed in Sections 4.6.4.1 and 4.6.4.3.

4.6.4.3 Public Health and Safety

Fugitive dust is concentrated in the short-term during construction but may occur to a lesser degree in the long term due to increased vehicle use and ground disturbance. In addition to fugitive dust, see Section 3.1 Air Resources for a comprehensive description of existing health and climate impacts and trends of other air pollutants, including criteria pollutants, VOCs, and HAPs. While any climate change-related effects from the future potential development of the parcels themselves would be minimal, climate change is the result of collective and global actions. Any climate change-related impact would be regional in nature but may still disproportionately affect individuals within potential communities of concern in the analysis area who are already vulnerable (EPA 2021b), in addition to the general population. Key weather and climate drivers of health impacts include increasingly frequent, intense, and longer lasting extreme heat, which worsens drought, wildfire, and air pollution risks; increasingly frequent extreme precipitation, intense storms, and changes in precipitation patterns that lead to drought and ecosystem changes. Key drivers of vulnerability include the attributes of certain groups (age, socioeconomic status, race, and current level of health) and of place (floodplains, coastal zones, and urban areas), as well as the resilience of critical public health infrastructure. Health effects of these disruptions include increased respiratory and cardiovascular disease, injuries, and premature deaths related to extreme weather events; changes in the prevalence and geographical distribution of foodborne and waterborne illnesses and other infectious diseases; and threats to mental health. Milder winters resulting from a warming climate can reduce illness, injuries, and deaths associated with cold and snow. Vulnerability to winter weather depends on many non-climate factors, including housing, age, and baseline health. Although deaths and injuries related to extreme cold events are projected to decline due to climate change, these reductions are not expected to compensate for the increase in heat-related deaths. The frequency of heavy precipitation events has already increased for the nation as a whole and is projected to increase in all U.S. regions. Increases in both extreme precipitation and total precipitation have contributed to increases in severe flooding events in certain regions. In addition to the immediate health hazards associated with extreme precipitation events when flooding occurs, other hazards can often appear once a storm event has passed. Water intrusion into buildings can result in mold contamination that manifests later, leading to indoor air quality problems.

The intensity, and likelihood, of potential impacts to public health and safety, including to the quality of usable water aquifers, is directly related to proximity of the proposed action to domestic and/or community water supplies (wells, reservoirs, lakes, rivers, etc.) and/or agricultural developments as well as regional population density. Groundwater resources are also regional in nature and water withdrawals are not anticipated to affect domestic water sources (see Section 3.3 and 4.2 for water resource discussions). Any impacts to local water wells (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic or agricultural use. Best Management Practices (BMPs) and Conditions of Approval (COAs) to an APD would be implemented to minimize this risk. Should a spill occur, the BLM would work with operators to immediately remediate spills in accordance with federal and state standards.

Potential cumulative impacts are also dependent on the extent of the production well's capture zone and well integrity. Standard Lease Notice No.1 specifies that development is generally restricted within a quarter mile of occupied dwellings and within 500 feet of riparian habitats and wetlands, perennial water sources (rivers, springs,

water wells, etc.) and/or floodplains. Intensity of impact is likely dependent on the density of development. Further information related to the rate of development is provided in Section 1. Human health risk assessments cannot be performed until project-specific details are known so that frequency, timing, and levels of contact with potential stressors may be identified (EPA 2021h). However, each of the reasonably foreseeable environmental trends and planned actions have been, or will be, subject to relevant rules and regulations regarding public health and safety.

Ongoing and future potential development would continue to present aggregate risks to human health as detailed above and in previous chapters and sections. When wells reach the end of their useful life and are properly plugged and reclaimed, they would no longer contribute to air quality effects; however, depending on the level and duration of individual's exposure during well operation, some of the public health effects from air pollution may endure beyond the life of the wells (e.g., chronic respiratory problems such as asthma). Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad" (January 27, 2021), directs the executive branch to establish policies or rules that put the United States on a path to achieve carbon neutrality, economywide, by no later than 2050. This goal is consistent with IPCC's recommendation to reduce net annual global CO emissions between 2020 and 2030 in order to reach carbon neutrality by mid-century. Federal agencies are still in the process of developing policies that align with a goal of carbon neutrality by 2050. In the short-term, the order has a stated goal of reducing economy-wide GHG emissions by 50 to 52% relative to 2005 emissions levels no later than 2030.

While continued fossil fuel authorizations will occur over the next decade to support energy demand and remain in compliance with the leasing mandates in the Inflation Reduction Act (IRA) passed in 2022, the U.S. Energy Information Administration International Energy Outlook expects renewable energy consumption to double between 2020 and 2050 and nearly equal liquid fuels consumption by 2050. The U.S. has committed to the expansion of renewable energy through infrastructure investments in clean energy transmission and grid upgrades include in the Bipartisan Infrastructure Investment and Jobs Act as well as clean energy investments and incentives included in the Inflation Reduction Act. The Department of Energy's Office of Policy developed a preliminary assessment that finds the IRA and BIL, in combination with past actions, are projected to reduce 2030 economy wide GHG emissions to 40% below 2005 level, even with continued oil and gas leasing in the near term. (https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf).

5 Appendices

5.1 Lease Sale Parcel List with Proposed Stipulations and Noted Deletions/Deferrals

WY-2024-06-1825 Split Estate
WY, Casper Field Office,
Bureau of Land Management,
PD
T. 36 N., R. 67 W., Sixth principal
Sec. 19 LOTS 1 thru 4;
Sec. 19
NE1/4,E1/2NW1/4,E1/2SW1/4,
N1/2SE1/4,SW1/4SE1/4;
Sec. 20
NE1/4SW1/4,NW1/4SE1/4;
Sec. 21 S1/2SW1/4;
Sec. 28 SE1/4SE1/4;
Sec. 29 E1/2;
Sec. 30 LOTS 1 thru 3;
Sec. 30
NW1/4NE1/4,E1/2NW1/4.
Converse County
1330.03 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY CFO_TLS_NR
BLM Stipulations for Nesting Raptors
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00019035

WY-2024-06-1824 Split Estate
WY, Casper Field Office,
Bureau of Land Management,
PD
T. 37 N., R. 69 W., Sixth principal
Sec. 11 E1/2;
Sec. 12
N1/2NE1/4,SW1/4NE1/4,NW1/4,SW1/4SW1/4,S1/2SE1/4.
Converse County
720 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY CFO_TLS_NR
BLM Stipulations for Nesting Raptors
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_CSU_PHMA
BLM Stipulations for Greater Sage-Grouse Priority Habitat Management Areas (PHMAs) - Core Only
WY SW_TLS_PHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Inside Priority Habitat Management Areas (Core only)
EOI# WY00019034

WY-2024-06-7296 Split Estate
WY, Buffalo Field Office,
Bureau of Land Management,
PD
T. 50 N., R. 71 W., Sixth principal
Sec. 29 LOT 11.
Campbell County
34.33 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY BFO_CSU_SE1004
BLM Stipulations for Severe Erosion Hazard
WY BFO_CSU_SLR1010
BLM Stipulations for Limited Reclamation Potential Areas
WY BFO_CSU_SSWLA4034
BLM Stipulations for Amphibian Species Breeding, Sheltering, and Hibernation Habitat
WY BFO_CSU_SSWLH4007
BLM Stipulations for Wildlife Habitat for Special Status Species

WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00019038

WY-2024-06-1835 Split Estate
WY, Casper Field Office, Bureau of Land Management, PD
T. 35 N., R. 73 W., Sixth principal
Sec. 14 NW1/4;
Sec. 22 S1/2NE1/4,S1/2SW1/4,SE1/4;
Sec. 29 N1/2NE1/4, N1/2SW1/4, S1/2SW1/4, S1/2SE1/4;
Sec. 30 LOTS 1, 4;
Sec. 30 N1/2NE1/4,NE1/4NW1/4,SE1/4 SW1/4,S1/2SE1/4.
Converse County
1117.3 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY CFO_CSU_BT3
BLM Stipulations for Bozeman Trail Cultural and Scenic Values
WY CFO_CSU_BTQTRM
BLM Stipulations for Bozeman Trail Cultural and Scenic Values
WY CFO_TLS_NR
BLM Stipulations for Nesting Raptors
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00019041

WY-2024-06-1833 Split Estate
WY, Pinedale Field Office, Bureau of Land Management, PD
T. 33 N., R. 109 W., Sixth principal
Sec. 6 LOTS 13 thru 16, 19, 20, 24 thru 26, 29.
Sublette County
72.2 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY PFO_TLS_BGCW
BLM Stipulations for Big Game Crucial Winter Range
WY PFO_TLS_BONH
BLM Stipulations for Burrowing Owl Nesting Habitat
WY PFO_TLS_RN
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_TLS_GHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Within 2 miles of an occupied lek outside Priority Habitat Management Areas
EOI# WY00019043

WY-2024-06-1836
WY, Casper Field Office, Bureau of Land Management, PD
T. 37 N., R. 68 W., SIXTH PRINCIPAL
Sec. 30 NE1/4SE1/4.
Converse County
40 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails

WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00019046

WY-2024-06-1786
WY, Buffalo Field Office, Bureau of Land Management, PD
T. 41 N., R. 71 W., SIXTH PRINCIPAL
Sec. 23 LOTS 3, 4, 12 thru 14;
Sec. 25 LOTS 1 thru 4.
Campbell County
375.22 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY BFO_CSU_CLBA2007
BLM Stipulations for Coal Lease By Application Areas
WY BFO_CSU_H20500F1014
BLM Stipulations for Surface Waters and Associated Riparian Habitats - 500 feet of springs, reservoirs, etc.
WY BFO_CSU_R500F4009
BLM Stipulations for Riparian Systems, Wetlands and Aquatic Habitats - 500 feet
WY BFO_CSU_RN4028
BLM Stipulations for Raptor Nests (Non-Special Status Species)
WY BFO_CSU_SE1004
BLM Stipulations for Severe Erosion Hazard
WY BFO_CSU_SLR1010
BLM Stipulations for Limited Reclamation Potential Areas
WY BFO_CSU_SSWLA4034
BLM Stipulations for Amphibian Species Breeding, Sheltering, and Hibernation Habitat
WY BFO_CSU_SSWLB4034
BLM Stipulations for Bat Species Breeding, Nursery, Roosting, and Hibernation Habitat
WY BFO_CSU_SSWLH4007
BLM Stipulations for Wildlife Habitat for Special Status Species
WY BFO_NSO_SSRN4032
BLM Stipulations for Raptor Nest (Special Status Species)
WY BFO_TLS_NSSRN4030
BLM Stipulations for Raptor Nests (Non-Special Status Species)
WY BFO_TLS_SSRN4031
BLM Stipulations for Raptor Nests (Special Status Species)
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018785

WY-2024-06-7294
WY, Casper Field Office, Bureau of Land Management, PD
T. 36 N., R. 74 W., SIXTH PRINCIPAL
Sec. 9 LOTS 2, 7, 10, 12, 13, 15.
Converse County
238.86 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY CFO_CSU_BT3
BLM Stipulations for Bozeman Trail Cultural and Scenic Values
WY CFO_TLS_NR
BLM Stipulations for Nesting Raptors
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_CSU_PHMA
BLM Stipulations for Greater Sage-Grouse Priority Habitat Management Areas (PHMAs) - Core Only
WY SW_TLS_PHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Inside Priority Habitat Management Areas (Core only)
EOI# WY00018956

WY-2024-06-1838 Split Estate
WY, Casper Field Office, Bureau of Land Management, PD
T. 41 N., R. 75 W., SIXTH PRINCIPAL
Sec. 26 W1/2, S1/2SE1/4.
Campbell County
400 Acres
Stipulations:
HQ-CR-1

BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY BFO_CSU_H5006
BLM Stipulations for Historic Properties Setting
WY BFO_CSU_R500F4009
BLM Stipulations for Riparian Systems, Wetlands and Aquatic Habitats - 500 feet
WY BFO_CSU_SE1004
BLM Stipulations for Severe Erosion Hazard
WY BFO_CSU_SSWLH4007
BLM Stipulations for Wildlife Habitat for Special Status Species
WY BFO_LN_UW
BLM Lease Notice for Unplugged Wellbore(s) and/or other Facilities
WY BFO_NSO_SSRN4032
BLM Stipulations for Raptor Nest (Special Status Species)
WY BFO_TLS_SSRN4031
BLM Stipulations for Raptor Nests (Special Status Species)
WY CFO_CSU_BT3
BLM Stipulations for Bozeman Trail Cultural and Scenic Values
WY CFO_CSU_BTQTRM
BLM Stipulations for Bozeman Trail Cultural and Scenic Values
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_CSU_PHMA
BLM Stipulations for Greater Sage-Grouse Priority Habitat Management Areas (PHMAs) - Core Only
WY SW_TLS_PHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Inside Priority Habitat Management Areas (Core only)
EOI# WY00017458

WY-2024-06-7295 Split Estate
WY, Lander Field Office, Bureau of Land Management, PD
T. 36 N., R. 89 W., SIXTH PRINCIPAL
Sec. 6 LOTS 3;
Sec. 6 SE1/4NW1/4.
Fremont County
59.76 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_RHTEH5018
BLM Stipulations for Regional Historic Trails and Early Highways and their Settings
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_CSU_PHMA
BLM Stipulations for Greater Sage-Grouse Priority Habitat Management Areas (PHMAs) - Core Only
WY SW_TLS_GHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Within 2 miles of an occupied lek outside Priority Habitat Management Areas
WY SW_TLS_PHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Inside Priority Habitat Management Areas (Core only)
WY SW_TLS_PHMAWCA
BLM Stipulations for Greater Sage-Grouse Winter Concentration Areas
EOI# WY00018825

WY-2024-06-1828
WY, Lander Field Office, Bureau of Land Management, PD
T. 37 N., R. 91 W., SIXTH PRINCIPAL
Sec. 32 E1/2.
Fremont County
320 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013

BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_TLS_BGCW4061
BLM Stipulations for Big Game Crucial Winter Range
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018825

WY-2024-06-1829 Split Estate
WY, Lander Field Office, Bureau of Land Management, PD
T. 38 N., R. 91 W., SIXTH PRINCIPAL
Sec. 18 LOTS 3 thru 13;
Sec. 18 S1/2NE1/4, SE1/4NW1/4, E1/2SW1/4, SE1/4;
Sec. 19 LOTS 2, 3, 6, 7.
Fremont County
855.68 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_RHTEH5018
BLM Stipulations for Regional Historic Trails and Early Highways and their Settings
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_NSO_SG25P1014
BLM Stipulations for Slopes Greater than 25 Percent
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
WY SW_TLS_GHMAL
BLM Stipulations for Greater Sage-Grouse breeding, nesting, etc. Within 2 miles of an occupied lek outside Priority Habitat Management Areas
EOI# WY00018825

WY-2024-06-1832
WY, Lander Field Office, Bureau of Land Management, PD
T. 37 N., R. 92 W., SIXTH PRINCIPAL
Sec. 18 LOTS 1 thru 4;
Sec. 18 E1/2NW1/4,E1/2SW1/4, SE1/4.
Fremont County
501.84 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails

WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018825

WY-2024-06-1834 Split Estate
WY, Lander Field Office, Bureau of Land Management, PD
T. 38 N., R. 92 W., SIXTH PRINCIPAL
Sec. 3 LOTS 1 thru 4;
Sec. 3 S1/2NE1/4,S1/2NW1/4, S1/2;
Sec. 8 S2SW;
Sec. 8 SWSE;
Sec. 8 NE1/4, N1/2NW1/4, SE1/4NW1/4, SE1/4SE1/4;
Sec. 9 S1/2SW1/4, S1/2SE1/4;
Sec. 10 NW1/4NW1/4, NE1/4SW1/4, S1/2SW1/4, SE1/4.
Fremont County
1585.33 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_RHTEH5018
BLM Stipulations for Regional Historic Trails and Early Highways and their Settings
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_NSO_SG25P1014
BLM Stipulations for Slopes Greater than 25 Percent
WY LFO_TLS_BGCW4061
BLM Stipulations for Big Game Crucial Winter Range
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018825

WY-2024-06-1840
WY, Lander Field Office, Bureau of Land Management, PD
T. 38 N., R. 92 W., SIXTH PRINCIPAL
Sec. 32 ALL.
Fremont County
640 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_RHTEH5018
BLM Stipulations for Regional Historic Trails and Early Highways and their Settings
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_PSW4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Outside of Designated Development Areas
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_TLS_BGCW4061
BLM Stipulations for Big Game Crucial Winter Range
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3

BLM Stipulations for Multiple Mineral Development
EOI# WY00018825

WY-2024-06-1841
WY, Lander Field Office, Bureau of Land Management, PD
T. 36 N., R. 93 W., SIXTH PRINCIPAL
Sec. 4 S1/2SW1/4, S1/2SE1/4;
Sec. 30 E1/2.
Fremont County
480 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_RHTEH5018
BLM Stipulations for Regional Historic Trails and Early Highways and their Settings
WY LFO_NSO_PSW4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Outside of Designated Development Areas
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_TLS_BGCW4061
BLM Stipulations for Big Game Crucial Winter Range
WY LFO_TLS_MPN4094
BLM Stipulations for Mountain Plover Nesting Habitat
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018825

WY-2024-06-1770
WY, Lander Field Office, Bureau of Land Management, PD
T. 33 N., R. 95 W., SIXTH PRINCIPAL
Sec. 17 ALL;
Sec. 20 E1/2;
Sec. 21 N1/2NE1/4, SE1/4NE1/4, N1/2NW1/4, SW1/4NW1/4, NW1/4SW1/4, SE1/4;
Sec. 27 SW1/4NE1/4, NW1/4, W1/2SW1/4, NE1/4SW1/4, N1/2SE1/4, SE1/4SE1/4;
Sec. 29 NE1/4.
Fremont County
2000 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_OPR4088
BLM Stipulations for Pygmy Rabbit Habitat
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_NSO_SG25P1014
BLM Stipulations for Slopes Greater than 25 Percent
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018128

WY-2024-06-1771
WY, Lander Field Office, Bureau of Land Management, PD
T. 33 N., R. 95 W., SIXTH PRINCIPAL
Sec. 22 E1/2;
Sec. 34 W1/2NW1/4.
Fremont County
400 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection

HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_OPR4088
BLM Stipulations for Pygmy Rabbit Habitat
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_NSO_SG25P1014
BLM Stipulations for Slopes Greater than 25 Percent
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018128

WY-2024-06-1837
WY, Lander Field Office, Bureau of Land Management, PD
T. 33 N., R. 95 W., SIXTH PRINCIPAL
Sec. 27 SW1/4SE1/4.
Fremont County
40 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
WY LFO_CSU_LRPS1013
BLM Stipulations for Limited Reclamation Potential Soils
WY LFO_CSU_PYFC5058
BLM Stipulations for Fossil Resources
WY LFO_CSU_S15TO24P1014
BLM Stipulations for Slopes between 15 and 24 Percent
WY LFO_NSO_OPR4088
BLM Stipulations for Pygmy Rabbit Habitat
WY LFO_NSO_PSWDDA4031
BLM Stipulations for Perennial Surface Waters, Riparian-Wetland Areas, and/or Playas Within Designated Development Areas
WY LFO_NSO_SG25P1014
BLM Stipulations for Slopes Greater than 25 Percent
WY LFO_TLS_RN4071
BLM Stipulations for Raptor Nests
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3
BLM Stipulations for Multiple Mineral Development
EOI# WY00018128

WY-2024-06-1823
WY, Rock Springs Field Office, Bureau of Land Management, PD
T. 24 N., R. 98 W., SIXTH PRINCIPAL
Sec. 27 SE1/4NW1/4.
Sweetwater County
40 Acres
Stipulations:
HQ-CR-1
BLM Lease Notice for Cultural Resource Protection
HQ-MLA-1
BLM Lease Notice for Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
HQ-TES-1
BLM Lease Notice for Threatened and Endangered Species Act
RSFO_CSU_Red Desert Watershed
BLM Stipulations for Red Desert Watershed
WY RSFO_LN_UW
BLM Lease Notice for Unplugged Wellbore(s) and/or other Facilities
WY STD LEASE NOTICE NO. 1
BLM Lease Notice for Reasonable Measures to Minimize Adverse Impacts to Resources
WY STD LEASE NOTICE NO. 2
BLM Lease Notice for National Historic Trails
WY STD LEASE NOTICE NO. 3
BLM Lease Notice for Greater Sage-Grouse Habitat
WY STD LEASE STIPULATION NO. 3

BLM Stipulations for Multiple
Mineral Development
EOI# WY00019032

5.2 Lease Stipulation Code Index

STIPULATION CODE	STIPULATION LANGUAGE
WY_BFO_CSU_BEGE	CSU (1) Prior to surface disturbance within 1.0 mile of consistently used bald and golden eagle winter roosts and riparian corridors a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that wintering eagles will not be disturbed (as defined by the Bald and Golden Eagle Protection Act). Bald or golden eagles will not be agitated or bothered to a degree that causes or is likely to cause physical injury, or a decrease in productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) protecting bald and golden eagle winter roosting habitat.
WY_BFO_CSU_BGCW	CSU (1) Prior to surface disturbance within Wyoming Game and Fish Department designated big game crucial winter range, a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that the function and suitability of crucial big game winter ranges will not be impaired; (2) as mapped by the Wyoming Game and Fish Department; (3) ensuring the function and suitability of crucial big game winter range.
WY_BFO_CSU_C100F	CSU (1) Prior to surface disturbance or disruptive activities near an entrance to a significant cave a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM Authorized Officer's satisfaction that the action will not destroy, disturb, deface, mar, alter, remove, or harm any significant cave or alter the free movement of any animal or plant life into or out of any significant cave; (2) as mapped by the BLM; (3) protecting significant cave resources (any material or substance occurring naturally in caves, such as animal life, plant life, paleontological deposits, sediments, minerals, speleogens, and speleothems).
WY_BFO_CSU_CLBA	CSU (1) Surface use or occupancy shall not be allowed by oil and gas lessee(s), operating rights holder(s), and/or oil and gas operator(s) on this Federal oil and gas lease to conduct any oil and gas operation, including drilling for, removing, or disposing of oil and/or gas contained in Federal coal lease(s) unless a plan for mitigation of anticipated impacts is developed between the oil and gas and the coal lessees, and the Plan is approved by the BLM Authorized Officer; (2) on areas identified as highly likely to be considered in a Coal Lease By Application as mapped by the US Office of Surface Mining, Wyoming Department of Environmental Quality, US Geological Survey, and/or BLM; (3) protecting the first in time valid existing rights of the coal lessee, the BLM Authorized Officer reserves the right to alter or modify any oil and gas operations on the lands described in this lease ensuring the orderly development of the coal resource by surface and/or

STIPULATION CODE	STIPULATION LANGUAGE
	underground mining methods, coal mine worker safety, and/or coal production rates or recovery of the coal resource. The oil and gas lessee(s), operating rights holder(s), and/or oil and gas operator(s) of this Federal oil and gas lease shall not hold the United States as lessor, coal lessee(s), sub-lessee(s), and/or coal operator(s) liable for any damage or loss of the oil and gas resource, including the venting of coalbed natural gas, caused by coal exploration or mining operations conducted on Federal coal lease.
WY_BFO_CSU_EC	CSU (1) Prior to surface disturbance within Wyoming Game and Fish Department designated elk calving areas a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that the function and suitability of elk calving areas will not be impaired; (2) as mapped by the Wyoming Game and Fish Department; (3) ensuring the function and suitability of elk calving areas.
WY_BFO_CSU_ECWC	CSU (1) Fluid mineral production and byproducts shall be piped out of, and permanent above ground facilities will be located outside of, Wyoming Game and Fish Department designated elk crucial winter range and calving areas unless a mitigation plan (Plan) is submitted by the applicant and approved by the BLM as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that the function and suitability of elk crucial winter range and elk calving areas will not be impaired; (2) as mapped by the Wyoming Game and Fish Department; (3) ensuring the function and suitability of elk crucial winter range and elk calving areas.
WY_BFO_CSU_FCR	CSU (1) Surface-disturbing and disruptive activities shall only be approved with adequate mitigation to ensure compliance with the Fortification Creek Resources Management Plan Amendment (BLM 2011) performance standards. Prior to surface disturbance within the Fortification Creek Planning Area a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface- disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate); (2) within the Fortification Creek Planning Area (Map 3- 36); (3) protecting the viability of the Fortification elk herd and facilitating ecosystem reconstruction in the stabilization of disturbed areas.
WY_BFO_CSU_FQM	CSU (1) Prior to surface disturbance within 0.25 mile of naturally occurring water bodies containing native or desirable non-native fish species a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that there will not be a local decline in fish abundance or range as a result of the lease operations. Examples of a few of the items to consider are as follows. Spill prevention measures must be used to ensure hydrocarbons and other potentially toxic substances used for lease activities are prevented from

STIPULATION CODE	STIPULATION LANGUAGE
	entering the watercourse. Sediment control measures must be used to ensure increased sediment contributions are avoided; (2) as mapped by the Wyoming Game and Fish Department and/or BLM; (3) protecting native and desirable non-native fish populations and habitat.
WY_BFO_CSU_GSGRH	CSU (1) All applicable surface disturbances (existing or future, and not limited to fluid mineral disturbances) must be restored, as described in the Buffalo Field Office Resource Management Plan, to the approval of the BLM Authorized Officer; (2) Greater Sage-Grouse Core Population Areas and Connectivity Corridors (Priority Habitat) as mapped on the Buffalo Field Office GIS database; (3) to restore functional Greater Sage-Grouse habitat to support core Greater Sage-Grouse populations.
WY_BFO_CSU_H	CSU (1) Prior to surface disturbance within 3 miles of the Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, and Crazy Woman Battle historic properties, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, and all Native American burials, a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan or approved it with conditions after consultation with the State Historic Preservation Office, applicable Indian tribes, and other interested parties. The Plan must demonstrate to the Authorized Officer's satisfaction that there will be no adverse effects to National Register of Historic Places eligible or listed historic properties (i.e., the infrastructure will either not be visible or will result in a weak contrast rating); (2) as mapped on the Buffalo Field Office GIS database; (3) ensuring the setting of historic properties.
WY_BFO_CSU_H20500F	CSU (1) Prior to surface disturbance within 500 feet of springs, reservoirs not associated with coal bed natural gas projects, water wells, and perennial streams a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM Authorized Officer's satisfaction how the operator will meet the following performance standards. Storm water and surface runoff will be controlled to minimize erosion (rilling, gullying, piping, mass wasting) and offsite siltation during construction, use/operations, and reclamation. Offsite areas will be protected from accelerated soil erosion. The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation; (2) as mapped by the US Geological Survey's National Hydrologic Inventory and/or as determined by a BLM evaluation of the area; (3) ensuring protection of surface waters and associated riparian habitats by meeting the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office Resource Management Plan Record of Decision.
WY_BFO_CSU_PD	CSU (1) Prior to surface disturbance within active prairie dog colonies on BLM- administered surface a special status species occupancy survey must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's

STIPULATION CODE	STIPULATION LANGUAGE
	satisfaction that activities with active prairie dog colonies on BLM surface would not adversely impact suitable habitat for special status species dependent upon prairie dog colonies; (2) as mapped or determined on the Buffalo Field Office GIS database or from field evaluation, in coordination with the US Fish and Wildlife Service and Wyoming Game and Fish Department; (3) conserving special status species wildlife and the prairie dog colonies on which they depend.
WY_BFO_CSU_PHMAC	CSU (1) Surface occupancy or use will be restricted. The cumulative value of all applicable surface disturbances, existing or future, must not exceed 5 percent of the Disturbance Density Calculation Tool (DDCT) area, as described in the DDCT manual; (2) as mapped on the Buffalo Field Office GIS database; (3) to protect Greater Sage-Grouse designated Priority Habitat Management Areas (Connectivity only) from habitat fragmentation and loss. This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated PHMAs (Connectivity only).
WY_BFO_CSU_R500F	CSU (1) Prior to surface disturbance within 500 feet of riparian systems, wetlands, and aquatic habitats a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface- disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM Authorized Officer's satisfaction how the operator will meet the following performance standards. Storm water and surface runoff will be controlled to minimize erosion (rilling, gullying, piping, mass wasting) and offsite siltation during construction, use/operations, and reclamation. Offsite areas will be protected from accelerated soil erosion. The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation; (2) as mapped by the US Geological Survey's National Hydrologic Inventory and/or as determined by a BLM evaluation of the area; (3) ensuring protection of surface waters and associated riparian habitats by meeting the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office Resource Management Plan Record of Decision.
WY_BFO_CSU_RN	CSU (1) Prior to surface disturbance within US Fish and Wildlife Service recommended spatial buffers of raptor nests a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that nesting raptors will not be disturbed. Nesting raptors will not be agitated or bothered to a degree that causes or is likely to cause physical injury, a decrease in productivity by substantially interfering with normal breeding, feeding, or sheltering behavior, or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior; (2) as mapped on the Buffalo Field Office GIS database or determined by the BLM from field evaluation in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring raptor productivity.
WY_BFO_CSU_SE	CSU (1) Prior to surface disturbance on soils with a severe erosion hazard rating a site- specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the

STIPULATION CODE	STIPULATION LANGUAGE
	Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM Authorized Officer's satisfaction how the operator will meet the following performance standards. The disturbed area will be stabilized with no evidence of accelerated erosion features. The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation; (2) as mapped by the Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) Order 3 soil survey and/or as determined by a BLM evaluation of the area; (3) ensuring successful reclamation and erosion control on soils with a severe erosion hazard rating in order to meet the standards outlined in Chapter 6 the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office Resource Management Plan Record of Decision.
WY_BFO_CSU_Slopes25to50	CSU (1) Prior to surface disturbance on slopes greater than 25% and less than 50% a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM Authorized Officer's satisfaction how the operator will meet the following performance standards. Slope stability is maintained preventing slope failure or mass wasting. The disturbed area will be stabilized with no evidence of accelerated erosion features. The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation; (2) as mapped by the US Geological Survey (USGS) 1:24,000 scale topographic maps, USGS Digital Elevation Models, and/or as determined by a BLM evaluation of the area; (3) ensuring successful reclamation and erosion control on slopes greater than 25% and less than 50% in order to meet the standards outlined in Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office Resource Management Plan Record of Decision.
WY_BFO_CSU_SLR	CSU (1) Prior to surface disturbance on limited reclamation potential areas a site- specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM

STIPULATION CODE	STIPULATION LANGUAGE
	Authorized Officer's satisfaction how the operator will meet the following performance standards. The disturbed area will be stabilized with no evidence of accelerated erosion features. The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. Slope stability is maintained preventing slope failure and erosion. Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation; (2) as mapped by the Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) Order 3 soil survey and as determined by a BLM evaluation of the area; (3) ensuring successful reclamation and erosion control on limited reclamation potential areas in order to meet the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office Resource Management Plan Record of Decision.
WY_BFO_CSU_SSP	CSU (1) Prior to surface disturbance within Ute ladies'-tresses orchid habitat flowering season survey(s) must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that Ute ladies'- tresses orchids will not be harmed and that the habitat on which they depend will be conserved; (2) as mapped or determined by the US Fish and Wildlife Service, Wyoming Natural Diversity Database, the Buffalo Field Office GIS database, or from field evaluation; (3) conserving Ute ladies'-tresses orchids and the habitat on which they depend.
WY_BFO_CSU_SSPF	CSU (1) Prior to surface disturbance within special status plant species habitats, flowering season surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that special status plant species will not be harmed and that the habitat on which they depend will be conserved; (2) as mapped or determined by the US Fish and Wildlife Service, Wyoming Natural Diversity Database, the Buffalo Field Office GIS database, or from field evaluation; (3) conserving special status plant species and the habitat on which they depend.
WY_BFO_CSU_SSWLA	CSU (1) Prior to surface disturbance within 1,640 feet (500 meters) of perennial water, vernal pools, playas, and wetlands appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan or approved it with conditions. The Plan must demonstrate to the Authorized Officer's satisfaction that special status amphibian species will not be disturbed to a degree that causes or is likely to cause physical injury, a decrease in productivity by substantially interfering with normal breeding, sheltering, or hibernation behavior, or site abandonment by substantially interfering with normal

STIPULATION CODE	STIPULATION LANGUAGE
	breeding, sheltering, or hibernation behavior; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring production of special status amphibian species breeding, sheltering, and hibernation habitat.
WY_BFO_CSU_SSWLB	CSU (1) Prior to surface disturbance within 1,640 feet (500 meters) of cave entrances, mature forest, and rock outcrops appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan or approved it with conditions. The Plan must demonstrate to the Authorized Officer's satisfaction that special status bat species will not be disturbed to a degree that causes or is likely to cause physical injury, a decrease in productivity by substantially interfering with normal breeding, nursery, roosting, or hibernation behavior, or site abandonment by substantially interfering with normal breeding, nursery, roosting, or hibernation behavior; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring protection of special status bat species breeding, nursery, roosting, and hibernation habitat.
WY_BFO_CSU_SSWLH	CSU (1) Prior to surface disturbance within special status species wildlife habitat an occupancy survey must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that special status wildlife species will not be harmed (any act which actually kills or injures wildlife including habitat modification or degradation that substantially impairs essential behavioral patterns) and that the habitat on which they depend will be conserved; (2) as mapped or determined by the US Fish and Wildlife Service, Wyoming Game and Fish Department, Wyoming Natural Diversity Database, or BLM from field evaluation; (3) conserving special status species wildlife and the habitat on which they depend (BLM 2008 -6840 manual).
WY_BFO_CSU_SSWLR	CSU (1) Prior to surface disturbance within 1,640 feet (500 meters) of south facing rock outcrops, perennial water, vernal pools, playas, and wetlands appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan or approved it with conditions. The Plan must demonstrate to the Authorized Officer's satisfaction that special status reptile species will not be disturbed to a degree that causes or is likely to cause physical injury, a decrease in productivity by substantially interfering with normal breeding, basking, sheltering, or hibernation behavior, or site abandonment by substantially interfering with normal breeding, basking, sheltering, or hibernation behavior; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring production of special status reptile species breeding, basking, sheltering, and hibernation habitat.

STIPULATION CODE	STIPULATION LANGUAGE
WY_BFO_CSU_STG	CSU (1) Prior to surface disturbance within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that the function and suitability of sharp-tailed grouse breeding habitat will not be impaired (result in physical injury, a decrease in productivity by substantially interfering with normal breeding, feeding, or sheltering behavior, or lek abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior); (2) as mapped by the Wyoming Game and Fish Department; (3) ensuring the function and suitability of sharp-tailed grouse breeding habitat.
WY_BFO_CSU_TCP	CSU (1) Prior to surface disturbance within 3 miles of traditional cultural properties a mitigation plan (Plan) must be submitted by the applicant. The Plan must be approved or approved with conditions by the BLM Authorized Officer prior to surface-disturbing activities after consultation with the State Historic Preservation Office, applicable Indian tribes, and other interested parties. The Plan must demonstrate there will be no adverse effects to National Register of Historic Places eligible or listed historic properties (i.e., proposed infrastructure is either not visible or will result in a weak contrast rating); (2) as mapped on the Buffalo Field Office GIS database; (3) ensuring the setting of traditional cultural properties.
WY_BFO_CSU_VRMII	CSU (1) Prior to surface disturbance within Visual Resource Management (VRM) Class 2 areas, a site-specific plan must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the plan (with conditions, as appropriate). The plan must demonstrate to the BLM Authorized Officer's satisfaction how the operator will meet the following performance standards. A visual contrast rating must demonstrate that VRM Class 2 objectives will be met. Where required by the BLM Authorized Officer, a visual simulation must be prepared and must demonstrate that VRM Class 2 objectives will be met through practices such as siting of permanent facilities. Where present and feasible, existing surface disturbances shall be utilized. New surface disturbances shall be minimized to the extent practicable. All permanent above-ground facilities (such as production tanks or other production facilities) not having specific coloration requirements for safety must be painted or designed using a BLM- approved color; (2) as mapped on the Buffalo Field Office GIS database; (3) protecting VRM Class 2 areas.
WY_BFO_CSU_WHSRMA	CSU (1) Prior to surface disturbance within Special Recreation Management Areas (SRMAs) available for leasing (Weston Hills) a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the Application for Permit to Drill (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM Authorized Officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the Authorized Officer's satisfaction that the proposed action is consistent with the prescribed management for the SRMA; (2) as mapped or determined by BLM; (3) ensuring the recreational opportunities and setting of the SRMA.
WY_BFO_NSO_BEGE	NSO (1) Within 0.5 miles from the edge of consistently used bald or golden eagle winter roosts and Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River, consistently used riparian corridors, as

STIPULATION CODE	STIPULATION LANGUAGE
	mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (2) protecting wintering bald and golden eagles.
WY_BFO_NSO_BEN	NSO (1) Within 0.5 mile of bald eagle nests as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (2) ensuring productivity of bald eagles.
WY_BFO_NSO_BGHMA	NSO (1) Within Wyoming Game and Fish Department Big Game Habitat Management Areas (Ed O. Taylor, Kerns, Bud Love, and Amsden Creek) as mapped by the Wyoming Game and Fish Department; (2) ensuring the function and suitability of Wyoming Game and Fish Department Big Game Habitat Management Areas.
WY_BFO_NSO_H	NSO (1) Within the Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, and Crazy Woman Battle historic properties, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, all Native American burials; as mapped on the Buffalo Field Office GIS database; (2) protecting historic properties.
WY_BFO_NSO_HIP	NSO (1) No surface occupancy or use is allowed on lands containing paleontological resources of high quality or importance as mapped on the Buffalo Field Office GIS database; (2) protecting paleontological resources of high quality or importance.
WY_BFO_NSO_PBACEC	NSO (1) Within the Pumpkin Buttes Area of Critical Environmental Concern as mapped or determined by BLM; (2) protecting the relevant and important values.
WY_BFO_NSO_Slopes50	NSO (1) On slopes greater than 50% as mapped by the US Geological Survey 1:24,000 scale topographic maps, US Geological Survey Digital Elevation Models, and/or as determined by a BLM evaluation of the area; (2) preventing mass slope failure and accelerated erosion.
WY_BFO_NSO_SSF	NSO (1) Within 0.25 mile of any waters containing special status fish species as mapped on the Buffalo Field Office GIS database or from field evaluation, in consultation with the Wyoming Game and Fish Department; (2) protecting special status fish populations and habitat.
WY_BFO_NSO_SSP	NSO (1) Within special status species plant populations as mapped on the Buffalo Field Office GIS database, or determined by BLM from field evaluation, in coordination with the Wyoming Natural Diversity Database and/or US Fish and Wildlife Service; (2) protecting special status species plant populations.
WY_BFO_NSO_SSRN	NSO (1) Within a species specific spatial buffer of special status species raptor nests using US Fish and Wildlife Service Wyoming Ecological Service's recommendations (Appendix Q (p. 633) or www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (2) protecting nest sites of special status raptors.
WY_BFO_NSO_TCP	NSO (1) On lands containing traditional cultural properties as mapped on the Buffalo Field Office GIS database; (2) protecting traditional cultural properties.
WY_BFO_TLS_BEN	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted from Feb 1 to Aug 15 within 1.0 mile of active bald eagle nests; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring productivity of bald eagles.

STIPULATION CODE	STIPULATION LANGUAGE
WY_BFO_TLS_BGCWEC	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted from Nov 15 to Apr 30 within big-game crucial winter range, or from May 1 to Jun 15 within elk calving areas (Wyoming Game and Fish Department 2009); (2) as mapped by the Wyoming Game and Fish Department and evaluated by the BLM; (3) ensuring the function and suitability of crucial big game winter ranges.
WY_BFO_TLS_EC	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted from May 1 to Jun 15 within elk calving areas (Wyoming Game and Fish Department 2009); (2) as mapped by the Wyoming Game and Fish Department and evaluated by the BLM; (3) ensuring the function and suitability of elk calving areas.
WY_BFO_TLS_EWR	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted from Nov 1 to Apr 1 within 1.0 mile from the edge of consistently used eagle winter roosts and the following consistently used riparian corridors: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) protecting roosting eagles.
WY_BFO_TLS_NSSRN	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted within the US Fish and Wildlife Service Wyoming Ecological Service's recommended spatial buffers and dates of active non-special status species raptor nests. (Appendix Q (p. 633) or www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html); (2) as mapped on the Buffalo Field Office GIS database or determined by BLM from field evaluation in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring raptor nest productivity.
WY_BFO_TLS_PHMAC	TLS (1) Mar 15 to Jun 30; (2) as mapped on the Buffalo Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse breeding, nesting and early brood-rearing habitats (independent of habitat suitability) inside Priority Habitat Management Areas (Connectivity only), within 4 miles of an occupied lek.
WY_BFO_TLS_PHMAL	TLS (1) Mar 15 to Jun 30; (2) as mapped on the Buffalo Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse breeding, nesting and early brood-rearing habitats (independent of habitat suitability) inside designated Priority Habitat Management Areas (Core only). Where credible data support different timeframes for this restriction, dates may be expanded by 14 days prior or subsequent to the above dates.
WY_BFO_TLS_PHMAWCA	TLS (1) Dec 1 to Mar 14; (2) as mapped on the Buffalo Field Office GIS database; (3) to seasonally protect Greater Sage-Grouse winter concentration areas in designated Priority Habitat Management Areas (Core and Connectivity), and outside designated PHMAs (Core and Connectivity) when supporting wintering Greater Sage-Grouse that attend leks within designated PHMAs (Core only).
WY_BFO_TLS_SSRN	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted within US Fish and Wildlife Service recommended spatial buffers and dates (Appendix Q (p. 633) or www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) of active raptor nests of special status species; (2) as mapped on the Buffalo Field Office GIS database or determined by field evaluation, in coordination with the Wyoming Game and Fish Department and/or US Fish and Wildlife Service; (3) ensuring productivity of nesting special status raptors.

STIPULATION CODE	STIPULATION LANGUAGE
WY_BFO_TLS_STG	TLS (1) Surface-disturbing and disruptive activities are prohibited or restricted from Apr 1 to Jul 15 (Wyoming Game and Fish Department 2009) within 2 miles of the perimeter of occupied sharp-tailed grouse leks; (2) as mapped by the Wyoming Game and Fish Department and evaluated by the BLM; (3) ensuring the function and suitability of sharp-tailed grouse nesting habitat.
WY_LFO_CSU_BRMLP2024	CSU (1) Surface occupancy or use will be restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting unique plant communities, cultural sites, viewshed, geologic resources, wild horse migration routes, and riparian-wetland resources of the Beaver Rim Master Leasing Plan analysis area.
WY_LFO_CSU_LRPS1013	CSU (1) Surface occupancy or use will be restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting limited reclamation potential soils.
WY_LFO_CSU_PYFC5058	CSU (1) Surface use or occupancy is restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting fossil resources within designated “very high” or “high” potential fossil yield classification areas.
WY_LFO_CSU_RHTEH5018	CSU (1) Surface use or occupancy will be restricted within a 2-mile buffer of Regional Historic Trails and Early Highways; (2) as mapped on the Lander Field Office GIS database; (3) protecting the Regional Historic Trails and Early Highways and their settings.
WY_LFO_CSU_S15TO24P1014	CSU (1) Surface occupancy or use will be restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting areas containing slopes between 15 and 24 percent.
WY_LFO_CSU_SR6124	CSU (1) Surface use or occupancy is restricted within the Sweetwater Rocks viewshed; (2) as mapped on the Lander Field Office GIS database; (3) protecting the Sweetwater Rocks periphery.
WY_LFO_CSU_VRM5066	CSU (1) Surface occupancy or use is restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting VRM Class I and II areas.
WY_LFO_CSU1048	CSU (1) Surface occupancy and use will be restricted; (2) as mapped on the Lander field Office GIS database; (3) protecting 100-year floodplains and riparian-wetland areas.
WY_LFO_CSU2024	CSU (1) Surface occupancy and use will be restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting 100-year floodplains within the Beaver Rim Master Leasing Plan analysis area.
WY_LFO_CSU5025	CSU (1) Surface use or occupancy will be restricted; (2) as mapped on the Lander Field Office GIS database; (3) protecting the Cedar Ridge Traditional Cultural Property periphery.
WY_LFO_NSO_ACEC7059	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting the relevant and important Area of Critical Environmental Concern values.
WY_LFO_NSO_BRH4095	NSO (1) Within 0.25-mile of identified bat maternity roosts and hibernation sites as mapped on the Lander Field Office GIS database; (2) protecting bat maternity roosts and hibernation sites.
WY_LFO_NSO_BRMLP2024	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting unique plant communities, cultural sites, viewshed, and geologic resources in the Beaver Rim Master Leasing Plan area.
WY_LFO_NSO_CG5034	NSO (1) as mapped on the Lander Field Office GIS database; (2) protecting the Castle Gardens cultural site and periphery.
WY_LFO_NSO_HTAC4045	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting wildlife, cultural resources, viewshed, and/or recreational use(s) in the Hudson to Atlantic City area.
WY_LFO_NSO_NTMC7002	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting Congressionally Designated Trails and their settings.
WY_LFO_NSO_OPR4088	NSO (1) Within 200 feet of occupied pygmy rabbit habitat, as mapped in the Lander Field Office GIS database; (2) protecting pygmy rabbit habitat.

STIPULATION CODE	STIPULATION LANGUAGE
WY_LFO_NSO_PSW4031	NSO (1) Within 500 feet of perennial surface waters, riparian-wetland areas, and/or playas, as mapped on the Lander Field Office GIS database; (2) protecting perennial surface waters, riparian-wetland areas, and/or playas outside of Designated Development Areas.
WY_LFO_NSO_PSWDDA4031	NSO (1) Within 500 feet of perennial surface waters, riparian-wetland areas, and/or playas, as mapped on the Lander Field Office GIS database; (2) protecting perennial surface waters, riparian-wetland areas, and/or playas within Designated Development Areas.
WY_LFO_NSO_REC6086	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting developed recreation sites.
WY_LFO_NSO_SG25P1014	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting areas containing slopes greater than 25 percent.
WY_LFO_NSO_YERMO4084	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting desert yellowhead population management areas.
WY_LFO_NSO1045	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting identified sole source aquifers.
WY_LFO_NSO2024	NSO (1) As mapped on the Lander Field Office GIS database; (2) protecting 100-year floodplains within the Beaver Rim Master Leasing Plan analysis area.
WY_LFO_TLS_PHMAWCA	TLS (1) Dec 1 to Mar 14; (2) as mapped on the Lander Field Office GIS database; (3) seasonally protecting Greater Sage-Grouse winter concentration areas.
WY_LFO_TLS_RN4071	TLS (1) Within 1 mile of bald eagle and ferruginous hawk nests and 0.75-mile of all other active raptor nests during the following time periods, Apr 1 to Aug 31 for northern goshawk, Apr 1 to Sep 15 for burrowing owl, Feb 1 to Aug 15 for bald and/or golden eagles, and Feb 1 to Jul 31 for all other raptors; (2) as mapped on the Lander Field Office GIS database; (3) protecting active raptor nests.
WY_NFO_CSU_PHMAC	CSU (1) Surface occupancy or use will be restricted. The cumulative value of all applicable surface disturbances, existing or future, must not exceed 5 percent of the Disturbance Density Calculation Tool (DDCT) area, as described in the DDCT manual; (2) as mapped on the Newcastle Field Office GIS database; (3) to protect Greater Sage-Grouse designated Priority Habitat Management Areas (Connectivity only) from habitat fragmentation and loss. This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated PHMAs (Connectivity only). The surface occupancy restriction criteria identified in this stipulation may preclude surface occupancy and may be beyond the ability of the lessee to meet due to existing surface disturbance on Federal, State, or private lands within designated PHMAs (Connectivity only) or surface disturbance created by other land users. The BLM may require the lessee or operator to enter into a unit agreement or drilling easement to facilitate the equitable development of this and surrounding leases.
WY_NFO_TLS_PHMAC	TLS (1) Mar 15 to Jun 30; (2) as mapped on the Newcastle Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse breeding, nesting and early brood-rearing habitats (independent of habitat suitability) inside Priority Habitat Management Areas (Connectivity only), within 4 miles of an occupied lek.
WY_SW_CSU_PHMA	CSU (1) Surface occupancy or use will be restricted to no more than an average of one disturbance location per 640 acres using the Disturbance Density Calculation Tool (DDCT), and the cumulative value of all applicable surface disturbances, existing or future, must not exceed 5 percent of the DDCT area, as described in the DDCT manual; (2) as mapped on the

STIPULATION CODE	STIPULATION LANGUAGE
	applicable Field Office GIS database; (3) to protect Greater Sage-Grouse designated Priority Habitat Management Areas (Core only) from habitat fragmentation and loss. This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated PHMAs (Core only). The surface occupancy restriction criteria identified in this stipulation may preclude surface occupancy and may be beyond the ability of the lessee to meet due to existing surface disturbance on Federal, State, or private lands within designated PHMAs (Core only) or surface disturbance created by other land users. The BLM may require the lessee or operator to enter into a unit agreement or drilling easement to facilitate the equitable development of this and surrounding leases.
WY_SW_NSO_GHMAL	NSO (1) As mapped on the applicable Field Office GIS database; (2) to protect occupied Greater Sage-Grouse leks and associated seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse in proximity to leks from habitat fragmentation and loss, and protect Greater Sage-Grouse populations from disturbance within a 0.25-mile radius of the perimeter of occupied Greater Sage- Grouse leks outside designated Priority Habitat Management Areas (Core and Connectivity).
WY_SW_NSO_PHMAL	NSO (1) As mapped on the applicable Field Office GIS database; (2) to protect occupied Greater Sage-Grouse leks and associated seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse in proximity to leks from habitat fragmentation and loss, and protect Greater Sage-Grouse populations from disturbance within a 0.6-mile radius of the perimeter of occupied Greater Sage- Grouse leks inside designated Priority Habitat Management Areas (Core and Connectivity).
WY_SW_TLS_GHMAL	TLS (1) Mar 15 to Jun 30; (2) as mapped on the applicable Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse breeding, nesting and early brood-rearing habitats outside designated Priority Habitat Management Areas (Core and Connectivity), within 2 miles of an occupied lek.
WY_SW_TLS_PHMAL	TLS (1) Mar 15 to Jun 30; (2) as mapped on the applicable Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse breeding, nesting and early brood-rearing habitats (independent of habitat suitability) inside designated Priority Habitat Management Areas (Core only).
WY_SW_TLS_PHMAWCA	TLS (1) Dec 1 to Mar 14; (2) as mapped on the applicable Field Office GIS database; (3) no surface use to seasonally protect Greater Sage-Grouse winter concentration areas in designated Priority Habitat Management Areas (Core only), and outside designated PHMAs (Core only) when supporting wintering Greater Sage-Grouse that attend leks within designated PHMAs (Core only).

Lease Notices and Stipulations

Lease Notice No. 1 – Reasonable Measures to Minimize Adverse Impacts to Resources (applies to all parcels)
Under Regulation 43 CFR 3101.1-2 and terms of the lease (BLM Form 3100-11), the authorized officer may require reasonable measures to minimize adverse impacts to other resource values, land uses, and users not addressed in lease stipulations at the time operations are proposed. Such reasonable measures may include, but are not limited to, modification of siting or design of facilities, timing of operations, and specification of interim and final reclamation measures, which may require relocating proposed operations up to 200 meters, but not off the leasehold, and prohibiting surface disturbance activities for up to 60 days.

The lands within this lease may include areas not specifically addressed by lease stipulations that may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special

areas will be strictly controlled or, if absolutely necessary, prohibited. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells.

1. Slopes in excess of 25 percent.
2. Within 500 feet of surface water and/or riparian areas.
3. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.
4. Within 500 feet of Interstate highways and 200 feet of other existing rights-of-way (i.e., U.S. and State highways, roads, railroads, pipelines, powerlines).
5. Within 1/4 mile of occupied dwellings.
6. Material sites

GUIDANCE: The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when one or more of the above conditions exist, surface disturbing activities will be prohibited unless or until the permittee or the designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action. Specific threshold criteria (e.g., 500 feet from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level (i.e., "surface water and/or riparian areas" may include both intermittent and ephemeral water sources or may be limited to perennial surface water). The referenced oil and gas leases on these lands are hereby made subject to the stipulation that the exploration or drilling activities will not interfere materially with the use of the area as a materials site/free use permit. At the time operations on the above lands are commenced, notification will be made to the appropriate agency. The name of the appropriate agency may be obtained from the proper BLM Field Office.

Lease Notice No. 2 – National Historic Trails (applies to all parcels)
BACKGROUND: The Bureau of Land Management (BLM), by including National Historic Trails within its National Landscape Conservation System, has recognized these trails as national treasures. Our responsibility is to review our strategy for management, protection, and preservation of these trails. The National Historic Trails in Wyoming, which include the Oregon, California, Mormon Pioneer, and Pony Express Trails, as well as the Nez Perce Trail, were designated by Congress through the National Trails System Act (P.L. 90-543; 16 U.S.C. 1241-1251) as amended through P.L. 106-509 dated November 13, 2000. Protection of the National Historic Trails is normally considered under the National Historic Preservation Act (P.L. 89-665; 16 U.S.C. 470 et seq.) as amended through 1992 and the National Trails System Act. Additionally, Executive Order 13195, “Trails for America in the 21st Century,” signed January 18, 2001, states in Section 1: “Federal agencies will...protect, connect, promote, and assist trails of all types throughout the United States. This will be accomplished by: (b) Protecting the trail corridors associated with national scenic trails and the high priority potential sites and segments of national historic trails to the degrees necessary to ensure that the values for which each trail was established remain intact.” Therefore, the BLM will be considering all impacts and intrusions to the National Historic Trails, their associated historic landscapes, and all associated features, such as trail traces, grave sites, historic encampments, inscriptions, natural features frequently commented on by emigrants in journals, letters and diaries, or any other feature contributing to the historic significance of the trails. Additional National Historic Trails will likely be designated amending the National Trails System Act. When these amendments occur, this notice will apply to those newly designated National Historic Trails as well.

STRATEGY: The BLM will proceed in this objective by conducting a viewshed analysis on either side of the designated centerline of the National Historic Trails in Wyoming, except, at this time, for the Nez Perce Trail, for the purpose of identifying and evaluating potential impacts to the trails, their associated historic landscapes, and their associated historic features. Subject to the viewshed analysis and archaeological inventory, reasonable mitigation measures may be applied. These may include, but are not limited to, modification of siting or design of facilities to camouflage or otherwise hide the proposed operations within the viewshed. Additionally, specification of interim and final reclamation measures may require relocating the proposed operations within the leasehold.

Surface disturbing activities will be analyzed in accordance with the National Environmental Policy Act of 1969 (P.L. 91- 190; 42 U.S.C. 4321-4347) as amended through P.L. 94-52, July 3, 1975 and P.L. 94-83, August 9, 1975, and the National Historic Preservation Act, supra, to determine if any design, siting, timing, or reclamation

requirements are necessary. This strategy is necessary until the BLM determines that, based on the results of the completed viewshed analysis and archaeological inventory, the existing land use plans (Resource Management Plans) have to be amended. The use of this lease notice is a pre-decisional action, necessary until final decisions regarding surface disturbing restrictions are made. Final decisions regarding surface disturbing restrictions will take place with full public disclosure and public involvement over the next several years if BLM determines that it is necessary to amend existing land use plans.

GUIDANCE: The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when any oil and gas lease contains remnants of National Historic Trails, or is located within the viewshed of a National Historic Trails' designated centerline, surface disturbing activities will require the lessee, permittee, operator or, their designated representative, and the surface management agency (SMA) to arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Lease Notice No. 3 – Greater Sage-Grouse Habitat (applies to all parcels)
Greater Sage-Grouse Habitat: The lease may in part, or in total, contain important Greater sage-grouse habitats as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on the Greater sage-grouse populations and habitat quality. Such measures shall be developed during the Application for Permit to Drill (APD) on-site and environmental review process and will be consistent with the lease rights granted.

Lease Notice 1041 – Water Monitoring Plans
Lease Notice. Require water monitoring plans for new activities resulting in surface discharges of water to track changes in receiving channels and to minimize adverse impacts to watershed health. If adverse impacts to receiving channels or watershed health occur, require development and implementation of water management plans which include reclamation strategies and mitigation to address impacts. Avoid BLM-authorized activities and infrastructure such as unlined impoundment ponds/pits, reserve pits, and evaporation ponds that could result in the contamination of sensitive water resources, including Source Water Protection Areas identified in Wellhead or Source Water Protection Plans approved local governing bodies and "High" and "Moderately High" sensitivity aquifer systems identified through the use of the Wyoming Groundwater Vulnerability Assessment Handbook or similar document as updated over time to the maximum extent possible. Where such activities or infrastructure cannot be avoided, apply mitigation to reduce potential impacts on a case-by-case basis.

WY Std Special Lease Notice II – Big Game Migration
Special Lease Notice: This parcel is located wholly or partially within a big game migration corridor designated by the State of Wyoming. The lessee or their designated operator will be required to work with the BLM and the State of Wyoming to take reasonable measures (see 43 CFR 3101.1-2) to maintain big game migration corridor functionality pursuant to State of Wyoming Executive Order 2020-1. The BLM will encourage the use of Master Development Plans for operations proposed on this lease parcel in accordance with Onshore Oil and Gas Order No. 1.

Special Lease Notice – Unplugged Well Bore
Unplugged wellbore(s) and/or other facilities are located on this parcel. For more information, please contact a Petroleum Engineer at the [insert office name] Field Office at (307) [insert phone number].

HQ-CR-1 – Cultural Resource Protection (applies to all parcels)
This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

HQ-MLA-1 – Notice to Lessee Concerning Mineral Leasing Act Section 2(a)(2)(A)
Provisions of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976, affect an entity's qualifications to obtain an oil and gas lease. Section 2(a)(2)(A) of the MLA, 30 U.S.C. 201(a)(2)(A), requires that any entity that holds and has held a Federal Coal Lease for 10 years beginning on or after August 4, 1976, and that is not producing coal in commercial quantities from each such lease cannot qualify for the issuance of any other lease granted under the MLA. 43 CFR 3472 explains coal lessee compliance with Section 2(a)(2)(A).

In accordance with the terms of this oil and gas lease with respect to compliance by the initial lessee with qualifications concerning Federal coal lease holdings, all assignees and transferees are hereby notified that this oil and gas lease is subject to cancellation if: (1) the initial lessee as assignor or as transferor has falsely certified compliance with Section 2(a)(2)(A) because of a denial or disapproval by a State Office of a pending coal action, i.e., arms-length assignment, relinquishment, or logical mining unit; (2) the initial lessee as assignor or as transferor is no longer in compliance with Section 2(a)(2)(A); or (3) the assignee or transferee does not qualify as a bona fide purchaser and, thus, has no rights to bona fide purchaser protection in the event of cancellation of this lease due to noncompliance with Section 2(a)(2)(A).

The lease case file, as well as in other Bureau of Land Management (BLM) records available through the State Office issuing this lease, contains information regarding assignor or transferor compliance with Section 2(a)(2)(A).

HQ-TES-1 – Endangered Species Act Section 7 Consultation Stipulation (applies to all parcels)
The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. The BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. The BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 et seq., including completion of any required procedure for conference or consultation.

Lease Stipulation No. 3 – Multiple Mineral Development (applies to all parcels)
Operations will not be approved which, in the opinion of the authorized officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

5.3 Hydraulic Fracturing White Paper (July 5, 2013)

BACKGROUND

Hydraulic fracturing (HF) is a well stimulation process used to maximize the extraction of underground resources – oil, natural gas and geothermal energy. The HF process includes the acquisition of water/mixing of chemicals, production zone fracturing, and HF flowback disposal.

In the United States, HF has been used since the 1940's. Early on, the HF process utilized pressures that are of a much smaller magnitude than those used today.

The HF process involves the injection of a fracturing fluid and propping agent into the hydrocarbon bearing formation under sufficient pressure to further open existing fractures and/or create new fractures. This allows the hydrocarbons to more readily flow into the wellbore. HF has gained interest recently as hydrocarbons previously trapped in low permeability tight sand and shale formations are now technically and economically recoverable. As a result, oil and gas production has increased significantly in the United States. The state of Wyoming classifies all gas production zones as Class 5 groundwater zones; this means these zones can be highly impacted by oil and gas activities and are exempt from regulation under the Clean Water Act. However, operations within these zones cannot cause other zones to lose their use classification.

Prior to the development of hydrocarbon bearing tight gas and shale formations, domestic production of conventional resources had been declining. In response to this decline, the federal government in the 1970's through 1992, passed tax credits to encourage the development of unconventional resources. It was during this time that the HF process was further advanced to include the high-pressure multi-stage frac jobs used today.

Generally, HF can be described as follows:

1. Water, proppant, and chemical additives are pumped at extremely high pressures down the wellbore.
2. The fracturing fluid is pumped through perforated sections of the wellbore and into the surrounding formation, creating fractures in the rock. The proppant holds the fractures open during well production.
3. Company personnel continuously monitor and gauge pressures, fluids and proppants, studying how the sand reacts when it hits the bottom of the wellbore, slowly increasing the density of sand to water as the frac progresses.
4. This process may be repeated multiple times, in "stages" to reach maximum areas of the formation(s). The wellbore is temporarily plugged between each stage to maintain the highest fluid pressure possible and get maximum fracturing results in the rock.
5. The plugs are drilled or removed from the wellbore and the well is tested for results.
6. The pressure is reduced and the fracturing fluids are returned up the wellbore for disposal or treatment and re-use, leaving the sand in place to prop open the fractures and allow the oil/gas to flow.

OPERATIONAL ISSUES

Wells that undergo HF may be drilled vertically, horizontally, or directionally and the resultant fractures induced by HF can be vertical, horizontal, or both. Wells in Wyoming (WY) may extend to depths greater than 20,000 feet or less than 1,000 feet, and horizontal sections of a well may extend several thousand feet from the production pad on the surface[9].

The total volume of fracturing fluids is generally 95-99% water. The amount of water needed to fracture a well in WY depends on the geologic basin, the formation, and depth and type of well (vertical, horizontal, directional), and the proposed completion process.

In general, approximately 50,000 to 300,000 gallons may be used to fracture shallow coalbed methane wells in the Powder River Basin, while approximately 800,000 to 2 million gallons may be used to fracture deep tight sand gas wells in southwestern WY. In the Niobrara oil play, approximately 250,000 gallons may be used to fracture a

[9] See Kemmerer RMP (2010), Pinedale RMP (2008), Green River RMP (1997), Rock Springs RMP Revision, and Rawlins RMP (2008) RFD and/or Mineral Occurrence Reports for specific information on current and projected oil and gas development.

vertical well, while up to 5 million gallons may be used to fracture a horizontal well.

Proppant, consisting of synthetic or natural silica sand, may be used in quantities of a few hundred tons for a vertical well to a few thousand tons for a horizontal well.

Drilling muds, drilling fluids, water, proppant and hydraulic fracturing fluids are stored in onsite tanks or lined pits during the drilling and/or completion process. Equipment transport and setup can take several days, and the actual HF and flowback process can occur in a few days up to a few weeks. For oil wells, the flowback fluid from the HF operations is treated in an oil-water separator before it is stored in a lined pit or tank located on the surface. Where gas wells are flowed back using a "green completion process" fluids are run through a multi-phase separator, which are then piped directly to enclosed tanks or to a production unit.

Gas emissions associated with the HF process are captured when the operator utilizes a green completion process. Where a green completion process is not utilized, gas associated with the well may be vented and/or flared until "saleable quality" product is obtained in accordance with federal and state rules and regulations. The total volume of emissions from the equipment used (trucks, engines) will vary based on the pressures needed to fracture the well, and the number of zones to be fractured. Emissions associated with a project, and HF if proposed, will be analyzed through a site specific NEPA document to ensure that the operation will not cause a violation of the Clean Air Act.

Under either completion process, wastewaters from HF may be disposed in several ways. For example, the flowback fluids may be stored in tanks pending reuse; the resultant waste may be re-injected using a permitted injection well, or the waste may be hauled to a licensed facility for treatment, disposal and/or reuse.

Disposal of the waste stream following establishment of "sale-quality" product, would be handled in accordance with 43 CFR § 3177 regulations and other state/federal rules and regulations.

FRACTURING FLUIDS

As indicated above, the fluid used in the HF process is approximately 95to 99 percent water and a small percentage of special-purpose chemical additives[10,11] and proppant. There is a broad array of chemicals that can be used as additives in a fracture treatment including, but not limited to, hydrochloric acid, anti-bacterial agents, corrosion inhibitors, gelling agents (polymers), surfactants, and scale inhibitors. The 1 to 5 percent of chemical additives translates to a minimum of 5,000 gallons of chemicals for every 1.5 million gallons of water used to fracture a well (Paschke, Dr. Suzanne. USGS, Denver, Colorado. September 2011). Water used in the HF process is generally acquired from surface water or groundwater in the local area.

RE-FRACTURING

Re-fracturing of wells (RHF) may be performed after a period of time to restore declining production rates. RHF success can be attributed to enlarging and reorienting existing fractures while restoring conductivity due to proppant degradation and fines plugging.

Prior to RHF, the wellbore may be cleaned out. Cleaning out the wellbore may recover over 50% of the initial frac sand. Once cleaned, the process of RHF is the same as the initial HF. The need for RHF cannot be predicted.

WATER AVAILABILITY AND CONSUMPTION ESTIMATES

The Wyoming Framework Water Plan, A Summary, (Wyoming Water Development Commission, October 2007), indicates that approximately 15 million acre-feet per year of water becomes either surface water or groundwater and is available for use. This estimate includes water that flows into the state and the precipitation that runs off as stream flow or infiltrates as groundwater; it does not include volumes lost to evapotranspiration.

Water flowing out of WY is estimated to be 13,678,200 acre-feet per year. Wyoming's share of this supply under existing water compacts is estimated to be 3,313,500 acre-feet per year; approximately10, 364,700 acre-feet flows downstream out of the state.

[10]FracFocus Chemical Registry. Hydraulic Fracturing Water Usage

[11] Chesapeake Energy. 2012. Hydraulic Fracturing Fact Sheet. http://www.chk.com/Media/Educational- Library/Fact-Sheets/Corporate/Hydraulic_Fracturing_Fact_Sheet.pdf (Last accessed March 1, 2012)

The industrial water use sector includes electric power generation, coal mining, conventional oil and gas production, uranium mining, trona mining and soda ash production, bentonite mining, gypsum mining, coalbed methane (CBM) production, manufacturing of aggregate, cement, and concrete, and road and bridge construction.

Total current industrial surface water use for Wyoming is estimated to be 125,000 acre- feet per year. Total current industrial groundwater water use is estimated to be 246,000 acre-feet per year.

According to the state water plan, it appears likely that any new water-intensive industrial developments in the state over the next 30 years will fall into the electric power generation and/or chemical products categories. The other two intensive water use industries, primary metals and paper producers, tend to locate near the source of their largest process inputs – metals and wood respectively. The total projected industrial use under the Mid Scenario is 331,000 acre-feet per year. The Mid-Scenario is a middle of the road estimate versus the projected low or high scenarios.

Water needs for future fracturing jobs were estimated for this discussion paper using the current Reasonable Foreseeable Development (RFD) scenario numbers taken from each of the nine WY RMPs and multiplied by the maximum volume of water necessary based on information located at fracfocus.org. The table is provided, below. Based on a statewide RFD of 25,478 non-CBM wells and 18,299 CBM wells, the maximum projected water needs for HF is 401,319 acre-feet of water. This number is an estimate based upon maximum projected water needs per HF job, and assumes that 100% of the water is freshwater.

According to the WOGCC, as of August 19, 2018, there are approximately 457 Disposal wells in the state disposing of oil and gas wastewater. Data obtained from the Wyoming Oil and Gas Conservation Commission, for a period ending June 30, 2018, indicates that 4,979,807,439 barrels of water have been injected into underground formations for disposal purposes. These injection wells may also utilize HF depending upon the specific geology of the disposal zone; however, subsequent disposal operations utilize injection pressures below the fracture stress of the receiving formation to ensure containment in the targeted zone. Each formation for which injection is approved must receive an aquifer exemption from the Environmental Protection Agency documenting that the injectate will be properly contained and that the formation receiving the water is not of useable quality (DEQ Class 4 Use).

POTENTIAL SOURCES OF WATER FOR HYDRAULIC FRACTURING

Freshwater-quality water is required to drill the surface-casing section of the wellbore per federal regulations; other sections of the wellbore (intermediate and/or production strings) would be drilled with appropriate quality makeup water as necessary. This is done to protect usable water zones from contamination, to prevent mixing of zones containing different water quality/use classifications, and to minimize total freshwater volumes. With detailed geologic well logging during drilling operations, geologists/mud loggers on location identify the bottoms of these usable water zones, which aids in the proper setting of casing depths.

Several sources of water are available for drilling and/or HF in WY. Because WY's water rights system is based in the prior appropriation doctrine, water cannot be diverted from a stream/reservoir or pumped out of the ground for drilling and/or HF without reconciling that diversion with the prior appropriation doctrine. Like any other water user, companies that drill or hydraulically fracture oil and gas wells must adhere to WY water laws when obtaining and using specific sources of water.

Below is a discussion of the sources of water that could potentially be used for HF. The decision to use any specific source is dependent on BLM authorization at the APD stage and the ability to satisfy the water appropriation doctrine. BLM must also consult in accordance with the Endangered Species Act (ESA) as amended (16 U.S .C. 1531 et seq.) with the U.S Fish and Wildlife Service (FWS on projects resulting in consumptive water use over de minimus levels, in the Platte and Colorado River Basins of WY. Where this is an issue, USFWS was consulted during the preparation of the appropriate RMP and would again be consulted on a case by case basis. From an operators' standpoint, the decision regarding which water source will be used is primarily driven by the economics associated with procuring a specific water source.

Water transported from outside the state. The operator may transport water from outside the state. As long as the transport and use of the water carries no legal obligation to Wyoming, this is an allowable source of water from a water rights perspective.

Irrigation water leased or purchased from a landowner. The landowner may have rights to surface water, delivered by a ditch or canal that is used to irrigate land. The operator may choose to enter into an agreement with the landowner to purchase or lease a portion of that water. This is allowable, however, in nearly every case, the use of an irrigation water right is likely limited to irrigation uses and cannot be used for well drilling and HF operations. To allow its use for drilling and HF, the owner of the water right and the operator must apply to change the water right through a formal process.

Treated water or raw water leased or purchased from a water provider. The operator may choose to enter into an agreement with a water provider to purchase or lease water from the water provider's system. Municipalities and other water providers may have a surplus of water in their system before it is treated (raw water) or after treatment that can be used for drilling and HF operations. Such an arrangement would be allowed only if the operator's use were compliant with the water provider's water rights.

Water treated at a wastewater treatment plant leased or purchased from a water provider. The operator may choose to enter into an agreement with a water provider to purchase or lease water that has been used by the public, and then treated as wastewater.
Municipalities and other water providers discharge their treated wastewater into the streams where it becomes part of the public resource, ready to be appropriated once again in the priority system. But for many municipalities a portion of the water that is discharged has the character of being "reusable." As a result, it is possible that after having been discharged to the stream, it could be diverted by the operator to be used for drilling and HF operations. Such an arrangement would only be appropriate with the approval of the WY State Engineer's Office (WSEO) and would be allowed only if the water provider's water rights include uses for drilling and HF operations.

New diversion of surface water flowing in streams and rivers. New diversion of surface waters in most parts of the state are rare because the surface streams are already "over appropriated," that is, the flows do not reliably occur in such a magnitude that all of the vested water rights on those streams can be satisfied. Therefore, the only time that an operator may be able to divert water directly from a river is during periods of high flow and less demand. These periods do occur but not reliably or predictably.

Produced Water. The operator may choose to use water produced in conjunction with oil or gas production at an existing oil or gas well. The water that is produced from an oil or gas well is under the administrative purview of the WSEO and is either non-tributary, in which case, it is administered independent of the prior appropriation doctrine; or is tributary, in which case, the depletions from its withdrawal must be fully augmented if the depletions occur in an over-appropriated basin. The result in either case is that the produced water is available for consumption for other purposes, not just oil and gas operations. The water must not be encumbered by other needs and the operator must obtain a proper well permit from the WSEO before the water can be used for drilling and HF operations.

Reused or Recycled Drilling Water. Water that is used for drilling of one well may be recovered and reused in the construction of subsequent wells. The BLM encourages reuse and recycling of both the water used in well drilling and the water produced in conjunction with oil or gas production. However, as described above, the operator must obtain the right to use the water for this purpose.

On-Location Water Supply Wells. Operators may apply for, and receive, permission from the WSEO to drill and use a new water supply well. These wells are usually drilled on location to provide an on-demand supply. These industrial-type water supply wells are typically drilled deeper than nearby domestic and/or stock wells to minimize drawdown interference, and have large capacity pumps. The proper construction, operation and maintenance, backflow prevention and security of these water supply wells are critical considerations at the time they are proposed to minimize impacts to the well and/or the waters in the well and are under the jurisdiction of the WSEO. Plugging these wells are also under the jurisdiction of the WSEO.

POTENTIAL IMPACTS TO USABLE WATER ZONES

Impacts to freshwater supplies can originate from point sources, such as chemical spills, chemical storage tanks (aboveground and underground), industrial sites, landfills, household septic tanks, and mining activities. Impacts to usable waters may also occur through a variety of oil and gas operational sources which may include, but are not limited to, pipeline and well casing failure, and well (gas, oil and/or water) drilling and construction of related facilities. Similarly, improper construction and management of open fluids pits and production facilities could

degrade ground water quality through leakage and leaching.[12]

Should hydrocarbons or associated chemicals for oil and gas development, including HF, exceeding EPA/WDEQ standards for minimum concentration levels migrate into culinary water supply wells, springs, or usable water systems, it could result in these water sources becoming non-potable. Water wells developed for oil and gas drilling could also result in a draw down in the quantity of water in nearby residential areas depending upon the geology; however, it is not currently possible to predict whether or not such water wells would be developed.

Usable groundwater aquifers are most susceptible to pollution where the aquifer is shallow (within 100 feet of the surface depending on surface geology) or perched, are very permeable, or connected directly to a surface water system, such as through floodplains and/or alluvial valleys or where operations occur in geologies which are highly fractured and/or lack a sealing formation between the production zone and the usable water zones. If an impact to usable waters were to occur, a greater number of people could be affected in densely populated areas versus sparsely populated areas characteristic of WY.

Potential impacts on usable groundwater resources from fluid mineral extraction activities can result from the five following scenarios:

- Contamination of aquifers through the introduction of drilling and/or completion fluids through spills or drilling problems such as lost circulation zones.
- Communication of the induced hydraulic fractures with existing fractures potentially allowing frac fluid migration into usable water zones/supplies. The potential for this impact is likely dependent on the local hydraulic gradients where those fluids are dissolved in the water column. To date, this is an unproven theory.
- Cross-contamination of aquifers/formations that may result when fluids from a deeper aquifer/formation migrate into a shallower aquifer/formation due to improperly cemented well casings.
- Localized depletion of unconfined groundwater availability.
- Progressive contamination of deep confined, shallow confined, and unconfined aquifers if the deep confined aquifers are not completely cased off, and geologically isolated, from deeper units. An example of this would be saltwater intrusion resulting from sustained drawdown associated with the pumping of groundwater.

The impacts above could occur as a result of the following processes:

<u>Improper casing and cementing.</u>
A well casing design that is not set at the proper depths or a cementing program that does not properly isolate necessary formations could allow oil, gas or HF fluids to contaminate other aquifers/formations.

<u>Natural fractures, faults, and abandoned wells.</u>
If HF of oil and gas wells result in new fractures connecting with established natural fractures, faults, or improperly plugged dry or abandoned wells, a pathway for gas or contaminants to migrate underground may be created posing a risk to water quality. The potential for this impact is currently unknown but it is generally accepted that the potential decreases with increasing distance between the production zone and usable water zones. This potential again is dependent upon the site specific conditions at the well location.

<u>Fracture growth.</u>
A number of studies and publications report that the risk of induced fractures extending out of the target formation into an aquifer—allowing hydrocarbons or other fluids to contaminate the aquifer —may depend, in part, on the formation thickness separating the targeted fractured formation and the aquifer. For example, according to a 2012 Bipartisan Policy Center report, the fracturing process itself is unlikely to directly affect freshwater aquifers because fracturing typically takes place at a depth of 6,000 to 10,000 feet, while drinking water aquifers are typically less than 1,000 feet deep. Fractures created during HF have not been shown to span the distance between the targeted l formation and freshwater bearing zones. If a parcel is sold and development is proposed in usable water zones, those

[12] See Subject RMP, Chapter 4, Environmental Consequences, for additional information.

operations would have to comply with federal and/or state water quality standards or receive a Class 5 designation from the WDEQ.

Fracture growth and the potential for upward fluid migration, through coal and other geologic formations depend on site-specific factors such as the following:

1. Physical properties, types, thicknesses, and depths of the targeted formation as well as those of the surrounding geologic formations.
2. Presence of existing natural fracture systems and their orientation in the target formation and surrounding formations.
3. Amount and distribution of stress (i.e., in-situ stress), and the stress contrasts between the targeted formation and the surrounding formations.

Hydraulic fracture stimulation designs include the volume of fracturing fluid injected into the formation as well as the fluid injection rate and fluid viscosity; this information would be evaluated against the above site specific considerations**.**

Fluid leak and recovery (flowback) of HF fluids.
It is theorized that not all fracturing fluids injected into the formation during the HF process may be recovered. It is theorized that fluid movement into smaller fractures or other geologic substructures can be to a point where flowback efforts will not recover all the fluid or that the pressure reduction caused by pumping during subsequent production operations may not be sufficient to recover all the fluid that has leaked into the formation. It is noted that the fluid loss due to leakage into small fractures and pores is minimized by the use of cross-linked gels.

Willberg et al. (1998) analyzed HF flowback and described the effect of pumping rates on cleanup efficiency in initially dry, very low permeability (0.001 md) shale. Some wells in this study were pumped at low flowback rates (less than 3 barrels per minute (bbl/min). Other wells were pumped more aggressively at greater than 3 bbl/min. Thirty- one percent of the injected HF fluids were recovered when low flowback rates were applied over a 5-day period. Forty-six percent of the fluids were recovered when aggressive flowback rates were applied in other wells over a 2-day period. In both cases, additional fluid recovery (10 percent to 13 percent) was achieved during the subsequent gas production phase, resulting in a total recovery rate of 41 percent to 59 percent of the initial volume of injected HF fluid. Ultimate recovery rate however, is dependent on the permeability of the rocks, fracture configuration, and the surface area of the fracture(s).

The ability of HF chemicals to migrate in an undissolved or dissolved phase into a usable water zone is likely dependent upon the location of the sealing formation (if any), the geology of the sealing formation, hydraulic gradients and production pressures. The following discussion, adapted from: Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs; Chapter 3 Characteristics of CBM Production and Associated HF Practices (3-5EPA 816-R-04-003, June, 2004), takes place where there is not a sealing formation between the fractured formation and usable waters; the two zones are separated by approximately 1000’ of earth in the Powder River Basin of WY.

HF Fluids can remain in the subsurface unrecovered, due to “leak off” into connected fractures and the pores of rocks. Fracturing fluids injected into the primary hydraulically induced fracture can intersect and flow (leak off) into preexisting smaller natural fractures. Some of the fluids lost in this way may occur very close to the well bore after traveling minimal distances in the hydraulically induced fracture before being diverted into other fractures and pores. Once “mixed” with the native water, local and regional vertical and horizontal gradients may influence where and if these fluids will come in contact with usable water zones, assuming that there is inadequate recovery either through the initial flowback or over the productive life of the well. Faults, folds, joints, etc., could also alter localized flow patterns as discussed below.

The following processes can influence effective recovery of the fracture fluids:

Check-Valve Effect
A check-valve effect occurs when natural and/ or newly created fractures open and HF fluid is forced into the

fractures when fracturing pressures are high, but the fluids are subsequently prevented from flowing back toward the wellbore as the fractures close when the fracturing pressure is decreased (Warpinski et al., 1988; Palmer et al., 1991a). A long fracture can be pinched-off at some distance from the wellbore. This reduces the effective fracture length. HF fluids trapped beyond the "pinch point" are unlikely to be recovered during flowback and oil/gas is unlikely to be recovered during production.

In most cases, when the fracturing pressure is reduced, the fracture closes in response to natural subsurface compressive stresses. Because the primary purpose of hydraulic fracturing is to increase the effective permeability of the target formation and connect new or widened fractures to the wellbore, a closed fracture is of little use. Therefore, a component of HF is to "prop" the fracture open, so that the enhanced permeability from the pressure-induced fracturing persists even after fracturing pressure is terminated. To this end, operators use a system of fluids and "proppants" to create and preserve a high- permeability fracture-channel from the wellbore deep into the formation.

The check-valve effect takes place in locations beyond the zone where proppants have been placed (or in smaller secondary fractures that have not received any proppant). It is possible that some volume of stimulation fluid cannot be recovered due to its movement into zones that were not completely "propped" open.

Adsorption and Chemical Reactions
Adsorption and chemical reactions can also prevent HF fluids from being recovered. Adsorption is the process by which fluid constituents adhere to a solid surface and are thereby unavailable to flow with groundwater. Adsorption to coal is likely; however, adsorption to other geologic material (e.g., shale, sandstone) is likely to be minimal. Another possible reaction affecting the recovery of fracturing fluid constituents is the neutralization of acids (in the fracturing fluids) by carbonates in the subsurface.

Movement of Fluids Outside the Capture Zone
Fracturing fluids injected into the target zone flow into fractures under very high pressure. The hydraulic gradients driving fluid flow away from the wellbore during injection are much greater than the hydraulic gradients pulling fluid flow back toward the wellbore during flowback and production (pumping) of the well. Some portion of the fracturing fluids could be forced along the hydraulically induced fracture to a point beyond the capture zone of the production well. The size of the capture zone will be affected by the regional groundwater gradients, and by the drawdown caused by producing the well. Site-specific geologic, hydrogeologic, injection pressure, and production pumping details should provide the information needed to estimate the dimension of the production well capture zone and the extent to which the fracturing fluids might disperse and dilute.

Incomplete Mixing of Fracturing Fluids with Water
Steidl (1993) documented the occurrence of a gelling agent that did not dissolve completely and actually formed clumps at 15 times the injected concentration in an induced fracture. Steidl also directly observed, in his mined-through studies, gel hanging in stringy clumps in many other induced fractures. As Willberg et al. (1997) noted, laboratory studies indicate that fingered flow of water past residual gel may impede fluid recovery. Therefore, some fracturing fluid gels appear not to flow with groundwater during production pumping and remain in the subsurface unrecovered. Such gels are unlikely to flow with groundwater during production, but may present a source of gel constituents to flowing groundwater during and after production.

Authorization of any future proposed projects, would require full compliance with local, state, and federal regulations and laws that relate to surface and groundwater protection and would be subject to routine inspections by the BLM and the Wyoming Oil and Gas Commission as described in Memorandum of Understanding WY920-94-09-79, dated September 21, 1994, prior to approval.

GEOLOGIC HAZARDS (INCLUDING SEISMIC/LANDSLIDES)
Potential geologic hazards caused by HF include induced seismic activity. Induced seismic activity could indirectly cause surficial landslide activity where soils/slopes are susceptible to failure.

Landslides involve the mass movement of earth materials down slopes and can include debris flows, soil creep, and slumping of large blocks of material. There are no identified landslides in the project area [Kemmerer RMP (2010), Pinedale RMP (2008), Green River RMP (1997), Rock Springs RMP Revision, and Rawlins RMP (2008) Chapter 2,

Affected Environment and/or Summary of the Management Situation Analysis; Wyoming State Geological Survey (2011)].

Earthquakes occur when energy is released due to blocks of the earth's crust moving along areas of weakness or faults. Earthquakes attributable to human activities are called "induced seismic events" or "induced earthquakes." In the past several years induced seismic events related to energy development projects have drawn heightened public attention. Although only a very small fraction of injection and extraction activities at hundreds of thousands of energy development sites in the United States have induced seismicity at levels that are noticeable to the public, seismic events caused by or likely related to energy development have been measured and felt in Alabama, Arkansas, California, Colorado, Illinois, Louisiana, Mississippi, Nebraska, Nevada, New Mexico, Ohio, Oklahoma, and Texas.

A study conducted by the National Academy of Sciences[13] studied the issue of induced seismic activity from energy development. As a result of the study, they found that: (1) the process of hydraulic fracturing a well as presently implemented for shale gas recovery does not pose a high risk for inducing felt seismic events; and (2) injection for disposal of waste water derived from energy technologies into the subsurface does pose some risk for induced seismicity, but very few events have been documented over the past several decades relative to the large number of disposal wells in operation.

The potential for induced seismicity cannot be made at the leasing stage; as such, it will be evaluated at the APD stage should the parcel be sold/issued, and a development proposal submitted.

SPILL RESPONSE AND REPORTING

Spill Prevention, Control, and Countermeasure (SPCC) - EPAs rules include requirements for oil spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines. The rule requires that operators of specific facilities prepare, amend, and implement SPCC Plans. The SPCC rule is part of the Oil Pollution Prevention regulation, which also includes the Facility Response Plan (FRP) rule. Originally published in 1973 under the authority of §311 of the Clean Water Act, the Oil Pollution Prevention regulation sets forth requirements for prevention of, preparedness for, and response to oil discharges at specific non-transportation-related facilities. To prevent oil from reaching navigable waters and adjoining shorelines, and to contain discharges of oil, the regulation requires the operator of these facilities to develop and implement SPCC Plans and establishes procedures, methods, and equipment requirements (Subparts A, B, and C). In 1990, the Oil Pollution Act amended the Clean Water Act to require some oil storage facilities to prepare Facility Response Plans. On July 1, 1994, EPA finalized the revisions that direct facility owners or operators to prepare and submit plans for responding to a worst-case discharge of oil.

In addition to EPA's requirements, operators must provide a plan for managing waste materials, and for the safe containment of hazardous materials, per 43 CFR § 3171 with their APD proposal. All spills and/or undesirable events are managed in accordance with Notice to Lessee (NTL) 3-A and WY Information Memorandums 2008-028: *NTL- 3A Reporting Requirements* and 2009-021 *Guidance & Standards for Response to Oil & Gas-Related Spills & Clean-Up Criteria.* Regulations found at 43 CFR 3162.5(c) provide BLM with the necessary regulatory framework for responding to all spills and/or undesirable events related to hydraulic fracturing operations.

PUBLIC HEALTH AND SAFETY

The intensity, and likelihood, of potential impacts to public health and safety, and to the quality of usable water aquifers is directly related to proximity of the proposed action to domestic and/or community water supplies (wells, reservoirs, lakes, rivers, etc.) and/or agricultural developments. The potential impacts are also dependent on the extent of the production well's capture zone and well integrity. Standard Lease Notice No.1 specifies that development is generally restricted within a quarter mile of occupied dwellings and within 500 feet of riparian habitats and wetlands, perennial water sources (rivers, springs, water wells, etc.) and/or floodplains. Intensity of impact is likely dependent on the density of development. Further information related to the rate of development is provided in the Leasing Environmental Analysis.

[13] Induced Seismicity Potential in Energy Technologies, National Academy of Sciences, 2012

HF White Paper Table									
Field Office (Year of RFD)	Proj. Num. of CBM wells	Projected Number of Non-CBM/ Conven-tional Wells	Max Frac Vol. CBM (gal. x 1,000)	Total Est. H2O for CBM (x 1,000)	Max Frac Volume Non-CBM (gal. x 1,000)	Total Est. H2O for Non-CBM (x 1,000,000)	Total Projected H2O for HF (gal. x 1,000)	Total Projected H2O for HF (barrels)	Total Project ed H2O for HF (acre-feet)
BFO (2012)	10,343	3,865	300	3,102,900	5,000	19,325	22,427,900	711,996,824	67,736.09
BHB (2010) (WFO/ CYFO)	150	1,890	300	45,000	5,000	9,450	9,495,000	301,428,571	28,676.52
CFO (2005)	700	2,100	300	210 ,000	5,000	10,500	10,710,000	340,000,000	32,346.03
NFO (2004)	0	30	300	0	5,000	150	150,000	4,761,905	453.03
LFO (2009)	861	2,566	300	258,300	5,000	12,830	13,088,300	415,501,587	39,528.90
RFO (2004)	4,655	4,655	300	1,396,500	5,000	23,275	24,671,500	783,222,221	74,512.14
RSFO (GRRM P/ 1991)	300	1,258	300	90,000	5,000	6,290	6,380,000	202,539,682	19,268.69
RSFO (JMH/ 2002)	50	314	300	15,000	5,000	1,570	1,585,000	50,317,460	4,786.97
KFO (2006)	640	220	300	192,000	5,000	1,100	1,292,000	41,015,873	3,902.06
PFO (2006)	600	8,580	300	180,000	5,000	42,900	43,080,000	1,367,619,046	130,108.96
Total	18,299	25,478		5,489,700		127,390	132,879,700	4,218,403,168	401,319

Calculation assumes 100% of HF H2O is freshwater.
*Conversion factor: gallons to barrels: *0.0317460317 Conversion factor: barrels to acre feet: /10511.3365126*

5.4 Water Resources

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation, and vegetation. Anthropogenic factors that currently affect surface include livestock grazing management, private, commercial, and industrial development, recreational use, drought, and vegetation control treatments. Based on best available data, the vast majority of the nominated parcels are within the following HUC8 watersheds: Lower Wind, Lighting, Little Wind, Badwater, and Antelope HUC8 units. Groundwater hydrology within the area is influenced by geology and recharge rates.

Groundwater quality and quantity can be influenced by precipitation, water supply wells and various disposal activities. Groundwater quality across the applicable field offices varies with depth from potable waters with low total dissolved solids (TDS) to highly saline, non-potable sources. Most of the groundwater in Wyoming is used for industrial, domestic and livestock/irrigation purposes. The information contained in Appendix 5.3, Hydraulic Fracturing White Paper (see section entitled Operational Issues/Water Availability and Consumption Estimates) is incorporated by reference.

Several parcels contain land with private surface overlying federal minerals (i.e., split-estate). The private surface lands have or have the potential to contain private residences and associated facilities such as domestic or stock water supply wells. Lands used as rangeland can also have stock water supply wells.

WIND RIVER BASIN

Areas of Oil and Gas Activities

Oil and gas activities are spread across the Wind River Basin and appear to have an affinity along primarily northwest-southeast intrabasinal faults. Both oil and gas are produced in the basin and preference for hydrocarbon phase is play-dependent.

Potential hydrocarbon production zones include the Tertiary Lower Wind River and Fort Union/Shotgun Formations; the Cretaceous Lance, Meeteetse, Mesa Verde, Cody Shale, and Frontier Formations; the Cretaceous-Jurassic Morrison Formation; the Jurassic Nugget Formation; the Triassic Chugwater Group; the Permian-Carboniferous Phosphoria and Tensleep Sandstone Formations (WSGS, 2024, 1.).

Identification of Usable Water Zones and Aquifers

The two principal groundwater-bearing zones and water well production in vicinity of these parcels is from Quaternary age unconsolidated deposit aquifers (alluvium) and the aquifer/usable water zones of the Eocene age Upper Wind River Formation, which is up to 5000 ft thick in the Wind River Basin. Both aquifers are considered major aquifers in the Wind River Basin and are both important sources of useable groundwater. These aquifers have limited continuity and are variegated with complex interbedded clay, shale, silt, and conglomerate beds and lenticular sand layers of variable extents and thicknesses.

Characterization of Usable Water Zones and Aquifers and Usage

Generally, water wells in alluvial aquifers and the usable water zones and aquifer of the Upper Wind River Formation in the Wind River Basin average around 100ft depths with some wells up to 1000ft deep (WSGS, 2024, 2.). Water quality from the alluvial aquifers in the Wind River Basin are generally fresh or moderately saline with TDS concentrations ranging from 102 to 4,630 mg/L, with a median of 539 mg/L (WSGS, 2012). Water quality from the Wind River aquifer is variable throughout Wind River Basin and TDS concentrations from water wells include mostly fresh water (67% of samples) and range from slightly saline to moderately saline ranging from 224 mg/L to 5,110 mg/L, with a median of 707 mg/L (WSGS, 2012). TDS concentrations from produced water samples from the Wind River aquifer are slightly saline to briny and range from 1,060 to 38,800 mg/L, with a median of 2,730 mg/L (WSGS, 2012).

Other major aquifers within the Wind River Basin include the Nugget Sandstone, Tensleep Sandstone, Madison Limestone, and Bighorn Dolomite in which fluid stratification generally occurs with more buoyant hydrocarbons overlying brines and usable water combined with interbedded shales and other less porous rocks serve as geologic isolation of hydrocarbons and brines from usable water, but notably at depth or on the fringes of the basin.

Geological Isolation of Usable Water Zones and Aquifers

Less porous Eocene through Miocene inter-bedded shales and tight sandstones, fluid stratification of buoyant hydrocarbons, faulting and discontinuous stratigraphy can independently or collectively geologically isolate hydrocarbon zones from brine and usable water zones. Similarly, inter-bedded shales within the Wind River Formation locally isolates usable water zones from lower Wind River productive hydrocarbon zones and collectively from productive hydrocarbon zones in deeper hydrocarbon reservoirs.

Engineered Protection of Usable Water Zones and Aquifers

Oil and gas wells permitted in vicinity of these parcels generally have surface casing between 1500 and 2500ft deep within the Wind River Formation or top of the Fort Union/Shotgun Formation and serve as engineered protections of useable water zones and aquifer in the Upper Wind River Formation. Applications for Permit to Drill (APDs) further analyze the significantly more local requirements for casing and cementing to ensure isolation of usable water zones on a well pad by well pad and borehole by borehole basis.

POWDER RIVER BASIN

Areas of Oil and Gas Activities

Oil and gas activities are spread across the Powder River Basin and appear to have an affinity along primarily northwest-southeast intrabasinal faults as well as systematic west-southwest to east-northeast trending counter-regional faults. Both oil and gas are produced in the basin and preference for hydrocarbon phase is play-dependent.

Potential hydrocarbon production zones include the Tertiary Fort Union Formation coalbeds, Upper Cretaceous Parkman, Sussex, Shannon, Niobrara, Carlile Shale, and Frontier Formations; the Lower Cretaceous Mowry Shale, Muddy, and Cloverly Formations; and the Carboniferous Minnelusa Formation.

Identification of Usable Water Zones and Aquifers

The Lower Eocene Wasatch Formation; the Tongue River, Lebo, and Tullock Members of the Paleocene Fort Union Formation; and the Upper Cretaceous Fox Hills Sandstone Formation are the primary aquifer and usable water zones in the Powder River Basin (Long et al, 2014). The overall Lower Tertiary system can be as thick as 7,180ft (Long et al, 2014) and is the most widely utilized source of groundwater (Taboga et al, 2019) with wells down to 2000ft. The Fox Hills system as thick as 7,600ft and is used for groundwater near the basins periphery (Taboga et al, 2017). In the Wyoming portion of the Powder River Basin, these intervals have varying permeability due to a variety of depositional environments resulting in lithostratigraphic complexity (Taboga et al, 2017) and to faulting and fracturing (Long et al, 2014).

Characterization of Usable Water Zones and Aquifers and Usage

The Fort Union Formation contains coal seams interbedded with lenticular sandstones to more ubiquitous shales (Taboga et al, 2017) while the Fox Hills Formation near-shore deltaic mudstones to sandstones (Tischerman et al, 2022). Production in the Fort Union coal seams and adjacent sandstones is geologically isolated from usable water zones by changes in lithology, stratigraphic barriers between formational bedding as well as fracturing and faulting (Tobago et al, 2017). The Wasatch Formation shales derived from nonmarine fluvial and paludal (swamp/marsh environments) (Taboga et al, 2019) serves as a more localized traditional confining unit for the biogenically-sourced hydrocarbons found in the Fort Union coal seams.

Water Quality in Usable Water Zones and Aquifers

Water quality in the Wasatch ranges from 160 to 8,620mg/L with a median of 1,125mg/L while Fort Union ranges from 113 to 5,480 mg/L with a median of 1,015mg/L (Taboga et al, 2019). In the Lance, water quality ranges from 244 to 3,060 mg/L with a median of 946mg/L and the Fox Hills ranges from 28 to 3,520 mg/L with a median of 1,170 mg/L (Taboga et al, 2019).

Geological Isolation of Usable Water Zones and Aquifers

The Upper Cretaceous Lewis Shale and Pierre Shale Formations combine to provide a more traditional confining unit cap to the basin's primarily thermogenically-sourced hydrocarbons and geologically isolating those hydrocarbons from the primary usable water zones for the basin. Usable water zones in deeper hydrocarbon bearing formations geologically isolate more buoyant hydrocarbons and brines from usable water zones. Isolation is also facilitated by stratigraphic barriers in bedding and by faulting and fracturing.

Engineered Protection of Usable Water Zones and Aquifers

Oil and gas wells generally employ surface casing and cement to protect the Wasatch and Fort Union usable water zones. Some wells may require intermediate or production casing and cement to protect the Fox Hills usable water zones. Further during plugging operations of particularly older wells, usable water zones are identified and plugged with to further isolate those zones. Applications for Permit to Drill (APDs) further analyze the significantly more local requirements for casing and cementing to ensure isolation of usable water zones on a well pad by well pad and borehole by borehole basis.

GREEN RIVER BASIN

Areas of Hydrocarbon Activity

There are multiple areas of oil and gas activities in the Green River Basin. The Pinedale Anticline (PA), the Jonah Infill Drilling (JID), and the Normally Pressured Lance (NPL) project areas lie in the north of the basin while additional activities occur along the Moxa Arch and along the LaBarge Platform along the western flank of the basin (WOGCC Data Explorer, Figure 1 from Lynds and Lichtner, 2016). The hydrocarbon phase produced in each of these areas is predominantly natural gas with historic oil production.

Potential hydrocarbon production zones include the Paleocene Fort Union Formation, Upper Cretaceous Lance, Lewis Shale, Almond, Ericson, Rock Springs, Baxter Shale, and Frontier Formations; the Lower Cretaceous Bear River and Cloverly Formations; the Jurassic Nugget Formation, and the Carboniferous Tensleep Sandstone and Madison Limestone. Of these, the Mesaverde, Lance, and Fort Union are generally the target intervals in the project areas listed above.

Identification of Usable Water Zones and Aquifers

Across the Green River Basin, undivided Tertiary formations and intervals occur stratigraphically younger than the Lower Eocene Wasatch Group (Wasatch) and include uppermost Eocene through Miocene aged stratigraphic intervals (Love et al., 1993). The undivided Tertiary interval, the Wasatch, and to a much lesser extent the Paleocene Fort Union Formation are the most common usable water zones. Of these, the Wasatch is the primary aquifer and usable water zone in the Green River Basin. The Wasatch occurs from the surface to approximately 6,200ft deep at an average thickness of about 8,000 feet.

Characterization of Usable Water Zones and Aquifers and Usage

The undivided Tertiary section overlies the Wasatch and does not include the Green River which interfingers with the Wasatch, but for these analyses will be included in the undivided Tertiary section. In general, the undivided Tertiary section is highlighted by the Miocene Bishop Conglomerate and the Battle Spring conglomerates and sandstones as well as other isolated permeable sandstone aquifers that intertongue with silts and shales.

The Wasatch both conformably and unconformably overlies the Fort Union and is largely comprised of alluvial deposits, more specifically, fluvial sands, flood plain shales, and coal that interfingers with the more lacustrine facies of the undivided Tertiary formations (Roberts, 2005). As such, local initial geologic isolation generally begins at deposition and persists through lithification to present day.

The Fort Union contains coal seams embedded with lenticular-shaped sandstones and includes fluvial, paludal, and lacustrine shales, claystones, and mudstones (Lynds and Lichtner, 2016) which geologically isolate from usable water zones by changes in lithology, stratigraphic barriers between formational bedding as well as fracturing and faulting (Tobago et al, 2017).

Water Quality in Usable Water Zones and Aquifers

Water quality measured by total dissolved solids (TDS) in milligrams per liter (mg/L) in the undivided Tertiary ranges from 1,401 to 20,531mg/L with a mean average of 5,035mg/L (Taboga et al, 2020) including 4 samples (11% of samples) >10,000 mg/L. These 4 samples are clustered near the center of the western flank of the Green River basin. For the Wasatch, TDS values range from 1,050 to 4,775 mg/L with a mean average of 2,778 mg/L while the Fort Union ranges from 1,542 to 3,519 mg/L with a mean average of 2,531 mg/L (Taboga et al, 2020).

Geological Isolation of Usable Water Zones and Aquifers

In general, the lacustrine shales of the Wasatch and undivided Tertiary as well as the Upper Cretaceous Lewis Shale combined with interbedded shales, mudstones, and siltstones with their lower permeabilities in the Paleocene Fort Union Formation and the Upper Cretaceous Fox Hills and Lance Formations provide a confining regional seal to the basin's deeper primarily thermogenically sourced hydrocarbons and thereby geologically isolating those hydrocarbons from the primary usable water zones for the basin (Buursink et al., 2012; Finn et al., 2005; Love et al., 1993). Usable water zones in deeper hydrocarbon bearing formations are locally geologically isolated from more buoyant hydrocarbons and brines. Isolation is also facilitated by stratigraphic barriers namely finer-grained, less-permeable shales and siltstones in bedding and by faulting and fracturing. Buursink et al., 2012 identify multiple carbon dioxide storage assessment units within the Green River Basin that have intervening shales and tight sandstones that serve as confining units for geologic carbon sequestration.

Engineered Protection of Usable Water Zones and Aquifers

Oil and gas wells generally employ surface casing and cement to protect the undivided Tertiary, the Wasatch and the Fort Union usable water zones. Some wells may require intermediate or production casing and cement to protect the in these or other usable water zones. Further during plugging operations of particularly older wells, usable water zones are identified and plugged to further isolate those zones. Applications for Permit to Drill (APDs) further analyze the significantly more local requirements for casing and cementing to ensure isolation of usable water zones on a well pad by well pad and borehole by borehole basis.

WASHAKIE-GREAT DIVIDE BASIN

Areas of Hydrocarbon Activity

The Wamsutter area is the primary area of oil and gas activities. This area is defined as the area along the Wamsutter Arch and across the Washakie Basin. Secondary areas of oil and gas activities occur along the Rock Springs Uplift and along the northern flank of the Great Divide Basin (WOGCC Data Explorer, Figure 1 from Lynds and Lichtner, 2016). The main hydrocarbon phase produced in the Wamsutter is predominantly natural gas and coal-bed methane gas with more historic oil production.

Potential hydrocarbon production zones include the Paleocene Fort Union Formation, Upper Cretaceous Lance, Lewis Shale, Almond, Ericson, Rock Springs, Baxter Shale, and Frontier Formations; the Lower Cretaceous Muddy Sandstone and Cloverly Formations; the Jurassic Nugget Formation, and the Carboniferous Weber Sandstone and Madison Limestone.

Identification of Usable Water Zones and Aquifers

Across the Green River Basin, undivided Tertiary formations and intervals occur stratigraphically younger than the Lower Eocene Wasatch Group (Wasatch) and include uppermost Eocene through Miocene aged stratigraphic intervals (Love et al., 1993). The undivided Tertiary interval, the Wasatch, and to a much lesser extent the Paleocene Fort Union Formation are the most common usable water zones. Of these, the Wasatch is the primary aquifer and usable water zone in the Green River Basin. The Wasatch occurs from the surface to approximately 6,200ft deep at an average thickness of about 8,000 feet.

Characterization of Usable Water Zones and Aquifers and Usage

The undivided Tertiary section overlies the Wasatch and does not include the Green River which interfingers with the Wasatch, but for these analyses will be included in the undivided Tertiary section. In general, the undivided Tertiary section is highlighted by the Miocene Bishop Conglomerate and the Battle Spring conglomerates and sandstones as well as other isolated permeable sandstone aquifers that intertongue with silts and shales.

The Wasatch both conformably and unconformably overlies the Fort Union and is largely comprised of alluvial deposits, more specifically, fluvial sands, flood plain shales, and coal that interfingers with the more lacustrine facies of the undivided Tertiary formations (Roberts, 2005). As such, local initial geologic isolation generally begins at deposition and persists through lithification to present day.

The Fort Union contains coal seams embedded with lenticular-shaped sandstones and includes fluvial, paludal, and lacustrine shales, claystones, and mudstones (Lynds and Lichtner, 2016) which geologically isolate from usable water zones by changes in lithology, stratigraphic barriers between formational bedding as well as fracturing and faulting (Tobago et al, 2017).

Water Quality in Usable Water Zones and Aquifers

Water quality from 1,000-2,000 feet measured by total dissolved solids (TDS) in milligrams per liter (mg/L) in the undivided Tertiary ranges from 2,433 to 8,458 mg/L with a mean average of 4,863mg/L (Taboga et al, 2020). For the Wasatch, TDS values range from 1,320 to 10,611 mg/L with a mean average of 4,971 mg/L with one sample (6% of all Wasatch samples) >10,000 mg/L. The Fort Union ranges from 1,938 to 14,366 mg/L with a mean average of 4,690 mg/L (Taboga et al, 2020) with one sample (14% of all Fort Union samples) >10,000 mg/L.

From 2,000-3,000 feet, water quality for the undivided Tertiary ranged from 2,407 to 18,421 mg/L with 2 samples (22% of all undivided Tertiary samples) >10,000 mg/L.

Geological Isolation of Usable Water Zones and Aquifers

In general, the lacustrine shales of the Wasatch and undivided Tertiary as well as the Upper Cretaceous Lewis Shale combined with interbedded shales, mudstones, and siltstones with their lower permeabilities in the Paleocene Fort Union Formation and the Upper Cretaceous Fox Hills and Lance Formations combine to provide a confining regional seal to the basin's deeper primarily thermogenically sourced hydrocarbons and thereby geologically isolating those hydrocarbons from the primary usable water zones for the basin (Buursink et al., 2012; Finn et al., 2005; Love et al., 1993). Usable water zones in deeper hydrocarbon bearing formations are locally geologically isolated from more buoyant hydrocarbons and brines. Isolation is also facilitated by stratigraphic barriers namely finer-grained, less-permeable shales and siltstones in bedding and by faulting and fracturing. Buursink et al., 2012 identify multiple carbon dioxide storage assessment units within the Washakie and Great Divide basins that have intervening shales and tight sandstones that serve as confining units for geologic carbon sequestration.

Engineered Protection of Usable Water Zones and Aquifers

Oil and gas wells generally employ surface casing and cement to protect the undivided Tertiary, the Wasatch and the Fort Union usable water zones. Some wells may require intermediate or production casing and cement to protect the in these or other usable water zones. Further during plugging operations of particularly older wells, usable water zones are identified and plugged to further isolate those zones. Applications for Permit to Drill (APDs) further analyze the significantly more local requirements for casing and cementing to ensure isolation of usable water zones on a well pad by well pad and borehole by borehole basis.

5.5 Parcel Evaluation in Greater Sage-Grouse Habitat

BLM Wyoming follows the ARMPA which indicates that prioritization would occur for leasing and development. In addition, BLM Wyoming uses the information provided from various court decisions to describe the prioritization process. Using the ARMPA, along with the decisions from the court cases, the WSO describes the prioritization process in the following paragraphs.

For all steps in the prioritization process, the field office first completes a review of the parcel(s) and applies the appropriate stipulations in conformance with the applicable FO RMP. Once a field office has completed its review, the parcel list is sent back to the BLM WSO, who then reviews the parcels; any parcel(s) located in Non-habitat are given first priority (see Section 3.4, Table 3-24 (P1)) within Prioritization Flowchart (below). The BLM WSO provides the proposed parcel list to the WGFD to review and provide comments to the BLM at the same time the parcels are being reviewed by the field offices. Once the WSO receives the input from both the field offices and the WGFD, the stipulations applied by the field office are reviewed to ensure input from the WGFD has been captured by field office stipulations.

Parcels completely within GHMA (or partially in non-habitat and partially within GHMA) were then reviewed to verify that the BLM is using the most current GHMA/PHMA boundaries, the most current lek location database information (maintained by WGFD) and most current Winter Concentration Area locations before being considered for sale offering. All parcels with the 'Evaluating Label' of GHMA were recommended to be offered for lease (see Section 3.4, Table 3-24 (P2) and in the flowchart below).

For all parcels (wholly or partially) located within designated PHMA, the BLM WSO has taken the following approach. Identify whether any of the PHMA parcels are located in an area in which a habitat and/or population metric indicates a need for further review (MD SSS 13, pg. 37-38, 2015 ARMPA). If a parcel is located within one of these areas, BLM WSO will use the adaptive management process outlined in Appendix D of the 2015 ARMPA and notify the BLM WY SD (P5). The decision made by the SD to lease or defer the parcel(s) would be based on criteria located in Appendix D along with other available information.

For the parcels with an Evaluation Label of PHMA, the WY BLM Resource Policy and Management division (WY930) reviewed potential conflicts between Greater sage-grouse (GRSG) and parcels nominated for the 2024 Q2 lease sale based on the following:

1. 2021 population adaptive management triggers [P5] calculated as described in Wyoming Executive Order (EO) 2019-3 and provided to the BLM by the Wyoming Game and Fish Department (WGFD; 2022 and 2023 data unavailable). A subcommittee convened in 2020 between WGFD, BLM and USFWS developed population trigger calculations to clarify language included in WY EO 2019-3 as: soft population triggers are identified at the scale of a Core Area when populations dip within 2 standard deviations from known population fluctuations of the previous 5 years; hard population triggers are identified when populations fall within one standard deviation of the standardized population, signifying a population decline that may require human intervention to revers.

2. 2021 habitat adaptive management triggers [P5] calculated as described in EO 2019-3 from data provided by the WGFD (2022 and 2023 data unavailable). The same subcommittee described above developed habitat trigger calculations following the 2015 GRSG ARMPA as: a habitat trigger (no differentiation between hard and soft habitat triggers) could be tripped in if habitat loss is greater than 60% normal range of variation in one year or loss is greater than 40% over a 3-year trend. Normal range of variation was established by examining available habitat reductions of each Core Area, using DDCT-derived data, compared to the state-wide average of habitat loss in all Core Areas. A habitat trigger was tripped if loss deviated more than 60% over 1 year or more than 40% over 3 years from the state-wide average habitat loss. Each Core Area is weighted in the calculation based on the proportion of sage-grouse habitat in the entire state contained within the core area to provide biological relevance for habitat loss thresholds.

3. Areas of [P5] based on WGFD regional wildlife and habitat biologists' concerns detailed in the document Sage-grouse Areas of Concern-2021.

4. Proximity (within 4 miles) to BLM priority restoration areas [P4].

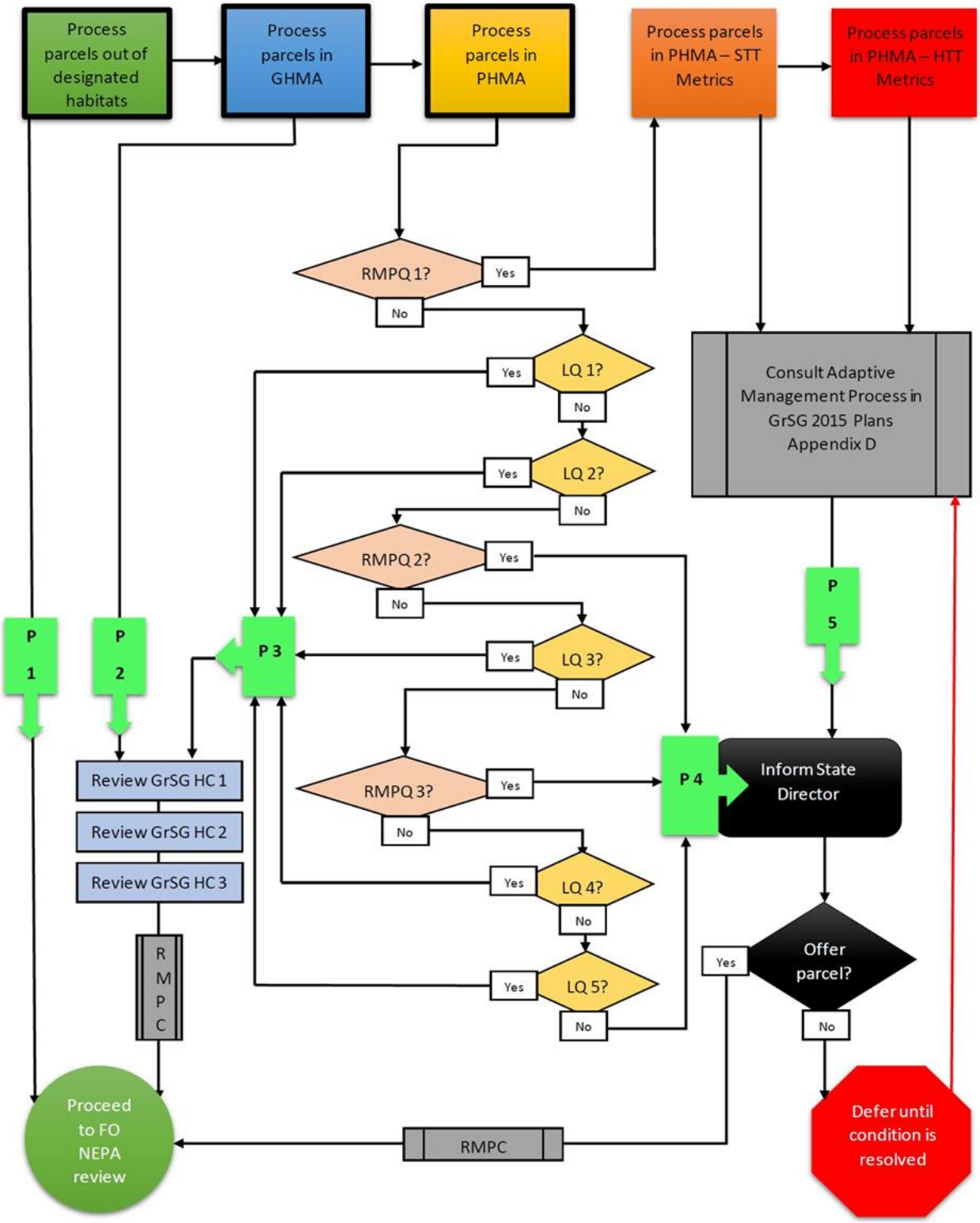
5. Land Health Standards (LHS) status [P4] of livestock grazing allotments.

6. Genetic connectivity IM-2023-007] identified as areas in the top 15% cumulative connectivity (i.e., the most likely connectivity pathways among GRSG genetic nodes as estimated by Cross et al. (2023; reference Fig. 4, Royal Society Open Science 10:220437) and situated within 3.1 miles (Holloran and Anderson 2005; Condor 107:742-752) of an occupied GRSG lek as defined by the WGFD (Whitford and Bish 2022). Deferral recommendations based on IM-2023-007 are under leasing preference criteria #2 (presence of important fish and wildlife habitats or connectivity areas, giving preference to lands that would not impair the proper functioning of such habitats or corridors).

7. High value seasonal habitats [P4] established as PHMA within 3.1 miles of occupied GRSG leks located in PHMA if a population or habitat trigger is tripped.

8. Existing anthropogenic infrastructure [P4] estimated from 2020 NAIP imagery.

Figure 5.5-1. Greater Sage-grouse Prioritization Flowchart



Refer to the list below when using the flowchart for prioritizing leasing.

Prioritization (**P**)
The prioritization arrows summarize consideration of parcels in addition to the sequence displayed across the top of the flowchart. The early enhanced review steps within the flowchart allow for categorization of proposed lease parcels into the following five leasing priorities:

P1 - These parcels receive the highest priority for leasing.
P2 - These parcels receive the second highest priority for leasing (after considering all parcels nominated for the current sale categorized as **P1**).
P3 - These parcels receive the third highest priority for leasing (after considering all parcels nominated for the current sale categorized as **P1** and/or **P2**).
P4 - These parcels receive the fourth highest priority for leasing (after considering all parcels nominated for the current sale categorized as **P1, P2**, and/or **P3**).
P5 - These parcels receive the lowest priority for leasing (after considering all parcels nominated for the current sale categorized as **P1, P2, P3**, and/or **P4**).

Greater Sage-Grouse (**GrSG**) Habitat Conditions (**HC**)
Wyoming State Office staff (WYSO 930) will verify with the appropriate agency that the most current and accurate data layers are available to the Field Offices for the review of these parcels. Current agreements with the Wyoming Game and Fish Department (WGFD) will be followed for utilization of the most current published data. A value assessment of these conditions and the subsequent application of RMP Management Decisions and Lease Stipulations will be addressed within the Leasing EA or during site-specific development proposal NEPA reviews. GrSG HCs within the flowchart refer to three types of potentially changing habitat designation conditions:

GrSG HC 1 – Verify with the BLM Wyoming Division of Resource Policy and Management (WYSO 930) that the most current PHMA boundaries are utilized.
GrSG HC 2 – Verify with WYSO 930 that the most current lek location database is utilized.
GrSG HC 3 – Verify with WYSO 930 that the most current Winter Concentration Area location database is utilized.

Resource Management Plan Questions (**RMPQ**)
Resource Management Plan Questions within the flowchart address RMP-level population and habitat disturbance/restoration/suitability conditions. The following three questions will provide evaluation considerations to determine prioritization of parcels located within PHMA.

RMPQ 1 - Discuss the Adaptive Management metrics with WYSO 930 for the PHMA unit containing this parcel.
RMPQ 2 – Is the parcel within an area of a prioritized restoration project?
RMPQ 3 - Is the parcel within an allotment that is failing to achieve the land health standards and conform with the guidelines?

Leasing Questions (**LQ**)
Leasing Questions within the flowchart encourage new development in lands already impacted by development factors. Parcels meeting any of the criteria in these questions are given a higher priority for leasing. Parcels meeting none of the criteria should be considered of lower priority for leasing. The following five questions inform the decision to categorize a parcel as either Priority 3 or Priority 4.

LQ 1 - Does the parcel lie within an area where law or regulation indicates that offering the lands for leasing is in the government's interest, due to drainage of Federal minerals, 43 CFR § 3162.2-2, or trespass drilling on unleased lands?
LQ 2 - Is the parcel within an existing Federal oil and gas unit?
LQ 3 - Is the parcel immediately adjacent or proximate to existing oil and gas leases and development operations or other land use development?
LQ 4 - Is the parcel within an area with a completed field-development Environmental Impact Statement or Master Leasing Plan that allows for adequate site-specific mitigation and is in conformance with the objectives and provisions in the GrSG Plans?
LQ 5 - Is the parcel in an area with higher potential for development (for example, considering the oil and gas potential maps developed by the BLM for the GrSG Plans)?

Resource Management Plan Conditions (**RMPC**)
RMPC- Ensure that a decision to lease those lands would conform to the conservation objectives and provisions in the GrSG Plans.

For parcels located in an area where the habitat and/or population metrics are within normal ranges, BLM WSO would identify any parcel(s) where law or regulation indicates that offering the lands for lease would be in the government's best interest. An example would be if any of the parcels are subject to potential fluid minerals drainage from a nearby/adjacent lease (see Table 4-10 below for any parcel meeting this criteria). If any of the proposed parcels identified as being in an area where law or regulation indicates that offering the lands is in the government's best interest (LQ1), BLM WSO would apply the appropriate stipulations (P3).

If none of the parcels are identified within the first two criteria, BLM WSO would identify whether any of the parcels are located within an existing federal oil and gas unit (LQ2, see Table 4-10 below for any parcel meeting this criteria). If a parcel is located within an existing unit, BLM WSO would apply the appropriate stipulations (P3) to the lease as described in Non-habitat process. Leasing parcels in an existing federal oil and gas unit congregates leases in a particular area, potentially minimizing the amount of surface disturbance.

Any parcels that are not located in an area in which a habitat and/or population metric indicates a need for further review (RMPQ1), in an area where it is the government's best interest to lease (LQ1), or in an existing Federal Oil and Gas Unit (LQ2), BLM WSO will identify any parcel(s) that are located within areas of prioritized restoration projects (RMPQ2, see Table 4-10 below for any parcel meeting this criteria). An example of this could be where BLM WY, along with state and local resources and/or private entities, have invested large amounts of time and resources to restore the habitat within an area. These areas would be considered a priority if they are trending toward successful reclamation and new disturbance that may occur as a result of leasing would hinder the continuation of that trend. If a parcel is identified within one of these areas, the BLM WY SD would make the final determination to lease the parcel or defer the parcel (P4). If the SD chooses to lease the parcel, BLM WSO would apply the appropriate sage-grouse stipulations (P3).

If none of the above criteria are met, BLM WSO would identify any of the parcels are located within a completed oil and gas field-development Environmental Impact Statement or Master Leasing Plan area (see Table 4-10 below for any parcel meeting this criteria) that allows for adequate site-specific mitigation and is in conformance with the objectives of the Greater Sage-Grouse (GSG) plans (LQ3). Any parcels that meet this criterion would have stipulations applied accordingly (P3).

If any of the above screening criteria are not met, BLM WSO would identify if any of the parcels are located within an allotment that is failing to achieve the land health standards (see Table 4-10 below for any parcel meeting this criteria) and conform with the guidelines (RMPQ3). If a proposed parcel is located within an allotment that is failing land health standards, the BLM WY SD will be notified (P4). It will be the discretion of the SD to defer the parcel(s) or lease the parcel(s) based upon the information available concerning the particular allotment. If a parcel is proposed for lease, the appropriate sage-grouse stipulations will be applied (P3).

If none of the parcels are located within the criteria listed above, BLM WSO would identify any parcel that is immediately adjacent or proximate to existing oil and gas leases and development (LQ4, see Table 4-10 below for any parcel meeting this criteria). Any parcel adjacent to an existing oil and gas lease or development would have the appropriate stipulations applied (P3).

The BLM WSO would identify any parcel located in an area with high potential for development (LQ5) (i.e. consider the oil and gas potential maps developed by the BLM for the GSG Plans) if none of the above criteria are met. Again, any parcel located within these areas with high potential for development, the BLM WSO would apply the appropriate stipulations (P3).

Finally, the BLM WSO would provide the SD a list of parcels, location, and any additional information required, if none of the criteria are met (P4). This would allow the SD to make an informed decision to lease the parcel during

this sale (P3) or defer and review again during the next sale. The process is also outlined in the flowchart on page 75 with the flowchart guidance on page 76 and 77.

FO NEPA Review

Once all of these reviews are completed, the State Director (SD) and the District Managers (DMs) coordinate and discuss the recommendations and concur on which potential parcels, or portions of parcels move forward for analysis and inclusion into the quarterly CLS environmental assessment (EA). The WSO fluid minerals staff prepares the EA and posts it on the ePlanning website for a 30-day public comment period and then makes changes to the EA, if necessary. The WGFD reviews and comments on the EA at this time as well. A State of Wyoming, WGFD, and BLM Wyoming coordination meeting occurs after the comment period closes. Any major conflicts identified are discussed with the SD and Deputy State Director (DSD) for Lands and Minerals (and other staff if determined necessary by the SD) for a decision on whether to delete, defer or move the parcel forward. The public comments and responses are then posted on ePlanning at the same time the Sale Notice is posted for a 30-day protest period. After the 30-day protest period, the fluid minerals staff reviews the protests and prepares responses. At any point in the review process, parcels or portions of parcels, in addition to those identified through this prioritization process, may be deleted or deferred.

5.6 EA Preparers/Reviewers, Consultation & Coordination

The following individuals or organizations were involved in consultation on issues in the development of this EA.

5.6.1 Outside Agencies or Individuals

Prior to publication of this EA, letters were sent to landowners by the WSO notifying them that the minerals under their surface lands had been nominated for lease and inviting them to participate in the BLM's review. Of the initial 20 parcel nominated for sale, all 20 appear to have at least some portion of the parcel in private fee ownership.

Where surface ownership information was provided, the WSO mailed notification letters to each person's whose information was provided. No comments were received from these surface owners during the initial or extended comment period.

Informal scoping letters were also sent to Native American tribal contacts known or identified as having interest or concerns with oil and gas leasing in the area. No comments were received as a result of sending these letters.

When necessary, notice letters were sent to the Forest Service, Douglas Ranger District and to units of the National Park Service in the northeast regional area of Wyoming. The superintendent of the Fort Laramie National Historic Site has identified concerns with oil and gas development in proximity to the Historic Site for previous sales. Those concerns include activities within the visual setting of the area, effects on visitor experience, and impacts to air quality, water quality and night skies. These are impacts associated with lease development and will be addressed site specifically if a development proposal is submitted. No new issues were identified that would suggest the need to consider alternatives beyond those being addressed in this EA and no specific comments were received from these entities.

In accordance with the BLM/WGFD Memorandum of Understanding WY131, Appendix 5G, the WSO sent the preliminary parcel list to the WGFD to provided an opportunity to review the preliminary parcel list and send their comments back to the BLM WSO. WGFD sent an email/letter to the BLM WSO indicating that they have reviewed the revised preliminary parcel list. BLM WSO has incorporated the WGFD concerns into this EA. The WSO also routinely meets with WGFD Habitat Protection Program personnel as a part of its coordination on oil and gas lease sales.

5.6.2 Internal Preparers and Reviewers

Table 5-1. BLM Wyoming State Office

Name	Title	Responsible for
Erik Norelius	Natural Resource Specialist	Project Manager and Preparer
Allen Stegeman	Natural Resource Specialist	Project Manager and Preparer
Katrina Gray	Natural Resource Specialist	Project Manager and Preparer
Charis Cooper	Physical Scientist, Air Quality	Air Quality & Climate Change
Wendy Huber	Planning & Environmental Coordinator	Planning
Amy Stillings	Socioeconomic Specialist	Socioeconomics
Jennie Frankus	Acting Planning & Environmental Coordinator	Environmental Justice
Matt Holloran	Wildlife Biologist	Wildlife

Table 5-2. BLM High Desert District

Name	Title	Responsible for
High Desert District Office		
Sonja Hunt	HDD Resource Advisor-Energy	District Project Coordinator
Jason Gay	HDD District Manager	Reviewer / Briefer
Adam George	HDD Associate District Manager	Reviewer

Name	Title	Responsible for
Pinedale Field Office		
Brian Roberts	Natural Resource Specialist	Lead
Juliann Orban	Wildlife Biologist	Wildlife sensitive species timing stips
Thea Koci	Recreation Specialist	ACEC, Wilderness
Shannon Groves	Cultural Resources Specialist	
Brandon Teppo	Supervisor NRS	Oversight
Rock Springs Field Office		
Kimberlee Foster	Field Manager	Reviewer
Gene Smith	Paleontology Coordinator	Archaeology/Paleo
Patrick Lionberger	Supervisory Wildlife Biologist	Wildlife
Miguel Valdez	Wildlife Biologist	Wildlife
T. J. Franklin	Superv. Natural Resource Specialist	PM
Alex Williams	Natural Resource Specialist	Soils/Veg/O&G
Morgan Hill	NRS/Geologist	Solid Minerals
Lauren Hazzard	Recreation Specialist	Rec / Visuals / Wilderness

Table 5-3. BLM High Plains District

Name	Title	Responsible for
High Plains District Office		
Kevin Christensen	District Manager	Review and Leadership support
Ben Bigalke	Associate District Manager	Review and Leadership support
Molly Wartenbee	District Secretary	Admin Support
Andrea Meeks	GIS Specialist	GIS Support
George Soehn	HPD Resource Advisor-Energy	District Project Coordinator
Casper Field Office		
Jesse Bassett	Natural Resource Specialist	CFO Team Lead
Ahren Ramirez	Natural Resource Specialist	CFO Team Lead
Matthew Clark	Geologist	Geology
Sandra Brock	Wildlife Biologist	Wildlife Review
Ryan Brentzel	Outdoor Recreation Planner	Wilderness Review
Renne Hardy	GIS Specialist	CFO GIS Support and Recreation Review and Coal Review
Shane Evans	Hydrologist	Hydrology
Brianne Carter	Reality Specialist	Realty
Dusten Burger	Rangeland Management Specialist	Range
Kaci Weinschrott	Archeologist	Cultural and Paleontology Review
Buffalo Field Office		
Todd Yeager	Field Manager	Reviewer
Katrina Gray	Natural Resource Specialist	Team lead, Soils, Coal, Special Notices
Wyatt Wittkop	Wildlife Biologist	Biological Resources
Clint Crago	Archeologist	Cultural and Paleontological Resources
Melah Corey	GIS Specialist	ArcGIS Data Management
Rachel Woita	Outdoor Recreation Planner	Recreation, Special Designations, Travel & Transportation Management, Visual Resource Management

Table 5-4. BLM Wind River/Bighorn Basin District

Name	Title	Responsible for
Wind River/Bighorn Basin District Office		
Jim Wolf	WR/BBD District Resource Advisor	District Project Manager & Preparer
Sarah Bucklin	WR/BBD District Resource Advisor	District Project Manager & Preparer

Name	Title	Responsible for
Holly Elliott	Planning & Environmental Coordinator	Review
Zack Poetzsch	Planning & Environmental Specialist	Review
Lander Field Office		
Lindsay Abercrombie-Johler	Natural Resource Specialist	Team Lead
Leah Yandow	Wildlife Biologist	Biological Resources
Nick Freeland	Archaeologist	Cultural and Paleontological Resources
Jared Oakleaf	Outdoor Recreation Planner	Rec / Visuals / Wilderness
Sarah Wempen	Geographic Information Specialist	GIS support

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7 Attachments

7.1 Parcel Specific Maps (Wildlife)

The attached maps are used to identify parcel specific interactions with Greater Sage-Grouse and Big Game habitat. Please refer to Chapter 3 for species-specific analysis. The parcel shapefile is available to download to compare to other data sources. Parcel numbers displayed on maps and shapefiles use a prefix of WY-2024-06, which was based on a planned sale date of June 2024.

7.2 Parcel Specific Maps (Leasing and Development)

The attached maps are used to identify existing oil and gas development on a parcel specific level. The parcel shapefile is available to download to compare to other data sources. The parcel shapefile is available to download to compare to other data sources. Parcel numbers displayed on maps and shapefiles use a prefix of WY-2024-06, which was based on a planned sale date of June 2024.

7.3 Lands with Wilderness Characteristics (LWC)

Sec. 603 (43 USC 1782). The Wilderness Act states:

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

"The word 'roadless' refers to the absence of roads which have been improved and maintained by mechanical means to ensure relatively regular and continuous use. A 'way' maintained solely by the passage of vehicles does not constitute a road"

Table 7-1. Wilderness Review Checklist for Oil and Gas Lease Parcels for Sale Year 2024, Sale Month 06

Parcel No. WY-2024-06-	More than 5000 ac of roadless land (yes/no)	Imprint of man's work substantially unnoticeable (yes/no)	Outstanding opportunity for solitude or primitive recreation (yes/no)	Contains natural features of scientific, educational, scenic, or historical value (yes/no)	In Citizens Proposed Wilderness Area (yes/no). If yes but dropped during RMP process, state why.	Field Office Notes or Explanations
1770	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.

Parcel No. WY-2024-06-	More than 5000 ac of roadless land (yes/no)	Imprint of man's work substantially unnoticeable (yes/no)	Outstanding opportunity for solitude or primitive recreation (yes/no)	Contains natural features of scientific, educational, scenic, or historical value (yes/no)	In Citizens Proposed Wilderness Area (yes/no). If yes but dropped during RMP process, state why.	Field Office Notes or Explanations
1771	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1828	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1829	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1832	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.

Parcel No. WY-2024-06-	More than 5000 ac of roadless land (yes/no)	Imprint of man's work substantially unnoticeable (yes/no)	Outstanding opportunity for solitude or primitive recreation (yes/no)	Contains natural features of scientific, educational, scenic, or historical value (yes/no)	In Citizens Proposed Wilderness Area (yes/no). If yes but dropped during RMP process, state why.	Field Office Notes or Explanations
1834	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1837	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1840	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1841	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.

Parcel No. WY-2024-06-	More than 5000 ac of roadless land (yes/no)	Imprint of man's work substantially unnoticeable (yes/no)	Outstanding opportunity for solitude or primitive recreation (yes/no)	Contains natural features of scientific, educational, scenic, or historical value (yes/no)	In Citizens Proposed Wilderness Area (yes/no). If yes but dropped during RMP process, state why.	Field Office Notes or Explanations
7295	No	No	No	No	No	The LFO 2014 inventory for wilderness characteristics did not detect wilderness characteristics in the area of these leases.
1786	No	No	No	No	No	Note for entire review: During RMP review of suitable lands, all of these criteria were used. The only lands that met the criteria are located in one of the Wilderness Study Areas or the Face of the Bighorns. None of these parcels is located in any of those areas.
7296	No	No	No	No	No	
1838	No	No	No	No	No	
1833	N/A	N/A	N/A	N/A	No	No Fed Surface ownership-no issues
1823	No	No	No	No	No	
1824	No	No	No	No	No	
1825	No	No	No	No	No	
1835	No	No	No	No	No	
1836	No	No	No	No	No	
1838	No	No	No	No	No	
7294	No	No	No	No	No	