U.S. Department of the Interior
Bureau of Land Management

Oklahoma Field Office Oil and Gas Lease Sale, Quarter 2 2024
Environmental Assessment
Cheyenne County, Kansas
Quarter 2 2024
DOI-BLM-NM-0040-2023-0030-EA

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DOI-BLM-NM-0040-2023-0030-EA

TABLE OF CONTENTS

Appendices

Figures

Tables

LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ACEC	area of critical environmental concern
AF	acre-feet
AIB	analyzed in brief
AirToxScreen	Air Toxics Screening Assessment
AO	Authorized Officer
APD	Application for Permit to Drill
AQI	air quality index
bbl	barrel(s)
Bcf/d	billion cubic feet per day
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
b/d	barrels per day
CAA	Clean Air Act
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	condition of approval
CSU	controlled surface use
DOI	U.S. Department of the Interior
DR	Decision Record
EA	environmental assessment
EIA	U.S. Energy Information Administration
EIS	environmental impact statement
EJ	environmental justice
EOI	Expression of Interest
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973

EUR	estimated ultimate recovery
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GIS	geographic information system
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
IDT	interdisciplinary team
IM	Instruction Memorandum
IPaC	Information for Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act of 2022
IWG	Interagency Working Group on the Social Cost of Greenhouse Gases
km	kilometer
LN	lease notice
LWC	Land with Wilderness Characteristics
m	meters
MAGICC	Model for the Assessment of Greenhouse Gas Induced Climate Change
mcf	thousand cubic feet
MLA	Mineral Leasing Act of 1920
MLAA	Mineral Leasing Act for Acquired Lands
MMst	million short tons
Mt	megatonnes
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act of 1969
NETL	National Energy Technology Laboratory
NHPA	National Historic Preservation Act of 1966
NMSO	New Mexico State Office
NORM	naturally occurring radioactive material
NO_2	nitrogen dioxide
NO_X	nitrogen oxide(s)

NSO	No Surface Occupancy
NSPS	New Source Performance Standard
O_3	ozone
OFO	Oklahoma Field Office
PL	Public Law
PM	particulate matter
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate matter equal to or less than 10 microns in diameter
RfC	reference concentration
RFD	reasonably foreseeable development
RMP	resource management plan
ROD	Record of Decision
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon dioxide
SC-GHG	social cost of greenhouse gas
SC-N_2O	social cost of nitrous oxide
SCR	selective catalytic reduction
SDA	special designation area
SHPO	State Historic Preservation Office
SMA	special management area
SO_2	sulfur dioxide
STEO	short-term energy outlook
THPO	Tribal Historic Preservation Office
TL	timing limitation
tonnes	metric tons
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VRM	Visual Resource Management
WMA	Wildlife Management Area

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CHAPTER 1. INTRODUCTION

1.1 BACKGROUND

This environmental assessment (EA) documents the Bureau of Land Management (BLM) Oklahoma Field Office (OFO) review of eight parcels (1,527.66 acres) nominated for auction in the OFO Quarter 2 2024 Competitive Oil and Gas Lease Sale (the Proposed Action). The nominated parcels are in Cheyenne County, Kansas (see parcel maps in Appendix A). The nominated parcels consist of federal sub-surface minerals managed by the BLM, and private surface lands. For detailed information on the leasing process, see the following website: https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/parcel-nominations.

The Proposed Action for this lease sale is similar to the leasing action analyzed in the OFO May 2023 Competitive Oil and Gas Lease Sale Final EA (DOI-BLM-NM-0040-2022-0045-EA) (herein called the May 2023 EA; available at: https://eplanning.blm.gov/eplanning-ui/project/2021698/510) based on similar analysis areas, geographic locations, and resource conditions. All parcels (26 total) analyzed in the May 2023 EA were located within the same county (Cheyenne County, Kansas) as the Quarter 2 2024 lease sale parcels, and eight of the parcels analyzed in the May 2023 EA are the same as the eight parcels which were nominated for the Quarter 2 2024 lease sale. Therefore, all eight parcels analyzed for Quarter 2 2024 were previously analyzed in the May 2023 EA. The stipulations and lease notices attached to these eight parcels analyzed in the May 2023 EA would also apply to the Quarter 2 2024 nominated lease parcels (see Section 2.1 and Appendix B).

Therefore, the analysis presented in this EA incorporates by reference the previous analysis from the May 2023 EA, and only includes new analysis specific to the Quarter 2 2024 lease sale where new information or circumstances rendered the May 2023 analysis inadequate (e.g., more recent National Environmental Policy Act of 1969 [NEPA] guidance, or new data sources needing to be incorporated).

1.2 PURPOSE AND NEED

The BLM's purpose in preparing the EA is to respond to an Expression of Interest (EOI) to lease federal oil and gas resources through a competitive leasing process. The need for the action is established by the BLM's responsibility under the Mineral Leasing Act of 1920 (MLA), as amended, to make mineral resources, such as oil and gas, available for development and as part of the BLM's multiple-use and sustained-yield mandate under the Federal Land Policy and Management Act of 1976 (FLPMA).

1.3 DECISION TO BE MADE

The BLM Authorized Officer (AO) will decide whether to make available for lease the nominated parcels with or without constraints, in the form of lease stipulations, as provided for in the approved land use plan. If the decision is to make the lands available for lease and subsequently issue a lease, standard terms and conditions under Section 6 of the BLM lease form (Form 3100-11, Offer to Lease and Lease for Oil and Gas), herein referred to as standard lease terms and conditions, would apply. The BLM AO also has the authority to defer the parcels, based on the analysis of potential effects presented in this EA. The Decision Record (DR) will identify whether the BLM decided to lease the nominated lease parcels and the rationale for the decision.

1.4 BLM LAND USE PLAN CONFORMANCE AND RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS

1.4.1 BLM Land Use Plan Conformance

The BLM, under the MLA and FLPMA as amended, must make mineral resources, such as oil and gas, available for development. Additionally, the Federal Onshore Oil and Gas Leasing Reform Act of 1987 states that lease sales shall be held for each state where eligible lands are available at least quarterly and more frequently if the Secretary of the Interior determines such sales are necessary.

Under FLPMA, the BLM must manage public lands, resources, and resource values according to its multiple-use, sustained-yield mandate in a manner that will best meet the present and future needs of the public, and in accordance with an approved land use plan or resource management plan (RMP). For split-estate lands where the mineral estate is an interest owned by the United States, the BLM has no authority over use of the surface estate; however, the BLM is required to declare how the federal mineral estate will be managed, including the identification of all appropriate lease stipulations(43 Code of Federal Regulations [C.F.R.] § 3101.1 and 43 C.F.R. § 1601.0-7(b); BLM Handbook H-1601-1 and H-1624-1 [BLM 2005, 2018a]). This Proposed Action is in conformance with the March 2020 *Oklahoma, Kansas, and Texas BLM Record of Decision and Approved Resource Management Plan* (referred to herein as Oklahoma, Kansas, and Texas BLM ROD and Approved RMP; BLM 2020).

The nominated lease parcels fall within an area that is open to leasing under the RMP (BLM 2020), subject to certain stipulations. The nominated lease parcels, lease parcel surface ownership, lease parcel legal descriptions and total acreages, and lease stipulations and notices that apply are detailed in Chapter 2, and lease notice (LN) descriptions are detailed in Appendix B.

1.4.2 Relationship to Statutes, Regulations, Policies, and Other Plans

Purchasers of oil and gas leases are required to comply with all applicable federal, state, and local laws and regulations, including obtaining all necessary permits prior to any lease development activities. The BLM is also required to comply with all applicable federal, state, and local laws and regulations as well as U.S. Department of the Interior (DOI) policies when leasing mineral estate and responding to EOIs. Table 1.1 provides a listing of statutes, regulations, policies, and other plans applicable to the leasing decision.

Table 1.1. Relationship to Statutes, Regulations, Policies, and Other Plans

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action
Federal Land Policy and Management Act	The FLPMA, 43 United States Code (U.S.C.) § 1701 et seq., established guidelines to provide for the management, protection, development, and enhancement of public lands. Section 103l of the FLPMA defines public lands as any lands and interest in lands owned by the United States. For split-estate lands where the mineral estate is an interest owned by the United States, the BLM has limited authority over use of the surface by the surface owner; however, the BLM is required to disclose potential effects connected to the authorization to lease and develop federal mineral estate and to declare in the RMP how federal mineral estate is managed, including identification of all appropriate lease stipulations. 43 C.F.R. § 3101.1 and 43 C.F.R. § 1601.0-7(b); BLM Handbook H-1601-1 and H-1624-1 (BLM 2005, 2018). Within the context of the NEPA, as amended, the BLM considers FLPMA compliance when conducting NEPA analyses for mineral leasing actions, and the BLM issues a Finding of No Significant Impact (FONSI) when it determines that the proposed action would not violate any federal, state, tribal, or local law protecting the environment, including but not limited to the FLPMA's mandate to ensure that undue and/or unnecessary degradation would not occur.
Mineral Leasing Act of 1920	The MLA establishes that deposits of oil and gas owned by the United States are subject to disposition in the form and manner provided by the MLA under the rules and regulations prescribed by the Secretary of the Interior, where consistent with the FLPMA, NEPA, 42 U.S.C. § 4321 et seq., and other applicable laws, regulations, and policies.
43 C.F.R. § 3100 et seq.	These regulations govern onshore oil and gas leasing, development, and production of federal minerals.
Federal Onshore Oil and Gas Leasing Reform Act of 1987	This Act, at 30 U.S.C. § 181, et seq., directs the BLM to conduct quarterly oil and gas lease sales whenever eligible lands are available for leasing.
Endangered Species Act of 1973 (ESA)	The ESA, 16 U.S.C. § 1531 et seq., requires all federal departments and agencies to conserve threatened, endangered, and critical and sensitive species and the habitats on which they depend as well as consult with the U.S. Fish and Wildlife Service (USFWS) on all actions authorized, funded, or carried out by the agency to ensure the action will not likely jeopardize the continued existence of any threatened and endangered species or adversely modify critical habitat.
Mineral Leasing Act for Acquired Lands (MLAA)	The MLAA allows for mineral leasing on "acquired lands." The MLAA defines "acquired lands" as including "all lands heretofore or hereafter acquired by the United States to which the 'mineral leasing laws' have not been extended, including such lands acquired under the provisions of sections 480, 500, 513 to 519, 521, 552, and 563 of Title 16." 30 U.S.C. § 351. The MLAA states acquired lands "may be leased by the Secretary under the same conditions as contained in the leasing provisions of the mineral leasing laws, subject to the provisions hereof." 30 U.S.C. § 352.
National Historic Preservation Act of 1966 (NHPA)	Leasing is considered an undertaking pursuant to 54 U.S.C. § 300101 et seq., commonly known as the NHPA, and 54 U.S.C. § 306108, commonly known as Section 106 of the NHPA (Section 106). Agencies may follow a phased approach to Section 106 compliance. At the leasing level, existing records reviews and consultation drive identification of historic properties. Class III field inventories are an important part of identification at the lease-development level. See the text of stipulation HQ-CR-1 in Appendix B for details.

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action
Inflation Reduction Act of 2022 (IRA)	The IRA made the following major changes to BLM's oil and gas leasing program: • Rescinded the BLM's authority to issue noncompetitive leases under the MLA by striking 30 U.S.C. § 226(c) • Removed BLM's authority to issue reversionary noncompetitive leases • Updated the royalty rate and rental rate lease terms for competitive leases • Changed the grounds and conditions for certain reinstatements In addition, Section 50265 of the IRA states that the BLM may not issue a right-of-way for wind or solar energy development on federal land unless it has 1) held an onshore oil and gas lease sale during the past 120 days and 2) offered the lesser of a "sum total" of either 2,000,000 acres or 50% of the acreage for which EOIs have been submitted for lease sales during the previous 1-year period. The BLM has issued policy guidance to implement the oil and gas leasing provisions in the IRA and provided updated direction on other program components (i.e., Instruction Memorandum [IM] 2023-006 [BLM 2022a], IM 2023-007 [BLM 2022b], IM 2023-008 [BLM 2022c], and IM 2023-010 [BLM 2022d]).
IM 2023-006 – Implementation of Section 50265 in the Inflation Reduction Act for Expressions of Interest for Oil and Gas Lease Sales (BLM 2022a)	This IM provides guidance regarding BLM's implementation of IRA Section 50265 with regard to EOIs. The BLM is using the National Fluid Lease Sale System (https://nflss.blm.gov/eoi/list) to track the acreage of EOIs submitted. As stated in IM 2023-006 and IM 2023-036, *Inflation Reduction Act Conditions for Issuing Rights-of-way for Solar or Wind Energy Development* (BLM 2022e), the BLM will prepare a national report and document the review prior to issuing a wind or solar energy right-of-way.
IM 2023-007 – Evaluating Competitive Oil and Gas Lease Sale Parcels for Future Lease Sales* (BLM 2022b)	This IM provides guidance to BLM offices in selecting parcels to be offered in oil and gas lease sales, and it also supplements IM 2023-010, *Oil and Gas Leasing – Land Use Planning and Lease Parcel Reviews*. This IM informs the agency's organization, procedures, and practice.
IM 2023-008 – Impacts of the Inflation Reduction Act of 2022 (Pub. L. No. 117-169) to the Oil and Natural Gas Leasing Program (BLM 2022c)	This IM provides the BLM State Offices with guidance for implementing the provisions of the IRA pertaining to EOIs, noncompetitive lease offers, pending competitive leases, and reinstatements. This IM updates expired policy IM 2014-004, *Oil and Gas Informal Expressions of Interest*.
IM 2023-010 – Oil and Gas Leasing – Land Use Planning and Lease Parcel Reviews (BLM 2022d)	This IM sets out the policy of the BLM to ensure that oil and gas lease sales are held in accordance with the MLA, 30 U.S.C. § 226; IRA, Public Law (PL) 117-169; and other applicable laws. This policy addresses land use planning, lease parcel review, lease sales, lease issuance, and IM implementation and directs the BLM to incorporate the revised policy, as appropriate, into the affected BLM handbooks and manuals.

*See Appendix C for BLM's evaluation of the nominated lease sale parcels in accordance with IM 2023-007, *Evaluating Competitive Oil and Gas Lease Sale Parcels for Future Lease Sales* (BLM 2022b).

1.5 PUBLIC INVOLVEMENT AND ISSUES

1.5.1 Internal Scoping

The BLM OFO interdisciplinary team (IDT) conducted internal scoping to identify issues, potential alternatives, and data needs by reviewing the leasing actions within the context of the applicable RMP under the NEPA framework. An IDT meeting was held at the BLM OFO on August 18, 2023, as were weekly meetings with additional BLM OFO IDT members during the parcel review process. Additionally, other resource-specific meetings with resource specialists were held to aid in refining issues related to the proposed lease sale.

1.5.2 External Scoping

A project summary page for the OFO Quarter 2 2024 Competitive Oil and Gas Lease Sale was posted on the BLM's National NEPA Register website (https://eplanning.blm.gov/eplanning-ui/home). The nominated lease parcel information was posted on that website for a public scoping period from August 21 to September 20, 2023.

The BLM OFO received nine comment letters via ePlanning during the scoping period for the Quarter 2 2024 Competitive Oil and Gas Lease Sale. One of the nine comment letters included 18,653 signatures in support of the comment letter. Concerns and comments presented by the public and non-governmental organizations are summarized below.

Concerns were presented regarding the following:

- Effects of lease sales on greenhouse gas (GHG) emissions and climate change
- Air quality and associated health impacts
- Compliance with the Inflation Reduction Act of 2022 (IRA)
- Tribal consultation and public participation
- Cumulative impacts of BLM's leasing program and other similar actions nationwide
- Public health and environmental justice
- Big game habitat and migration corridors
- Impacts to groundwater quality and quantity from hydraulic fracturing and injection wells

In addition, the following requests were presented:

- Defer parcels with no or low potential for oil and gas development and/or with resource concerns.
- Complete a programmatic environmental impact statement (EIS) for the BLM's federal oil and gas program.
- Consider and recommend a reasonable range of alternatives.
- Incorporate climate costs.
- Impose climate change impact requirements and GHG emissions mitigation on leasing.

1.5.3 Draft EA Public Comment and Response

The draft Quarter 2 2024 Competitive Oil and Gas Lease Sale EA will be made available for a public comment period from November 20 to December 20, 2023. All comments received will be reviewed and analyzed. Substantive comments will be extracted and responded to appropriately.

1.5.4 Public Protest Period

The Oil and Gas Lease Sale Notice will be made available for a protest period from March 11 to April 10, 2024. The BLM will resolve any protests prior to issuing leases.

1.5.5 Issues

The Council on Environmental Quality (CEQ) regulations at 40 C.F.R. § 1500.4(i) direct that the scoping process should be used "not only to identify significant environmental issues deserving of study, but also to deemphasize insignificant issues, narrowing the scope of the [NEPA] process accordingly."
In accordance with 40 C.F.R. § 1501.9 (f)(1), the lead agency "shall identify and eliminate from detailed study the issues that are not significant or have been covered by prior environmental review(s), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere."
Table 1.2 cites and summarizes issue analysis and other documentation from the May 2023 EA (DOI-BLM-NM-0040-2022-0045-EA). Analysis of these issues beyond those incorporated by reference from the prior EA is not warranted for reasons explained in Section 1.1.

Table 1.3 provides a list of resources that are not present within the nominated lease parcels or surrounding areas and therefore do not warrant analysis in this EA. Resource issues for which the Proposed Action would result in new or different effects than those of the May 2023 EA are evaluated in brief (see Section 3.5) or evaluated in detail (see Section 3.6).

Through scoping, three issues were identified for detailed analysis in this EA:

- How would future potential development of the nominated lease parcels affect air quality (particularly with respect to National Ambient Air Quality Standards [NAAQS] and volatile organic compounds [VOCs]) in the analysis area?
- How would future potential development of the nominated lease parcels contribute to GHG emissions and climate change?
- How would future potential development of the nominated lease parcels affect surface water and groundwater quantity?

An additional four issues were identified, considered, and analyzed in brief (AIB) by members of the IDT in review of the Proposed Action. These issues are presented in Section 3.5.

Table 1.2. Issue Analyses and Documentation Incorporated by Reference from the May 2023 EA

Resource or Concern	Rationale for Not Analyzing in EA
Groundwater quality	Impacts to groundwater quality from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-1). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development of the nominated lease parcels would pose risks to groundwater from potential contamination of freshwater aquifers from well integrity failures, spills, or loss of fluids during the drilling and completion processes. Well completion activities would be subject to standard industry practices and other regulatory requirements related to hydraulic fracturing under 43 C.F.R. § 3160; Onshore Orders 1, 2, and 7; 43 C.F.R. § 3162.3-3; 43 C.F.R. § 3162.3-5; Notice to Lessees 3A; and Kansas Administrative Regulations, Volume 4, Chapter 82. The regulatory program and standard terms and conditions would greatly reduce the risks to groundwater from the projected future well development.
Surface water quality	Impacts to surface waters from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-2). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface waters within the nominated lease parcels would be protected from direct disturbance due to the No Surface Occupancy (NSO) stipulation (OFO-4-NSO, attached to the parcels) (see Appendix B). Impacts to any surface water features that occur off-lease would be avoided or mitigated though application of standard terms and conditions, which allow for the application of measures to avoid and mitigate accelerated soil erosion and sedimentation to waterbodies. These measures include, but are not limited to, BLM “Gold Book” standards (BLM 2007), onshore orders, operators’ surface use plan of operations, and conditions of approval (COAs). The BLM’s authority to require additional protective measures and the low level of surface disturbance relative to the total watersheds would serve to minimize the risk of effects on watershed hydrology and surface water quality. Should a spill occur, the BLM would work with operators to immediately remediate spills in accordance with federal and state standards.
Soils and erosion	Impacts to soils with erosion potential from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-3). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development of the nominated lease parcels would affect the physical and biological integrity of soils within the footprint of surface disturbance. The anticipated surface disturbance associated with lease development of the nominated lease parcels (approximately 1,527.66 acres) would comprise 0.0006% of the 270-million-acre OFO. To prevent potential impacts on sensitive soils and soil stability, stipulation OFO-1-CSU is applied to all nominated lease parcels, which prohibits surface disturbance within sensitive soils, including soils susceptible to erosion (see Appendix B). Impact to soils would be remedied upon reclamation of the well pads and associated infrastructure. Additional measures, such as topsoil stockpiling and pad placement in respect to topography and other factors, would be incorporated to further mitigate effects on the physical and biological integrity of soils during the development of a lease.
Prime farmland	Impacts to prime and unique farmlands from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-4). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface disturbance associated with future potential development of the nominated lease parcels may occur on prime farmlands. However, impacts to prime farmland soils would be avoided or minimized through the application of standard terms and conditions attached as COAs to the Application for Permit to Drill (APD), which allow for measures to reduce impacts on or avoid prime farmland soils. Plugging and abandoning the wells and final reclamation may result in the reestablishment of prime farmland or farmland of statewide importance characteristics (or similar) to the area, depending on the specific regulatory and policy context of any given well.

Resource or Concern	**Rationale for Not Analyzing in EA**
Vegetation	Impacts to vegetation from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-7). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Standard lease terms and conditions provide the BLM with the authority to determine site-specific vegetation management strategies, including relocating wells up to 200 meters (m) (656 feet), at the lease development stage for any future actions within the lease parcels to determine whether effects on rare and unique or otherwise sensitive vegetation would occur. Under standard terms and conditions, which would apply to the Quarter 2 2024 nominated lease parcels, pre-disturbance surveys would be required at the time of the proposed lease development. The surveys would identify occurrence of rare or unique vegetation types, special status plant species, and/or vegetation providing habitat for special status wildlife species for avoidance during project siting and construction. Avoidance, minimization, and/or mitigation measures would also be determined at that time.
Threatened and Endangered Species	Impacts to threatened and endangered species from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-8, and Section 4.1). Impacts associated with future potential development of the nominated lease parcels would be essentially similar to those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. Any differences in potential impacts between the May 2023 EA nominated lease parcels and Quarter 2 2024 nominated lease parcels are not substantial. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface disturbance associated with future potential development of the nominated lease parcels could affect potentially suitable habitat for the monarch butterfly (*Danaus plexippus*). Stipulation HQ-TES-1 is applied to the lease parcels providing protections to threatened and endangered species, which would apply to off-lease development of the nominated lease parcels (see Appendix B). Future potential development is not anticipated to create short- or long-term, significant adverse effects for the following reasons: 1) stipulations and LNs facilitate the reduction or avoidance of effects, 2) site-specific analysis at the lease development stage provides an additional opportunity to evaluate effects and develop measures to reduce or avoid effects, and 3) the standard lease terms and conditions that apply to the nominated lease parcels provide the BLM with the authority to require reasonable measures that reduce or avoid effects. The BLM completed a review of species listings within the vicinity of the nominated lease parcels using the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system in September 2023 under Consultation Code 2023-0134971, and one additional species was identified that was not already analyzed in the May 2023 EA (tricolored bat [*Perimyotis subflavus*]). Impacts to tricolored bat from future potential lease development are further analyzed in Section 3.4, AIB-4.
Migratory birds	Impacts to migratory birds from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-9). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface disturbance from future potential development of a nominated lease parcel would result in long-term habitat loss and fragmentation, depending on the proximity of disturbance to migratory bird habitat. Following reclamation, these effects would decrease over time. Stipulation OFO-4-NSO would be applied to all the nominated lease parcels and would prohibit surface disturbance within riparian-wetland areas and waterbodies (up to 126 m [415 feet] landward from the edge of wetland or waterbody, as determined by the BLM biologist before any surface-disturbing activities) that provide important habitat for migratory birds. In addition, compliance with the Migratory Bird Treaty Act would be required for any future potential development, and pre-disturbance surveys may be required at the time of proposed lease development in accordance with standard terms and conditions. The BLM applies measures to mitigate effects on migratory birds at the leasing stage.

Resource or Concern	**Rationale for Not Analyzing in EA**
General wildlife	Impacts to wildlife and big game species from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-10). Impacts associated with future potential development of the nominated lease parcel would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface disturbance from future potential development of the nominated lease parcels can result in long-term loss of vegetation, burrows, and nests, and could also cause habitat loss, fragmentation, and mortalities. Future potential development may also have effects on migratory game species by causing them to avoid areas within and near the nominated lease parcels. Pre-disturbance surveys would be required at the time of the proposed lease development in accordance with standard terms and conditions of the lease, which would apply to off-lease development. Avoidance, minimization, and/or mitigation measures would also be determined at that time. The BLM has the authority under standard terms and conditions to attach COAs at the site-specific level to minimize significant adverse effects on resource values at the time operations are proposed.
Fluid minerals	Impacts to fluid mineral availability from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-11). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. The future estimated production of oil and gas from the nominated leases would result in irretrievable loss of these resources. However, the OFO 2020 RMP committed these resources for oil and gas leasing.
Socioeconomics	Impacts to socioeconomics from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-12). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. While the act of leasing federal minerals itself would not result in direct social impacts, subsequent development of the lease may generate impacts on communities and individuals in the vicinity of the lease (e.g., employment opportunities related to the oil and gas and service support industries in the region) as well as impacts on federal, state, and county governments related to taxes, royalty payments, and other revenue streams. To the extent that additional oil and gas development affect recreational and tourism opportunities in the area of the nominated lease parcels, there may be related effects in these economic sectors. The BLM uses a number of stipulations and LNs applied to the nominated lease parcels that may mitigate potential effects on wildlife and other resources that in turn may mitigate effects on related recreational and quality-of-life concerns (see Appendix B).
Paleontological resources	Impacts to paleontological resources from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-13). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Surface disturbance from future potential development of nominated lease parcels would result in rock material potentially containing fossils being removed. Site-specific impacts may be analyzed further under NEPA at the lease development stage when development details are known. For locations where the BLM determines future development of this parcel may have a potential to cause ground disturbance in areas with Potential Fossil Yield Classification 4 or 5 ratings, on-the-ground surveys would be recommended, as well as paleontological monitors during ground-disturbing activities. Specifically, lease notice NM-14-LN (under which lease development would be subject to compliance with the Paleontological Resources Preservation Act, NEPA, and FLPMA) and NM-13-CSU (see Appendix B) are applied to the nominated lease parcels. Therefore, any impacts on paleontological resources of scientific interest would be reduced or avoided.
Induced seismicity	Impacts to induced seismicity from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-14). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development of the nominated lease parcels would include hydraulic fracturing and the need to dispose of produced water over the total life of the well. Based on the underground injection control regulatory program for injection wells, the amount of produced water anticipated from future potential development of the nominated lease parcels, and the declining trend of induced seismicity within Kansas, leasing and future potential development of the nominated lease parcels is not expected to contribute to additional induced seismicity.

Resource or Concern	**Rationale for Not Analyzing in EA**
Visual resources	Visual impacts from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-15). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. The BLM does not manage visual resources on private surface estate, and the Quarter 2 2024 nominated lease parcels are all on private land with no visual resource management (VRM) designations. However, landscape modifications on private lands can still cause visual impacts for sensitive viewer groups in the surrounding area (e.g., residential areas). Given the limited scale of the existing oil and gas development surrounding the nominated lease sale parcels, the presence of oil and gas development–related equipment and structures would cause localized changes to the visual landscape that may be visible from some or all the residences within proximity of the nominated lease parcels and immediately adjacent areas. Standard terms and conditions allow the BLM to consider measures to minimize visual impacts at the time of proposed lease development.
Human health and safety	Impacts to human health and safety from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-16). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development of the nominated lease parcels would incrementally contribute to the human health and safety risks which already exist as a result of the existing oil and gas development in the planning area; these include fire starts; spills of hazardous materials, hydrocarbons, produced water or hydraulic fracturing fluid and corresponding potential contamination of air, soil, or water; exposure to naturally occurring radioactive material (NORM) in drill cuttings or produced water (Appendix D); traffic congestion and collisions from commercial vehicles and heavy use, infrequent industrial accidents; presence of hydrogen sulfide (H_2S); or increased levels of fugitive dust (particulate matter equal to or less than 10 microns in diameter [PM_{10}] and particulate matter equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), other criteria pollutants, VOCs, and hazardous air pollutants (HAPs). Residences that occur within approximately 2,000 m (1.25 miles) or less of active oil and gas wells would generally be at a higher risk for experiencing human health and safety effects (Adgate et al. 2014; Czolowski et al. 2017; Haley et al. 2016; Kroepsch et al. 2019). Compliance with federal and state laws, regulations, and policies would help to reduce these risks and respond to incidents. Human health effects associated with emissions of air pollutants are described in the May 2023 EA air quality analysis (Section 3.5) and are further discussed in the *BLM 2022 Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas, and Kansas* (BLM 2023a).
Quality of life	Impacts to quality of life from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-17). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development of the nominated lease parcels could affect quality of life for nearby residences through increased human activity, traffic, noise, dust, odor, light pollution, visual effects, and health and safety effects. Residences within 2,000 m (1.25 miles) or less are generally at a higher risk for experiencing air pollution effects, and residences less than 805 m (0.5 mile) away may experience noise and odor effects at nuisance levels, depending on the phase of development. While the exact location of development is unknown, there are opportunities for future potential development to reasonably be placed in areas that are less proximal to residences to minimize quality of life issues. Under the authority granted in standard terms and conditions attached to each lease, measures to reduce effects on or avoid resource values, land uses, or users would be attached as COAs to the APD. Site-specific avoidance, minimization, and/or mitigation measures would be determined at the time of the 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 on quality of life 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 effects as needed. In addition, future potential development of the nominated lease parcels, as well as any reasonable foreseeable actions, would be subject to compliance with state and local laws related to noise and other public nuisances, wherever applicable.

Resource or Concern	**Rationale for Not Analyzing in EA**
Cave and karst	Impacts to cave and karst from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-18). Impacts associated with future potential development of the nominated lease parcels would be the same as those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. There is no new information or circumstances that would substantively change the analysis or the conclusions from those presented in the May 2023 EA. Future potential development within mapped karst features on the nominated lease parcels would be further reviewed and mitigated at the time of the proposed lease development, or during other proposed ground-disturbing activities, per standard terms and conditions of the lease. Lease notice OFO-7-LN has been applied to all nominated lease parcels for potential cave or karst occurrence areas, which would allow BLM to develop special protective measures (i.e., operational constraints) at the APD stage (see Appendix B). While several measures can be implemented to mitigate impacts, it is still possible for impacts to occur from containment failures, well blowouts, accidents, spills, and structural collapses. It is therefore necessary to implement long-term monitoring studies to determine if current mitigation measures are sufficient to prevent long-term or short-term impacts on cave/karst resources. Mitigation measures could include changes in drilling operations, special casing and cementing programs, installation of leak detection and automatic shut-off systems, and modifications in surface activities.

Table 1.3. Issues Determined to be Not Present

Resource or Concern	Rationale for not Analyzing in EA
Lands with wilderness characteristics (LWCs)	There are no designated LWCs within the OFO planning area. Therefore, analysis of potential effects on LWCs is not warranted.
Areas of critical environmental concern (ACECs) or special management areas (SMAs)	There are no designated ACECs or SMAs within the OFO planning area. Therefore, analysis of potential effects on ACECs or SMAs is not warranted.
Special designation area (SDA)	There are no SDAs (e.g., wilderness areas, wilderness study areas, wild and scenic rivers, national trails, research natural areas, wildlife areas) within or near the nominated lease parcels. The closest SDA is approximately 40 kilometers (km) (25 miles) away. Therefore, analysis of potential effects on special designations is not warranted.
Invasive plants/noxious weeds	BLM does not have authority to manage vegetation on private or non-BLM-administered surface lands, other than to direct the potential operator to control invasive species during development and production. The nominated lease parcels do not contain any BLM-administered surface land. Therefore, analysis of potential effects on invasive species or noxious weeds is not warranted.
Grazing	There are no grazing allotments within the nominated lease parcels, and no private grazing operations are evident from aerial imagery. Therefore, analysis of potential effects on grazing is not warranted.
BLM sensitive species	BLM sensitive species are only managed on BLM-administered surface lands. The nominated lease parcels do not contain any BLM-administered surface land; therefore, analysis of potential effects on BLM sensitive species is not warranted.
Solid minerals	There are no mines or solid mineral deposits within or near the nominated lease parcels. The closest active mine location is approximately 764 km (475 miles) from the nominated lease parcels. Therefore, analysis of potential effects on solid minerals is not warranted.
Recreation	There are no designated recreation areas within or near the nominated lease parcels. The closest recreation areas (South Fork Wildlife Area) is approximately 5 km (3 miles) from the parcel boundaries. Therefore, analysis of potential effects on recreation is not warranted.
Dark night skies	There are no dark night sky monitoring locations within or near the nominated lease parcels. The closest monitoring locations are located approximately 134 km (83 miles) from the nominated lease parcels. Therefore, analysis of potential effects on dark night skies is not warranted.
Potash or coal	There are no potash or coal resources (including mine workings, drill islands, or development areas) within or near the nominated lease parcels. Therefore, analysis of potential effects on potash and coal is not warranted.
Forestry and woodlands	Forest and woodland vegetation types are either absent or occur in negligible amounts within the nominated lease parcels. No specific concerns or conflicts were identified through internal scoping relating to the effects of future potential development on forestry and woodlands. Therefore, analysis of potential effects on forestry and woodlands is not warranted.
Fuels and fire management	The potential for ignition of wildland fire from activities associated with future potential development of the nominated lease parcels would be minimized to the extent practicable through adherence to all applicable federal, state, and local fire safety requirements. No specific concerns or conflicts were identified through internal scoping relating to the effects of future potential development on fuels and fire management. Therefore, analysis of potential effects on fuels and fire management is not warranted.

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CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

Under the Proposed Action, the BLM would offer for lease federal minerals associated with eight nominated lease parcels. Surface management, the legal land description of the nominated lease parcels totaling 1,527.66 acres, and lease stipulations and notices attached to the lease parcel are included in Table 2.1. Appendix A contains parcel maps. Appendix B provides a summary of stipulations and lease notices. Under the Proposed Action, the BLM AO has the authority to lease the parcels, or to defer the parcels, based on the analysis of potential effects presented in this EA.

Table 2.1. Nominated Lease Parcel Description

Parcel Number (number of acres)*	Surface Management	Legal Land Description	Lease Notices and Stipulations
0008 (200.00 acres)	Private	T. 2 S., R. 40 W., 6TH PM Sec. 2 SW1/4NE1/4, SE1/4NW1/4, SE1/4SW1/4, W1/2SE1/4. Cheyenne County EOI# NM00017920	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation
0009 (40.00 acres)	Private	T. 2 S., R. 41 W., 6TH PM Sec. 11 SE1/4SE1/4. Cheyenne County EOI# NM00017920	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation

Parcel Number (number of acres)*	**Surface Management**	**Legal Land Description**	**Lease Notices and Stipulations**
0012 (927.39 acres)	Private	T. 1 S., R. 40 W., 6TH PM Sec. 4 LOTS 3, 4; Sec. 4 S1/2NW1/4, SW1/4; Sec. 5 LOTS 1 through 4; Sec. 5 S1/2N1/2, SE1/4, N1/2SW1/4, SW1/4SW1/4. Cheyenne County EOI# NM00017906	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation
0035 (40.00 acres)	Private	T. 1 S., R. 40 W., 6TH PM Sec. 34 NE1/4NE1/4. Cheyenne County EOI# NM00017915	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation

Parcel Number (number of acres)*	**Surface Management**	**Legal Land Description**	**Lease Notices and Stipulations**
0037 (40.27 acres)	Private	T. 2 S., R. 37 W., 6TH PM Sec. 5 LOT 2. Cheyenne County EOI# NM00017921	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation
0038 (80.00 acres)	Private	T. 1 S., R. 38 W., 6TH PM Sec. 28 N1/2SW1/4. Cheyenne County EOI# NM00017921	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation

Parcel Number (number of acres)*	Surface Management	Legal Land Description	Lease Notices and Stipulations
0044 (160.00 acres)	Private	T. 2 S., R. 42 W., 6TH PM Sec. 9 N1/2SE1/4, SE1/4NE1/4; Sec. 10 SW1/4NW1/4. Cheyenne County EOI# NM00017920	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation
6113 (40.00 acres)	Private	T. 2 S., R. 37 W., 6TH PM Sec. 5 NE1/4SE1/4. Cheyenne County EOI# NM00017921	**HQ-TES-1** BLM Lease Notice for Endangered Species Act Section 7 Consultation **HQ-CR-1** BLM Lease Notice for Cultural Resources and Tribal Consultation Stipulation **HQ-MLA-1** BLM Lease Notice for MLA Section 2(a)(2)(A) Compliance **NM-11-LN** BLM Lease Notice for Special Cultural Resource **NM-14-LN** BLM Lease Notice for Paleontological Resources **NM-13-CSU** Paleontological Resources **OFO-1-CSU** Sensitive Soils **OFO-1-TL** Bald and Golden Eagle Nests **OFO-4-NSO** Riparian-Wetland Areas and Waterbodies **OFO-4-LN** Migratory Birds and Birds of Conservation Concern **OFO-7-LN** Potential Cave or Karst Occurrence Area **OFO-8-LN** Cultural Resources and Tribal Consultation

* All acreages contained in the EA analysis were calculated using geographic information system (GIS) data sets for resources and parcels, which may differ slightly from the acreage contained in the legal description here. The difference in total acres between parcels can vary due to geoprocessing operations where slivers of area are created when two or more data sets intersect. Any inaccuracies are negligible and do not change the overall impact analysis conclusions presented in this EA.

The drilling of wells is not permitted until the leaseholder submits and the BLM approves (subsequent to additional site-specific environmental review documentation) a complete Application for Permit to Drill (APD) package (Form 3160-3) following the requirements specified in 43 C.F.R. § 3162.3-1 and 43 C.F.R. § 3171. The BLM has authority, according to the standard terms and conditions of the leases, to attach conditions of approval (COAs) to the APD that reduce or avoid site-specific impacts to public land, resources, and/or resource values. Under 43 C.F.R. § 3101-1-2, such reasonable measures may include modification to the siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Measures shall be deemed consistent with lease rights granted provided they do not require relocation of proposed operations by more than 200 m (656 feet), require that operations be sited off the leasehold, or prohibit new surface-disturbing operations for a period in excess of 60 days in any lease year.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not offer the nominated parcels for competitive leasing in the Quarter 2 2024 Competitive Oil and Gas Lease Sale; therefore, no parcels would be developed at this time. The parcels would have the potential to be nominated again for a future oil and gas lease sale.

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CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1 INTRODUCTION

This chapter contains the impacts analysis related to the issues listed in Section 1.5.6. Section 3.2 describes the analysis assumptions related to future potential development of the nominated lease parcels. Section 3.3 presents an overview of reasonably foreseeable environmental trends and planned actions considered in the impact analysis. Section 3.4 describes the effects of the No Action Alternative for all issues. Section 3.5 presents the issues analyzed in brief, and Section 3.6 presents the issues analyzed in detail.

3.2 ANALYSIS METHODOLOGY

While leasing itself would not directly authorize any oil and gas development or production, future oil and gas development and production is a reasonable outcome of a granted lease right. Because there is currently no development proposal for the nominated lease parcels, site-specific details are unknown. This analysis conservatively assumes future potential development of the nominated lease parcels would include the development of up to one well per parcel. Sections 3.2.1 and 3.2.2 outline the methodology for estimating number of wells, potential production volumes, and surface disturbance associated with the future potential development of the nominated lease parcels. Estimates of future potential development are based on known historical data and reasonable assumptions.

3.2.1 Methodology for Estimating Number of Oil and Gas Wells and Production Volumes

Reasonably foreseeable quantitative well development estimates were derived from the well densities that were analyzed in the *Oklahoma, Kansas and Texas Final Joint Environmental Impact Statement/ Proposed BLM Resource Management Plan and Proposed BIA Integrated Resource Management Plan* (OFO RMP Final EIS) (BLM and Bureau of Indian Affairs [BIA] 2019a). To calculate the volumes of oil, natural gas, and water expected to be produced from the parcels, the projected number of wells was multiplied by the estimated ultimate recoveries (EURs) of oil, natural gas, and produced water per well. These EURs are generated by performing decline curve analyses of existing production within the OFO planning area.

The projected number of wells and associated oil, gas, and produced water production for the nominated lease parcels are summarized in Table 3.1.

Table 3.1. Estimated Well Count and Production for the Nominated Lease Parcels

Parcel Number (number of acres)*	State	Surface Ownership	Total Vertical Wells†	Surface Disturbance (acres)	Oil Production (bbl)	Gas Production (mcf)	Produced Water Production (bbl)
0008 (200.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000
0009 (40.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000
0012 (927.39 acres)	KS	Private	1	6.26	59,000	641,000	36,000
0035 (40.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000

Parcel Number (number of acres)*	State	Surface Ownership	Total Vertical Wells†	Surface Disturbance (acres)	Oil Production (bbl)	Gas Production (mcf)	Produced Water Production (bbl)
0037 (40.27 acres)	KS	Private	1	6.26	59,000	641,000	36,000
0038 (80.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000
0044 (160.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000
6113 (40.00 acres)	KS	Private	1	6.26	59,000	641,000	36,000
Total OFO (1,527.66 acres)			**8**	**50.10‡**	**472,000**	**5,128,000**	**288,000**

Note: bbl = barrels; mcf = thousand cubic feet

* All acreages contained in the EA analysis were calculated using geographic information system (GIS) data sets for resources and the parcels, which may differ slightly from the acreages contained in the legal description here and in Table 2.1. Difference in total acres for the parcel can vary because of geoprocessing operations where slivers of area are created when two or more data sets intersect. Any inaccuracies are negligible and do not change the overall impact analysis conclusions presented in this EA.

† In cases where the methodology used for estimating the number of wells per nominated lease parcel resulted in a fractional value of less than one well per nominated lease parcel (because of low anticipated drilling rate), the fractional value was adjusted upward to the next whole number to represent a rational outcome of the number of potential wells that could be drilled and developed on the nominated lease parcel, as well as to provide meaningful inputs to the oil, gas, and produced water production projections.

‡ Values may differ due to rounding.

3.2.2 Methodology for Estimating Surface Disturbance

It is unknown when, where, and to what extent subsequent well sites, roads, and associated infrastructure would be proposed in the event the BLM decides to lease the nominated parcels. Future potential development of the nominated lease parcels could include the following phases:

- Constructing new access roads or expansion of existing roads
- Constructing a well pad
- Drilling a well
- Hydraulically fracturing a well
- Installing pipeline
- Production, including vehicle traffic; hauling of produced fluids such as oil or produced water; compression to move gas through pipeline systems; potential venting from storage tanks; regular well monitoring; and work-over tasks for the life of the well
- Well plugging and abandonment
- Reclamation and remediation

Appendix D provides a summary of the phases of oil and gas development.

Based on surface disturbance values identified in the 2016 reasonably foreseeable development (RFD) scenario for Kansas, Oklahoma, and Texas (BLM 2016), the BLM estimates 4.5 acres of surface disturbance per new horizontal well pad, 2.7 acres of surface disturbance per new vertical well pad, and 3.56 acres of surface disturbance for each well pad's associated access road and pipeline infrastructure. The OFO RMP projects a "maximum buildout" of 1,230 federal wells on 4,480,100 acres of land and calculates a well density (wells per acre) using this maximum buildout value. Based on the RMP well density, acres of land, and number of parcels available for leasing, and rounding to ensure that the number of wells per parcel is a nonzero, whole number, one well per parcel was estimated for this lease sale. Assuming future potential development of one vertical well per parcel (eight vertical wells total), along with any associated access roads and pipelines, 50.10 total acres of new surface disturbance are

anticipated (see Table 3.1). Disturbance would remain on the landscape until final abandonment and reclamation of facilities (generally assumed to occur after 20 years). Interim/ongoing reclamation procedures must be completed within 6 months of well completion and would be used to limit impacts by restoring disturbed areas as soon as they are no longer required for operations.

3.3 CUMULATIVE IMPACTS SCENARIO

The BLM OFO planning area encompasses 269,650,000 acres of BLM, other federal surface management agency, tribal (trust, allotted, and/or restricted), state, county, and private lands across Oklahoma, Kansas, and Texas. Surface land managers within the OFO planning area include the BIA; Bureau of Reclamation; U.S. Department of Defense; International Boundary and Water Commission; National Park Service; U.S. Department of Agriculture; U.S. Fish and Wildlife Service (USFWS); U.S. Army Corps of Engineers; the States of Oklahoma, Kansas, and Texas; and private landowners. Of the 270-million-acre OFO planning area, the BLM decision area is limited to BLM-administered surface and subsurface mineral estate, which covers approximately 15,100 acres (0.01% of the OFO planning area) and 4,810,900 acres (1.8% of the OFO planning area), respectively (BLM and BIA 2019a). BLM-administered surface estate (15,100 acres total) includes approximately 3,300 acres of isolated scattered tracts in Oklahoma and 11,800 acres at the Cross Bar Management Area near Amarillo, Texas. BLM-administered mineral estate consists of approximately 4,810,900 acres underlying BLM-administered surface land, federal minerals underlying other federal surface management agency lands, and federal minerals underlying split-estate tracts (BLM and BIA 2019a).

The following sections outline the reasonably foreseeable environmental trends and planned actions within the OFO planning area that are closely related to the Proposed Action and the RFD of the nominated lease parcels. The BLM can identify and analyze reasonably foreseeable environmental trends and planned actions expected to occur over the next 20 years, as this time period is aligned with available RMP and RFD scenario information. Additional information related to environmental impacts of BLM management decisions can be found in the Oklahoma, Kansas, and Texas BLM ROD and Approved RMP (BLM 2020), and the OFO RMP Final EIS (BLM and BIA 2019a). More information related to air resources environmental trends is available in the *BLM 2022 Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas and Kansas* (BLM 2023a); this document is incorporated by reference into the EA.

3.3.1 Energy Development and Other Land Uses

3.3.1.1 *Oil and Gas Development*

The OFO planning area contains 40 existing and potential oil and gas plays (BLM and BIA 2019a). Some of these play areas are on a decline or near the end of their life, whereas others are relatively new. Portions of eight plays overlap BLM-administered lands, and 26 plays overlap BLM-administered federal mineral estate. BLM-administered surface lands overlap plays almost exclusively in Oklahoma, but some overlapping also occurs in Texas.

According to the 2016 RFD scenario for Kansas, Oklahoma, and Texas (BLM 2016; herein incorporated by reference), historical well counts total 541,301 in Oklahoma, 344,511 in Kansas, and 1,397,108 in Texas, for a total of 2,282,920 historical wells drilled on the OFO planning area. Federal and trust wells comprise only 0.3% of all historical wells drilled in the OFO planning area (BLM 2016). Approximately 409,000 (18%) of the total historical wells are currently producing (BLM 2016). Most of the historical wells drilled are vertical wells. Assuming an average disturbance of 2.7 acres per vertical well, there would be approximately 1,104,300 acres of existing surface disturbance from the 409,000 producing wells across the OFO planning area (BLM 2016). It is assumed the other 1,873,920 wells drilled in the

past are in some stage of reclamation, and these are not included in Table 3.2. Injection wells have also been drilled in the BLM OFO. As of 2016, there were six injection wells on BLM-administered surface lands in Texas (plus one in Oklahoma) and 499 injection wells on BLM-administered federal mineral estate across all four states (BLM and BIA 2019a).

The OFO RMP Final EIS predicts that over the next 20 years the approximate number of federal and trust wells[1] to be drilled would range from 775 to 3,054 wells (BLM and BIA 2019a). Additionally, the 2016 RFD scenario estimates the associated surface disturbance would range from approximately 6,598 to approximately 13,466 acres (BLM 2016). These estimates were made using an average total surface disturbance of 4.41 acres per well, for all horizontal and vertical well types, which accounts for well pads and related infrastructure including roads, electric lines, and pipelines (BLM 2016).

The total amount of surface disturbance associated with existing and planned oil and gas development within the OFO planning area is estimated to entail 1,117,766 acres of surface disturbance (see Table 3.2). Energy and mineral development on federal lands or mineral estate is expected to continue under the management and conditions outlined in the Oklahoma, Kansas, and Texas BLM ROD and Approved RMP (BLM 2020). This represents a continued trend of human use of land and mineral resources. Continued oil and gas development could contribute to landscape-level modifications over time, including habitat loss or degradation; changes in plant communities; fluctuating but generally increasing levels of emissions of pollutants; changes in land use patterns and the amount of landscape unaltered by human activities; changes to the visual landscape; and changes in the quantity or quality of water resources. Sections 3.5 and 3.6 consider the effects of these environmental trends and planned actions related to oil and gas development on resource issues analyzed in brief and in detail, respectively.

3.3.1.2 *Other Mineral and Energy Development*

In addition to oil and gas development, OFO-managed lands provide additional surface and subsurface resources used for other types of mineral and energy development, including coal, helium, geothermal, mineral materials, non-energy leasable minerals, wind, and solar. Past and planned actions associated with these resources are summarized below.

COAL

Most of the BLM-administered federal coal within the BLM OFO decision area is in eastern Oklahoma (BLM and BIA 2019a). Seven federal coal leases are in Oklahoma, composed of approximately 10,900 acres of BLM-administered mineral estate. Three of these leases are for underground mining operations, while the remaining four leases are for surface mines that are in reclamation status. Overall, coal development is anticipated to continue at current levels, but it is likely to include more underground mining and less surface disturbance (BLM 2016).

HELIUM

Four helium areas overlap BLM-administered surface lands and federal mineral estate in the western portion of the planning area: Hugoton/Panoma/Panhandle, Greenwood/Keyes, Bradshaw, and Cliffside. These areas contain natural gas fields with high concentrations of helium and overlap approximately 150 acres of BLM-administered surface lands within the OFO planning area. Because helium is a by-product of natural gas, the RFD considered helium development in its oil and gas well development scenario (BLM 2016).

[1] Trust wells are wells drilled on tribal trust lands or lands where subsurface mineral estates are held in trust by the United States for American Indians, Indian tribes, and Alaska Natives.

GEOTHERMAL

The areas in the OFO planning area with the highest geothermal energy potential are along its southern border and in east Texas. North Oklahoma and central Kansas also have moderate geothermal potential. Although portions of the BLM decision area have moderately high geothermal resource potential, geothermal resource development in the decision area is not expected in the next 20 years (BLM and BIA 2019a).

MINERAL MATERIALS

The planning area contains numerous mineral materials, such as sand and gravel, limestone, granite, chalk, and pumice. Public domain federal mineral estate (mineral estate that has always been under federal jurisdiction, rather than having been acquired by the federal government) does exist along the Red River in the BLM decision area along the Texas–Oklahoma border. Sand and gravel are the most common mineral materials in this area; however, no mineral material activity has occurred on BLM-administered surface or federal mineral estate in this area to date. Because of the small area of public domain federal mineral estate in the BLM decision area, mineral material activity is not expected to be significant in the next 20 years (BLM and BIA 2019a).

NON-ENERGY LEASABLE MINERALS

The primary non-energy leasable minerals in the planning area are evaporites, which include salt and gypsum, along with other minerals that are less commercially viable. Large salt deposits lie beneath west Texas, west Oklahoma, and west and central Kansas. Based on low historical demand and the widespread availability of hardrock minerals and mineral materials on private lands, the BLM does not expect leasing activity associated with hardrock minerals and mineral materials in the next 20 years (BLM and BIA 2019a).

WIND

Wind energy development is a rapidly growing industry throughout the planning area, particularly in Kansas, west Oklahoma, northwest Texas, and the Texas Gulf Coast. In 2021, Texas ranked first in the nation for wind energy generation, with over 35,000 megawatts (MW) of wind capacity in 2022 (U.S. Energy Information Administration [EIA] 2022a). As of 2022, Kansas ranks among the top five states in wind energy generation with nearly 8,250 MW of installed wind generating capacity (EIA 2022b). In Oklahoma, several large wind projects came online in 2021, and in March 2022, the 998-MW Traverse Wind Project became operational (EIA 2022c). Wind energy development in the OFO planning area is expected to increase substantially over the next 20 years, especially in Texas, where state policies have proactively encouraged wind energy development. Although Kansas and Oklahoma also contain large undeveloped areas with high wind potential, development in these states is slower because of fewer incentives from state and local regulations and policies (BLM 2016). For these reasons, the number, location, and size of future wind projects within the OFO planning area over the next 20 years are difficult to predict.

SOLAR

Solar energy development potential exists in the OFO planning area, with areas of highest solar potential in the western portions of Texas, Oklahoma, and Kansas (BLM and BIA 2019a). Texas is the state with the largest amount of solar development in the OFO planning area, with over 10,000 MW of generating capacity in 2021 (EIA 2022a). Both Oklahoma and Kansas have small but growing amounts of solar energy generation, with notable increases in solar development over recent years (2017–2021)

(EIA 2022b, 2022c). For example, the 250-MW Skeleton Creek Solar and Battery Storage project was approved for construction in March 2022 and will have an estimated footprint of 2,472 acres in Garfield County, Oklahoma (U.S. Department of Agriculture 2022). Solar development, along with other renewable energy sources (i.e., wind, biomass, and hydropower), is expected to grow over the next 20 years to meet state goals or mandates for renewable energy generation. However, forecasting the number, location, and size of solar developments is difficult because of the influence of market factors and state regulations, policies, and incentives that can encourage or dissuade solar development (BLM 2016). In addition, the size of solar developments and associated surface disturbance can vary widely (BLM 2016).

3.3.1.3 *Municipal and Other Land Uses*

Existing municipal and other land use within the OFO planning area, such as urban development, grazing, recreation, off-road travel, and transmission or pipeline rights-of-way, are expected to continue at current or slightly increased levels. Urban growth is expected to increase, particularly near Dallas, Amarillo, Austin, San Antonio, and Houston, Texas; Oklahoma City and Tulsa, Oklahoma; and Wichita, Kansas.

Livestock grazing is pervasive throughout the OFO planning area, but generally occurs on private lands and is uncommon on BLM-administered surface lands (BLM 2015). Presently, there are four BLM grazing leases, totaling 435 acres, being administered in Oklahoma and none in Texas or Kansas (BLM and BIA 2019a). The BLM anticipates grazing to continue at current rates, especially on private lands.

Recreation opportunities (e.g., hunting, fishing, camping, hiking, and off-highway vehicle use) are present throughout the OFO planning area on BLM-administered lands as well as state parks, national forests, and state and federally managed reservoirs (BLM 2015). Recreation on BLM-administered lands in the planning area is concentrated in the Red River area and Canadian River corridor in Oklahoma, and Cross Bar Management Area in Texas (BLM and BIA 2019a). Recreation uses are expected to continue in the planning area, with potential for increased use at developed recreation areas near urban areas experiencing population growth (BLM and BIA 2019a).

The OFO planning area currently includes approximately 41,000 miles of transmission lines, pipelines, and other rights-of-way. Over the next 20 years, planned developments include multiple reservoirs and interstate water pipelines, including the proposed Plains and Eastern Clean Line transmission line project (700 miles crossing Oklahoma) and the proposed Grain Belt Express transmission line project (includes 370 miles in Kansas). There are also several gas pipelines and compressor stations in the permitting or construction phase in the planning area in Texas.

Associated effects would correspond to the resources present at the specific development location with contribution to landscape-level conditions and could result in landscape modifications over time including habitat loss or degradation, changes in plant communities, fluctuating but generally increasing levels of emissions of pollutants, changes in land use patterns and the amount of landscape unaltered by human activities, changes to the visual landscape, and changes in the quantity or quality of water resources. The analyses presented in Sections 3.5 and 3.6 consider the effects of these environmental trends and planned actions related to oil and gas development on resource issues analyzed in brief and in detail, respectively.

3.3.1.4 *Quantification of Landscape Disturbance*

Table 3.2 summarizes the number of wells and estimated acreage of landscape disturbance associated with energy and mineral development and other land uses within the OFO.

Based on the information provided in Table 3.2, future potential development of eight wells under the Proposed Action would represent 0.3% of the maximum projected wells in the oil and gas RFD scenario and 0.002% of the total number of existing and projected wells in the OFO planning area. Table 3.2 also shows the estimated acreage of surface disturbance (50.10 acres) associated with future potential development under the Proposed Action would represent 0.4% of the projected surface disturbance in the oil and gas RFD scenario and 0.004% of the total existing and projected landscape disturbance in the OFO planning area.

Table 3.2. Estimated Landscape Disturbance Associated with Environmental Trends and Planned Actions within the OFO

Environmental Trends and Planned Actions within OFO Planning Area (Analysis Area) (Total Acres: 269,650,000)	Number of Wells	Acreage of Surface Disturbance	Percent of Analysis Area (acreage)
OFO existing oil and gas development (construction of oil and gas well pads and associated access roads and pipeline infrastructure)	409,000	1,104,300	0.41%
Oil and gas RFD*	Up to 3,054	Up to 13,466	0.005%
OFO existing other development and surface use (mining, renewable energy, grazing, roads, transmission lines, and urban expansion) †	Not applicable	13,435	0.005%
Total	**412,054**	**1,131,201**	**0.42%**
Future potential development under the Proposed Action	8	50.10	0.00002%

* Source BLM (2016). New surface disturbance from potential wells in the RFD scenario is estimated at 4.41 acres per well.

† This estimate includes approximately 13,000 acres of surface disturbance associated with existing coal leases and 435 acres of surface disturbance from existing grazing allotments. Some additional land uses discussed in Section 3.3.1 are not accounted for in this estimate due to a lack of past and planned surface disturbance estimates. Therefore, this acreage is likely an underestimate of the total past and planned surface disturbance associated with all energy development and other land uses.

3.3.2 Land Restoration and Conservation Activities

Fuel treatments, which include mechanical, biological, and chemical treatments and prescribed fire to reduce hazardous fuels and undesirable vegetation, would likely continue on public and private lands. Manual, biological, chemical, and mechanical treatments of noxious weeds and invasive plants are also likely to continue in the foreseeable future (BLM and BIA 2019a).

Prairie restoration vegetation treatments are ongoing in the Cross Bar Management Area (11,800 acres) near Amarillo, Texas. Native and invasive woody shrubs, including mesquite (*Prosopis* spp.), saltcedar (*Tamarix ramosissima*), and cholla cactus (*Cylindropuntia* spp.), are being treated through mechanical and chemical treatments and prescribed burning (BLM and BIA 2019a). To date, approximately 7,500 acres of mesquite on the Cross Bar Management Area have been sprayed and/or masticated, and an additional 1,100 acres of mesquite were aerially treated in 2020. Prescribed burning is integrated into the restoration process with the goal of maintaining a fire return interval of every 3 to 5 years, as funding and personnel resource availability allows. Cholla cactus and saltcedar are targeted on an individual-plant basis. Chemical and mechanical treatments are expected to slow over time, but follow-up treatments would occur as needed for maintenance (Escobar 2021).

3.3.3 Changes to Regional Environmental Conditions Related to Climate Change

Climate change, as further discussed in Section 3.6.2, is a global process that is impacted by the total of GHGs in the Earth's atmosphere. Currently, global climate models are unable to forecast local or regional effects on resources (Intergovernmental Panel on Climate Change [IPCC] 2013). However, there are

general projections regarding potential impacts to natural resources and plant and animal species that may be attributed to climate change from GHG emissions over time. These effects are likely to be varied, including those in the southwestern United States (Karl 2009). Climate models project robust differences in regional changes related to precipitation patterns, average temperatures, and frequency or severity of drought (IPCC 2013). Impacts of climate change on regionally variable ecosystem processes have also been observed and have been used to make general projections regarding potential future effects of climate change on natural resources and plant and animal species for different regions (Karl 2009).

The OFO planning area is part of the Great Plains region (including Texas, Oklahoma, and Kansas), which is expected to be affected in both the short and long–term by variations in global and regional environmental conditions related to climate change. The Great Plains region is projected to experience higher temperatures and more frequent drought in the future. Temperature increases and precipitation decreases would stress the region's primary water supply, the Ogallala Aquifer. Seventy percent of the land in this area is used for agriculture. Threats to the region associated with climate change include pest migration as ecological zones shift northward; an increase in weeds; and decreases in soil moisture and water availability (BLM 2023a). Additional information related to global, regional, and state climate change projections can be found in the *BLM 2022 Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas, and Kansas* (BLM 2023a) and the *2022 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2023b). Lastly, information regarding climate impacts to the High Plains ecoregion, which the nominated lease parcels occur in, can be found in the U.S. Geological Survey (USGS) Southern Great Plains Rapid Ecoregional Assessment (Reese et al. 2017, incorporated by reference).

3.4 NO ACTION ALTERNATIVE FOR ALL ISSUES

Under the No Action Alternative, the BLM would not lease the nominated lease parcels, and the existing conditions and trends related to each issue would continue. Potential impacts associated with future potential development of the nominated lease parcels would not occur under this alternative, current land and resource uses would continue, and the federal mineral acreage would remain open to future oil and gas lease development. Oil and gas development on previously leased BLM-managed lands surrounding the nominated lease parcels and adjacent privately owned lands would continue. No natural gas or crude oil from the nominated lease parcels would be produced, and no royalties would accrue to federal or state treasuries. A choice on the part of the BLM not to lease the nominated lease parcels would eliminate eight oil and gas development opportunities in the BLM OFO. The parcels would have the potential to be nominated again for a future oil and gas lease sale. Reduction or elimination of total oil and gas development opportunities in the area is likely to incrementally reduce local and regional employment and revenue opportunities related to the oil and gas and service support industries over time. This is because the oil and gas sector of the economy 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 and revenue on a sustained basis. In the OFO planning area, development of federal leases is approximately 0.3% of total oil and gas development activities (BLM 2016).

3.5 ISSUES ANALYZED IN BRIEF

Following internal and external scoping, three issues were identified, considered, and analyzed in brief by members of the IDT in review of the Proposed Action. Each of these issues is outlined below with a concise discussion regarding the context and intensity of the impact related to each issue. Stipulations HQ-TES-1, HQ-CR-1, HQ-MLA-1, and Lease Notice NM-11-LN, as well as standard terms and conditions as described in the lease form, would apply to all nominated lease parcels. For all issues

analyzed in brief that follow, it is assumed that the effects of reasonably foreseeable environmental trends and planned actions to relevant elements of the environment would be consistent with the landscape disturbance acreages presented in Section 3.3.

For the purposes of this analysis, short-term effects are considered those that cease after well construction and completion (30–60 days) or cease after interim reclamation (2–5 years). Long-term effects are considered to be those associated with operation production activities over the life of the well (e.g., noise) or otherwise extend beyond the short-term time period (for example, surface disturbance subject to final reclamation). As such, some long-term effects would cease immediately upon the end of operations (e.g., visual and noise impacts associated with well infrastructure), whereas other long-term effects would remain until successful landscape reclamation is accomplished (e.g., vegetation disturbance) dependent on the nature of the effect. Note that the time frame for successful reclamation would vary by vegetation type and other facts such as the amount and timing of annual precipitation.

AIB-1 Cultural Resources

How would future potential development of the nominated lease parcels impact cultural resources?

Cultural resources is a broad term including anything from isolated artifacts to complex cultural sites; cultural resources may or may not be considered Historic Properties as defined in the National Historic Preservation Act of 1966 (NHPA). Leasing and future potential development of the nominated lease parcels are anticipated to result in approximately 50.10 acres of disturbance. This disturbance may result in loss or damage to cultural resources. The BLM anticipates that any future potential development of the lease parcels would most likely be within the leased parcels themselves using vertical drilling; therefore, the area of potential effects encompasses the nominated lease parcel boundaries. In addition, a 1-mile buffer of the nominated lease parcels (within the Kansas state line) was used to conduct a literature search. The BLM OFO reviewed survey and site information from the Kansas State Historic Preservation Office (SHPO) and found one previously recorded site reported within a 1-mile radius of the nominated lease parcels, but none within the actual parcel boundaries.

The Quarter 2 2024 lease sale is composed of eight parcels not sold during the May 2023 lease sale; the BLM OFO conducted Section 106 consultation on these parcels in November 2022. The BLM OFO determined that if no newly recorded sites were reported in the currently proposed parcels or within 1 mile of them, then there was no need to reinitiate Section 106 for this project. The BLM reviewed survey and site information from the Kansas SHPO on July 20, 2023. The review showed no previously recorded sites within the proposed parcels and one previously recorded site within 1 mile of one of the parcels. This site was identified in the Section 106 analysis and analyzed in the May 2023 EA. It is possible that other undocumented cultural resources exist in this area. Future potential development would be analyzed further through separate NEPA and NHPA Section 106 processes, as directed by regulations and current policy, including Permanent IM 2018-014. Where the BLM determines its decisions regarding these future developments or undertakings have the potential to affect historic properties, an on-the-ground survey would be recommended. In that scenario, it is anticipated that adverse effects on those cultural resources that are considered historic properties would be avoided, minimized, or mitigated through the NHPA Section 106 process. The nominated lease parcels are subject to HQ-CR-1, NM-11-LN, and OFO-8-LN for any on-parcel development (see Appendix B).

Approximately 1.1 million acres of surface disturbance are currently within the 270-million-acre OFO planning area (see Table 3.2). Surface disturbance associated with reasonably foreseeable environmental trends and planned actions within the OFO may impact cultural resources. Such impacts may include, but are not limited to, loss of or damage to cultural resources or contextual information (such as distribution of cultural resources) due to the development of oil and gas facilities and related industrial development,

increased vehicular traffic, unauthorized ground disturbances, inadvertent oil and produced water spills, erosion, and unauthorized collection. The magnitude of impacts associated with reasonably foreseeable environmental trends and planned actions would generally depend upon the location of the RFD relative to the location of cultural resources and the degree to which the setting has already been affected. As directed by regulations and current policy, including Permanent IM 2018-014, where the BLM determines its decisions regarding these future developments or undertakings have the potential to affect historic properties, an on-the-ground survey would be recommended. In that scenario, it is anticipated that adverse effects on those cultural resources that are considered historic properties would be avoided, minimized, or mitigated through the NHPA Section 106 process.

AIB-2 Native American Concerns

How would future potential development of the nominated lease parcels impact Native American concerns?

The Quarter 2 2024 lease sale is composed of eight parcels not sold during the May 2023 lease sale. The BLM initiated government-to-government consultation under NEPA for the May 2023 lease sale on October 5, 2022, and Tribal Historic Preservation Office (THPO) consultation under NHPA Section 106 on November 16 and December 13, 2022, with the Apache Tribe of Oklahoma, Caddo Nation, Cheyenne and Arapaho Tribes of Oklahoma, Comanche Nation, Kaw Nation, Kiowa Tribe of Oklahoma, Northern Arapaho Tribe, Northern Cheyenne Tribe, Osage Nation, Otoe-Missouria Tribe, Ponca Tribe, Prairie Band Potawatomi Nation, Southern Ute Indian Tribe, Wichita & Affiliated Tribes, and Wyandotte Nation. On December 14, 2022, the Northern Cheyenne Tribe determined the project will have no effect and may proceed. No other tribe responded, and no Native American concerns were identified. If there had been any Native American concerns for the May 2023 lease sale, the BLM OFO would have reinitiated government-to-government consultation on the subject lease parcels.

There are currently approximately 1.1 million acres of surface disturbance within the 270-million-acre OFO planning area (see Table 3.2). Surface disturbance associated with reasonably foreseeable environmental trends and planned oil and gas operations within the OFO have the potential to adversely impact traditional cultural and religious properties within the vicinity. Such impacts may include temporary or long-term loss of or damage to Native American areas of concern, increased vehicular traffic, inadvertent oil and produced water spills, or erosion. The magnitude of impacts associated with reasonably foreseeable environmental trends and planned actions would generally depend upon the location of RFD relative to the areas of concern to Native American tribes. RFD on federal lands or lands with a federal nexus would undergo the same type of consultation process discussed above. In addition, on federal, tribal, or split-estate lands, the BLM may apply COAs to avoid, minimize, and/or mitigate effects on traditional cultural properties or sacred sites.

AIB-3 Environmental Justice

What are the potential impacts from oil and gas leasing and future potential development on environmental justice populations?

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* (February 16, 1994), requires federal agencies to determine if proposed actions would have disproportionately high and adverse environmental impacts to minority, low-income, and American Indian populations of concern. BLM policy, as contained in BLM Land Use Planning Handbook H-1601-

1 (see Appendix C in BLM 2005), provides direction on how to fulfill agency responsibilities for Executive Order 12898.

The 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 minority and low-income EJ populations using U.S. Census Bureau data. The BLM's IM 2022-059, titled Environmental Justice Implementation and issued on September 20, 2022, builds upon CEQ's guidance and provides further direction for considering EJ concerns in BLM-prepared NEPA documents including a detailed framework for identifying EJ populations using Census data as well as several other recommended data sources (BLM 2022f).

The analysis area for EJ comprises Cheyenne County, Kansas, which represents the maximum anticipated extent of potential effects (e.g., air quality, water quality) associated with future potential development of the nominated lease parcels. This analysis area is intended to represent all communities that could be affected by future potential development of the lease parcels, either directly or indirectly.

Cheyenne County has a population of 2,647, with 5.6% of the population under the age of 5 and 27.6% of the population over the age of 65 (Headwaters Economics 2023a). Median household income is $45,039, with 55.0% of the population between the ages of 16 and 64 participating in the labor force and an unemployment rate of 2.4% (Headwaters Economics 2023a, 2023b).

Within the analysis area, the county, census tracts, and census-mapped places (i.e., individual cities and towns) are the geographic units of analysis used for gathering information about low-income and minority populations. There is one census tract and two census-mapped places within the analysis area (see Figure E.1 in Appendix E). The state of Kansas is used as the reference area for determining whether minority or low-income EJ populations exist within the county, census tracts, or census-mapped places.

The BLM defines low-income populations as individuals or groups of people whose income is less than or equal to twice (200% of) the federal poverty threshold, as identified by the U.S. Census Bureau (BLM 2022f). Minority populations include the following population groups: American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, Black or African American, some other race (other than White), a combination of two or more races, or Hispanic (BLM 2022f; CEQ 1997). Except for white non-Hispanics, all other racial and ethnic groups are considered minorities; therefore, the total minority population of an area is calculated by subtracting the white non-Hispanic population from the total population (BLM 2022f).

Members of tribal populations include all persons having origins in any of the original peoples of North America and South America (including Central America), and who maintain tribal affiliation or community attachment. Any American Indian or Alaska Native population qualifies as a tribal population, and membership in a federally recognized tribe is not required (BLM 2022f). All tribal populations qualify as EJ populations, regardless of the percentage of the analysis area population they constitute. In addition, dispersed tribal populations can also constitute EJ populations if they do not reside within the analysis area but depend on cultural resources or places located on BLM-managed land within the analysis area.

Based on the percentage of the analysis area population that constitutes a low-income, minority, or tribal population, the BLM uses the following five criteria to identify EJ populations (BLM 2022f):

1. The low-income population of the analysis area is the same or greater than that of the reference area.
2. The low-income population of the analysis area is 50% or more of the total analysis area population.

3. The minority population of the analysis area is meaningfully greater than that of the reference area (i.e., 110% or more of reference area population).
4. The minority population of the analysis area is 50% or more of the total analysis area population.
5. Tribal populations are present within the analysis area.

After examining the most recently available data on minority and low-income populations for the analysis area and reference area (U.S. Census Bureau 2022a, 2022b, 2022c), the BLM has determined that there are minority and low-income EJ communities of concern present in the analysis area. Data concerning low-income and minority communities of concern within the analysis area are presented in Table E.1 of Appendix E. Tribal populations which reside, or rely on resources, within the analysis area are identified in AIB-2 (Native American Concerns) and Section 4.2 (Tribal Consultation). The BLM will consult with these tribal populations as part of government-to-government consultation under NEPA and the NHPA.

All geographic units within the analysis area, including Cheyenne County and the one census tract and two census mapped places within the county, meet the criteria for low-income and minority communities of concern (see Table E.1 in Appendix E). Specific minority groups that meet the criteria for EJ communities of concern vary by geographic unit, and consist of Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, some other race, two or more races, and Hispanic or Latino (see Table E.1 of Appendix E).

The total minority population in Cheyenne County has increased by approximately 0.7% over recent years (2016–2021) compared with a 2% increase in the state of Kansas during that same period. The low-income population in Cheyenne County (including both individuals and families) has increased by approximately 5% to 6% over recent years (2016–2021) compared with an approximate 3% to 4% decrease in the state of Kansas during that same period (U.S. Census Bureau 2022a–2022f).

The communities of concern within the analysis area includes several types of populations at risk, or populations who are more likely to experience adverse health outcomes due to demographic or socioeconomic factors (Headwaters Economics 2023c). Indicators for populations at risk, which are notably higher in Cheyenne County compared to the State, are people with disabilities, people over the age of 65, people over the age of 65 living alone, people in "deep poverty," families living below the poverty level, and people without health insurance. The percentages of these populations at risk in Cheyenne County exceed those within the state of Kansas by 3.5% to 13.9% (Headwaters Economics 2023c).

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 considers that additional adverse impacts may be identified by local communities as specific development locations and types are proposed. Therefore, the BLM would provide communities of concern with opportunities to identify any perceived adverse environmental impacts at the time of site-specific analysis during the APD stage. As a result, the following discussion assesses only the effects for the issues identified by the BLM during scoping associated with this leasing process. BLM staff members also posted press releases at the scoping stage, in English, through various media outlets (i.e., newspapers and radio stations) in the analysis area. The BLM would continue to work with potentially affected communities of concern to identify and address additional EJ issues as they arise.

The BLM cannot predict where oil and gas reserves may exist on each lease sale parcel. Consequently, there may be instances where oil and gas exploration activities disproportionately and adversely affect communities of concern due to proximity and other factors, and for variable amounts of time. For example, a typical horizontal well averages 30 to 60 days from the start of drilling to completion

(see Appendix D) and may have a greater effect (increased dust, traffic, etc.) on nearby resident populations while the drilling operations are occurring. These types of exploration activities may result in adverse impacts to communities of concern located near the drilling operations; 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. Thus, the BLM OFO uses stipulations and COAs to minimize impacts to nearby populations, including communities of concern, during construction and operations, to the extent practicable.

For purposes of the proposed leasing action, Table 3.3 provides a summary of the resource analyses presented in Sections 3.5 and 3.6 that would have potential to affect communities of concern. Those conclusions were then assessed by the BLM relative to whether the projected impacts to communities of concern may be adverse and disproportionate. None of the nominated lease parcels contain residences, and lands surrounding the nominated lease parcels are characterized as rural and sparsely populated. The closest residences to the nominated lease parcels are approximately 0.4 to 2.48 km (0.24 to 1.54 miles) from the parcel boundaries. 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. In addition, there were no other resources of significance identified during public scoping, and no specific Native American resource concerns have been identified on the subject lease parcels; however, this consultation is considered ongoing. Therefore, given the lack of any residences or other resources of concern identified within the nominated lease parcels, any impacts to EJ communities of concern associated with future potential development of the lease parcels are more likely to be indirect and may incrementally contribute to impacts associated with reasonably foreseeable environmental trends and planned actions.

Additional review would be conducted at the time of the proposed lease development. Standard terms and conditions attached as COAs to the APD could include measures to reduce effects on nearby EJ communities of concern. Under the Oil and Gas Leasing Regulation for Surface Use Rights, 43 C.F.R. § 3101-1-2, such reasonable measures may include modification to siting or design of facilities, including relocation of proposed operations up to 200 m (656 feet). These measures may minimize potential significant adverse effects (e.g., from dust or visual/audio effects) to members of EJ communities of concern.

Table 3.3. Summary Comparison of Conclusions from Analysis of Other Issues to Environmental Justice

Issues Analyzed	Summary of Potential Significant Adverse Effects	Are potential effects disproportionate to environmental justice communities of concern?
Air quality (Issue 1, Section 3.6.1)	Criteria pollutant, VOC, and hazardous air pollutant (HAP) emissions would increase as shown in Section 3.6.1.2. Future potential development of the lease parcels would result in short-term local area increases of pollutant emissions, particularly fugitive dust (particulate matter equal to or less than 2.5 microns in diameter [$PM_{2.5}$] or particulate matter equal to or less than 10 microns in diameter [PM_{10}]), lasting an average of 30 to 60 days.	There is potential for disproportionate impacts to communities of concern. Fugitive dust and diesel exhaust emissions from construction would result in criteria pollutant, VOC, and HAP emissions. These emissions would be short term (30–60 days) and would have the greatest impact at locations near the construction activities (2,000 m [1.25 miles] or less). Therefore, residents near the construction activities would experience greater levels of impacts due to project construction. Air pollution and associated health effects (as described in Section 3.6.1) can disproportionately affect individuals within communities of concern in the analysis area who are already socially vulnerable and have greater difficulty accessing healthcare facilities and paying for medical treatment or have a higher likelihood of having pre-existing health conditions (U.S. Environmental Protection Agency [EPA] 2021b). Additional review would be conducted at the time of proposed lease development if development occurs; standard design features and project-specific COAs would help to minimize potential effects that could be adverse and disproportionate to communities of concern.
Greenhouse gases and climate change (Issue 2, Section 3.6.2)	Based on a 100-year global warming potential, future potential development of the nominated lease parcels is estimated to result in 0.859 megatonne carbon dioxide equivalent (Mt CO_2e) over the life of the leases (see Section 3.6.2.2). All GHG emissions would contribute to global GHG emissions. GHG emissions are associated with documented ongoing and reasonably foreseeable climate-related effects. For the Great Plains region (including Texas, Oklahoma, and Kansas) these may include higher temperatures, more frequent drought, reduced precipitation, and decreases in overall water availability (BLM 2023a).	There is potential for disproportionate impacts to communities of concern. While any climate change–related effect 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 disproportionately affect individuals within communities of concern in the analysis area who are already socially vulnerable and have a lower capacity to prepare for, cope with, and recover from climate change impacts, including higher temperatures, decreased overall water availability, or increased flooding (EPA 2021).
Water use and quantity (Issue 3, Section 3.6.3)	Drilling and completion of eight vertical wells on the nominated lease parcels is estimated to use approximately 27.2 acre-feet of water. Assuming that all wells are developed in the same year, this would increase the annual water use in the analysis area by up to 0.05% at current usage rates. With consideration of design features and regulatory requirements, no effects on groundwater or surface water quality are expected from well drilling and completion. Spills affecting groundwater or surface waters could occur.	There is potential for disproportionate impacts to communities of concern. While groundwater resources are regional in nature and water withdrawals are not anticipated to affect domestic water sources, any impacts to local water wells (e.g., a spill that affects groundwater) could force residents to find other means of supplying water for domestic use. Best management practices (BMPs) and COAs would help 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.

Issues Analyzed	Summary of Potential Significant Adverse Effects	Are potential effects disproportionate to environmental justice communities of concern?
Quality of life (see AIB-17 from the May 2023 OFO Lease Sale EA)	Future potential development of the nominated lease parcels could result in localized air, noise, visual resources, traffic, and safety effects that could affect quality of life for local residences and communities of concern, particularly during construction. Continued expansion of the oil and gas industry can have a negative effect on the quality of life for people who value undeveloped landscapes.	There is potential for disproportionate impacts to communities of concern. In general, quality of life impacts would be greater for the residents near future potential development (2,000 m [1.25 miles] or less). None of the nominated lease parcels contain residences; however, scattered rural residences are within approximately 2 miles or less of the parcel boundaries, and the majority of the nominated lase parcels (six parcels) have at least one residence that occurs within 2,000 m (1.25 miles) or less. When evaluating the placement of wells at the lease development stage, standard design features and project-specific COAs would be applied to reduce effects that could be adverse and disproportionate to communities of concern.
Human health and safety (see AIB-16 from the May 2023 OFO Lease Sale EA)	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. Other potential health and safety risks include occasional fire starts; spills of hazardous materials and corresponding potential contamination of air, soil, or water; exposure to NORM; traffic collisions; and the presence of hydrogen sulfide (H_2S). The magnitude of effects on human populations would depend on the frequency, timing, and levels of contact with potential stressors. After wells are properly plugged and reclaimed, they would no longer contribute to human health and safety risks; however, some public health effects from air pollution may endure beyond the life of the wells (e.g., chronic respiratory problems such as asthma).	There is potential for disproportionate impacts to communities of concern. In general, health and safety impacts would be greater for the residents near the future potential development (2,000 m [1.25 miles] or less). The communities of concern within the analysis area include several types of populations at risk who are more likely to experience adverse health outcomes due to demographic or socioeconomic factors including poverty, age, type of housing, lack of health insurance, and disabilities (Headwaters Economics 2023c). Therefore, the analysis area communities of concern may be more sensitive to the effects of air pollution and other health and safety risks associated with the future potential development of the lease parcels, relative to non-EJ communities. Additional review of potential human health and safety risks would be conducted at the time of the proposed lease development. Standard terms and conditions attached as COAs to the APD could include measures to reduce health and safety effects on nearby communities of concern. Future potential development would be subject to relevant rules and regulations regarding public health and safety.

AIB-4 Threatened and Endangered Species

How would future potential development of the nominated lease parcels affect threatened and endangered species?

Impacts to threatened and endangered species from future potential lease development were previously analyzed in the May 2023 EA (Section 3.4, AIB-8, and Section 4.1). The May 2023 EA states that surface disturbance associated with future potential development of the nominated lease parcels could affect potentially suitable habitat for the monarch butterfly (*Danaus plexippus*), which is a candidate for listing under the Endangered Species Act. Monarch butterfly impacts associated with future potential development of the nominated lease parcels would essentially be similar to those disclosed in the May 2023 EA due to similar analysis area geographic location(s) and resource conditions. Any differences in potential monarch butterfly impacts between the May 2023 EA nominated lease parcels and Quarter 2 2024 nominated lease parcels are not substantial, therefore no further analysis is warranted.

The BLM completed a review of species listings within the vicinity of the nominated lease parcels using the USFWS Information for Planning and Consultation (IPaC) system in September 2023 under Consultation Code 2023-0134971, and one additional species was identified that was not already analyzed in the May 2023 EA (tricolored bat [*Perimyotis subflavus*], proposed endangered). The proposed listing rule (Federal Register 87:64700) to include tricolored bat as endangered was published on September 14,

2022 and the species was not included within the vicinity of the nominated lease parcels using the USFWS IPaC system in December 2022 under Consultation Code 2023-0021692 (USFWS 2022, accessed December 5, 2022).

The potential for the tricolored bat and its' associated habitat to occur within the nominated lease sale parcels was determined through review of the best available data and a comparison of habitat resources in the nominated lease parcels with known habitat requirements of the species listed in Table 3.4. Data sources reviewed include the USFWS IPaC system (USFWS 2023a) and USFWS descriptions of species habitat requirements and current mapped critical habitat (USFWS 2023b).

Based on review of USFWS IPaC data (USFWS 2023a), the threatened and endangered species listed in Table 3.4 were found to have potential to occur on or in the vicinity of the nominated lease parcels based on the presence of potentially suitable habitat. There is no designated critical habitat within the nominated lease parcels. The closest critical habitat is approximately 103 miles northeast of the parcels.

Total landscape-level disturbance associated with reasonably foreseeable environmental trends and planned actions within the OFO (1,131,201 acres) may contribute to reduction of suitable habitat and increased fragmentation, which could affect species occurring within the planning area, including those listed in Table 3.4.

Table 3.4. Additional Threatened and Endangered Species with Potential to Occur on or in the Vicinity of the Nominated Lease Parcels

Species (*Scientific Name*) (Status)*	**Suitable Habitat within Nominated Lease Parcels**	**Discussion**
Tricolored bat (*Perimyotis subflavus*) (FPE)	All	Tricolored bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. In addition, tricolored bats have been observed roosting during summer among pine needles, eastern red cedar (*Juniperus virginiana*), within artificial roosts like barns, beneath porch roofs, bridges, concrete bunkers, and rarely within caves. During the winter, tricolored bats hibernate in caves and mines; although, in the southern United States where caves are sparse, tricolored bats often hibernate in road-associated culverts, as well as sometimes in tree cavities and abandoned water wells. A review of the BatAMP Bat Acoustic Monitoring Portal (Conservation Biology Institute 2023) indicated that there has been no documented tricolored bat occurrences within or near (within 2 miles) the nominated lease sale parcels. However, given the generalist habitat requirements for tricolored bats, all eight nominated lease parcels may contain suitable habitat based on the vegetation analysis performed in the May 2023 EA (Section 3.5, AIB-7 Vegetation).

Source: USFWS (2023)

* Status code: FPE = federally proposed endangered

Results of the data analysis indicate that suitable habitat for the Tricolored bat has the potential to occur within some or all the nominated lease parcels and surrounding areas within 2 miles, as summarized in Table 3.4. Future potential development of the nominated lease parcels could occur within potentially suitable habitat for threatened and endangered species. According to stipulation HQ-TES-1, which is applied to the nominated lease parcels, the BLM would not approve any ground-disturbing activity that may affect species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act (ESA), which would apply to off-lease development of the nominated lease parcels. In addition, the BLM may require modifications to or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species (see Appendix B). Depending on the nature of lease development and its potential to affect threatened and endangered species (or proposed species for listing) has been determined, site specific analysis and

Section 7 consultation would be required as needed to achieve compliance with the ESA. Future potential development is not anticipated to create short- or long-term, significant adverse effects for the following reasons: 1) stipulations and lease notices facilitate the reduction or avoidance of effects, 2) site-specific analysis at the lease development stage provides an additional opportunity to evaluate effects and develop measures to reduce or avoid effects, and 3) the standard lease terms and conditions that apply to the nominated lease parcels provide the BLM with the authority to require reasonable measures that reduce or avoid effects.

Section 4.1 further discusses BLM's continued review of the available climate science in connection with its statutory responsibilities and how the Proposed Action would comply with threatened and endangered species management guidelines outlined in the Biological Assessment for the 2020 Oklahoma, Kansas, and Texas BLM RMP (BLM and BIA 2019b), and ESA Section 7 consultation requirements.

3.6 ISSUES ANALYZED IN DETAIL

The issues identified for detailed analysis in this EA were developed in accordance with CEQ regulations and the guidelines set forth in the BLM NEPA Handbook H-1790-1 (BLM 2008) using input from internal and external scoping. Issues were retained for detailed analysis if that analysis is necessary to make a reasoned choice between alternatives; to determine significance; if there is disagreement about the best way to use a resource; or if there is conflict between resource impacts or uses.

3.6.1 Issue 1: Air Quality

How would future potential development of the nominated lease parcels affect air quality (particularly National Ambient Air Quality Standards and volatile organic compounds) in the analysis area?

Air quality is determined by the quantity and chemistry of atmospheric pollutants in consideration of meteorological factors (i.e., weather patterns) and topography, both of which influence the dispersion and concentration of those pollutants. Air pollutants result from different and widespread sources of emissions. The analysis area for this issue is Cheyenne County, Kansas. This spatial scope of analysis was identified based on the regional nature of air pollution and to facilitate analysis using the best available air quality data, which are generally provided at the county level. For the purposes of this analysis, short-term effects on air quality are considered those that cease after well construction and completion (30–60 days); long-term effects are considered those associated with operation. Long-term effects would cease after well operation.

Much of the information in this section is incorporated from the *BLM 2022 Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas and Kansas* (herein referred to as Air Resources Technical Report and incorporated into this EA by reference) (BLM 2023a).

3.6.1.1 *Affected Environment*

The Clean Air Act (CAA) (42 United States Code [U.S.C.] §§ 7401-7671q) requires the U.S. Environmental Protection Agency (EPA) to set NAAQS for pollutants considered harmful to public health and the environment. *Primary standards* provide public health protection, and *secondary standards* provide for public welfare, including protection against degraded visibility and damage to animals, crops, vegetation, and buildings (EPA 2023a). The primary NAAQS are required to be set at a level to protect public health, including the health of at-risk populations, with an adequate margin of safety in order to prevent an known or anticipated health related effects from polluted air.

The EPA has set NAAQS for six principal pollutants ("criteria" air pollutants): carbon monoxide (CO); nitrogen dioxide (NO_2); ozone (O_3); particulate matter equal to or less than 10 microns in diameter (PM_{10}) and particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$); sulfur dioxide (SO_2); and lead (EPA 2023a). The Kansas Department of Health and Environment, Bureau of Air is responsible for enforcement of air quality standards (BLM 2023a). The Air Resources Technical Report includes additional health information on various pollutants (BLM 2023a).

Cheyenne County, Kansas, is in northeast Kansas on the border of Nebraska. The county is in attainment for all criteria pollutants.

CRITERIA POLLUTANT CONCENTRATIONS

The EPA provides data on criteria pollutant emissions, expressed in tons per year for the total volume of pollutant released into the atmosphere. Emissions data indicate which industries and/or practices are contributing the most to the general level of pollution in that area (BLM 2023a). Total emissions within the analysis area are reported in Table 3.5, based on 2020 National Emissions Inventory (NEI) in tons per year (EPA 2023b).

The primary sources of air pollution in the analysis area are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. Total human-caused emissions of criteria pollutant and O_3 precursor emissions from the analysis area are shown in Table 3.5. These emissions are based on the EPA's 2020 emissions inventory in tons per year (EPA 2023b).

Table 3.5. Emissions in Cheyenne County, Kansas

National Emissions Inventory Human-Caused Current Emissions		Emissions (tons/year)					
	NO_X	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2	HAPs
2020 NEI for Cheyenne County	826	1,581	3,635	3,135	525	1	599

Note: The table above shows emissions including biogenic sources.

HAP = hazardous air pollutant; NO_X = nitrogen oxides

Source: EPA (2023b); data pulled from NEI as of October 9, 2023. Values include a summaries for each county, including combustion, industrial, on-road/nonroad, and miscellaneous sectors.

As a secondary pollutant, O_3 is not a direct emission pollutant (that is, it is not emitted directly into the air), but it is the result of chemical reactions between a group of highly reactive gases called nitrogen oxides (NO_X) and VOCs (which are organic compounds that vaporize [i.e., become a gas] at room temperature) when exposed to sunlight (EPA 2023c). O_3 and NO_2 are criteria air pollutants and are regulated under the NAAQS. VOCs are not criteria pollutants; however, because O_3 is not a direct emission, emissions of NO_X (particularly NO_2, which is used as an indicator for the larger group of gases) and VOCs are used as a proxy for determining potential levels of secondary formation of O_3.

O_3 is most likely to reach unhealthy levels on hot, sunny days in urban environments and can be transported long distances by wind into rural areas (EPA 2023c). People most at risk from breathing air containing O_3 include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers. In addition, people with certain genetic characteristics and people with reduced intake of certain nutrients, such as vitamins C and E, are at greater risk from O_3 exposure (EPA 2023c). Major sources of both NO_X and VOCs emissions include industrial facilities like oil and gas production, motor vehicle exhaust (including off-road equipment) and fuel combustion. Biogenic sources, such as vegetation and soil, can also represent a substantial portion of NO_X and VOC emissions in an area, including Kansas (BLM 2023a).

The primary sources of NO_X nationally are from the burning of fossil fuels associated with transportation and industry. The excess air required for complete combustion of fuels introduces atmospheric nitrogen into the combustion reactions at high temperatures and produces NO_X. VOCs are components of natural gas and may be emitted from well drilling, operations, and equipment leaks; valves; pipes; and pneumatic devices. Additionally, VOCs are emitted from a variety of sources, such as refineries, oil and gas production equipment, consumer products (solvents), and natural (biogenic) sources, such as vegetation and soil.

Particulate matter (also known as particle pollution) is a mixture of solid particles and liquid droplets in the air. Particulate matter varies in size; PM_{10} refers to particulate matter that is 10 micrometers or less in diameter (commonly considered "dust"), and $PM_{2.5}$ refers to particulate matter that measures 2.5 micrometers or less (i.e., fine particles), which are the main cause of reduced visibility (haze) in the United States (EPA 2023d). The EPA regulates particulate matter that is 10 micrometers in diameter or smaller (i.e., PM_{10} and $PM_{2.5}$) because these smaller particles are associated with negative health effects, including respiratory and cardiovascular problems, and because they can become more deeply imbedded into the lungs and may even get into the bloodstream (EPA 2023d), but does not regulate particles larger than 10 micrometers in diameter (such as sand and larger dust particles). PM_{10} and $PM_{2.5}$ are not currently monitored in the analysis area, and there are no areas of high concentrations that would warrant monitoring. Like O_3, most particulate matter is formed by reactions between other chemicals, specifically between SO_2 and NO_X, which are emitted from vehicles, power plants, and other industrial processes (EPA 2023d). Particulate matter emissions often result directly from activities like construction, traffic on unpaved roads, fields, smokestacks and fires (EPA 2023d). Particulate matter is of heightened concern when emissions are near sensitive receptors, such as residences, because it can be present in higher concentrations in a localized area prior to settling or dispersion. The distance that particulate matter can travel from an emission source depends on several environmental factors such as meteorological conditions, topography, land use, and time of day, as well any management controls (e.g., best management practices [BMPs]) that are implemented at the source. Generally speaking, PM_{10} particles can travel distances from 91 m up to 48 km (100 yards up to 30 miles), whereas $PM_{2.5}$ particles remain airborne for longer periods of time and can travel even farther (hundreds of miles) (EPA 2008, Pima County 2022). The Air Resources Technical Report includes additional information on particulate matter health effects and trends (BLM 2023a).

AIR QUALITY INDEX

Air quality in a given region can also be measured by its air quality index (AQI) value. The AQI is used to report daily air quality information in an easy-to-understand way by explaining how local air quality relates to human health. Calculated by the EPA, the AQI considers the following pollutants: O_3, particulate matter ($PM_{2.5}$ and PM_{10}), NO_2, and CO. As of December 8, 2021, SO_2 is no longer included in the AQI report because SO_2 concentrations tend to be very localized and not necessarily representative of broad geographical areas (EPA 2022a).

The AQI translates daily air quality data into a tiered, color-coded system that helps people understand how clean outdoor air is, who may be affected if pollutant levels are higher than desired, and when individuals may want to take measures to protect their health. The higher the AQI value, the greater the level of air pollution and the greater the concern for public health. An AQI value of 100 typically corresponds to the NAAQS set for that pollutant, and values below 100 are considered satisfactory for public health. Table 3.6 presents the AQI values (with associated color category) and levels of health concern.

Table 3.6. Air Quality Index

AQI Values	Levels of Health Concern	Meaning
0 to 50 (green)	Good	Air quality is considered satisfactory, and air pollution poses little or no risk.
51 to 100 (yellow)	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a small number of people who are unusually sensitive to air pollution.
101 to 150 (orange)	Unhealthy for sensitive groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
151 to 200 (red)	Unhealthy	Everyone may begin to experience health effects, and members of sensitive groups may experience serious health effects.
201 to 300 (purple)	Very unhealthy	Health alert is issued; everyone may experience serious health effects.
301 to 500 (maroon)	Hazardous	Health warning of emergency conditions is issued. The entire population is more likely to be affected.

Source: EPA (2023e).

Note: AQI values above 500 are considered beyond the AQI and represent extreme levels of particle pollution.

The AQI summary report provides annual summary information, including maximum AQI values and count of days in each AQI category (EPA 2022b). Table 3.7 lists the number of days in which the AQI was "unhealthy for sensitive groups" or worse for the past 11 years. At the time this EA was written, no data for Cheyenne County were available; however, data for Sherman County (immediately south of Cheyenne County), which had 4 days with an AQI over 100 recorded from 2012 through 2022, were available. Over the past 10 years, Sherman County shows no significant trends in maximum AQI.

Table 3.7. AQI Summary Data for Number of Days Classified above 100 for the Analysis Area (2012–2022)

Location	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sherman County	0	1	0	0	N/A	0	0	0	1	1	1

Source: EPA (2022b).

Note: Data from Sherman County are available for less than one-third of the year for 2011 to 2015. However, based on the Sherman County data that are available, the number of days with an AQI over 100 is one or fewer for each of the years represented.

HAZARDOUS AIR POLLUTANTS

The CAA requires control measures for hazardous air pollutants (HAPs). A pollutant is classified as a HAP if it has been identified by the EPA as a compound that is known or suspected to cause cancer or other serious health effects, such as compromises to immune and reproductive systems, birth defects, developmental disorders, and/or adverse environmental effects (BLM 2023a). The EPA currently lists 188 compounds as HAPs. National Emission Standards for Hazardous Air Pollutants, established by the EPA, limit the release of specified HAPs from specific industries (BLM 2023a). These emission standards for oil and gas development include control of benzene, toluene, ethyl benzene, mixed xylenes, and n-hexane from major sources, and benzene emissions from triethylene glycol dehydration units as area sources (BLM 2023a). The CAA defines a major source for HAPs as being one that emits 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs. Under state regulations (Kansas Administrative Regulations 28-19-500), a construction or operating permit may be required for any minor and major source, though some exceptions apply.

The Air Resources Technical Report discusses the relevance of HAPs to oil and gas development and the particular HAPs regulated in relation to these activities (BLM 2023a). The EPA's Air Toxics Screening

Assessment (AirToxScreen) provides a screening tool for state, local, and tribal air agencies. AirToxScreen's results help the EPA and other agencies identify which pollutants, emission sources, and places they may wish to study further to better understand any possible risks to public health from air toxics. AirToxScreen is the successor to the previous National Air Toxics Assessment, or NATA. In December 2022, EPA released the results of its 2019 AirToxScreen. AirToxScreen calculates concentration and risk estimates from a single year's emissions data using meteorological data for that same year (EPA 2022c). The risk estimates assume a person breathes these emissions each year over a lifetime (or approximately 70 years). AirToxScreen then provides quantitative estimates of potential cancer risk and five classes of non-cancer hazards (grouped by organ/system: immunological, kidney, liver, neurological, and respiratory) associated with chronic inhalation exposure to real-world toxics for each county and census tract (BLM 2023a). The 2019 AirToxScreen assessment includes emissions, ambient concentrations, and exposure estimates for about 181 of the 188 CAA air toxics plus diesel particulate matter (diesel PM). AirToxScreen cannot give precise exposures and risks for a specific individual; therefore, AirToxScreen data are best applied to larger areas. It derives concentration and risk estimates from emissions data from a single year and assumes a person breathes these emissions each year over a lifetime (approximately 70 years). Lastly, AirToxScreen only considers health impacts from breathing air toxics and does not consider indoor hazards, contacting or ingesting these air toxics, or other ways in which people may be exposed (BLM 2023a). A review of the results of the 2019 AirToxScreen shows that cancer risks, neurological risks, and respiratory risks in the analysis area (Cheyenne County, Kansas) are all lower than national levels (EPA 2022c).

The 2019 AirToxScreen map application reveals that the total cancer risk (defined as the probability of contracting cancer over the course of a 70-year lifetime, assuming continuous exposure) from human-caused emissions of HAPs in Kansas is approximately 24.8 cases per 1 million people, which is lower than the nationwide level (25.5 cases per 1 million people) (BLM 2023a). The total cancer risk is 12.9 for Cheyenne County. The contribution of the oil and gas industry to the cancer risk in Cheyenne County is 0.353 in 1 million, which is within the acceptable range of risk published by the EPA of 100 in 1 million as discussed in 40 C.F.R. § 300.430 (e)(2)(i)(A)(2) and the Residual Risk Report to Congress, EPA-453/R-99-001 (EPA 1999).

AirToxScreen non-cancer hazards (i.e., respiratory and neurological) are expressed as a ratio of an exposure concentration to a reference concentration (RfC) associated with observable adverse health effects (i.e., a hazard quotient). For a given air toxic, exposures at or below the RfC (i.e., hazard quotients are 1 or less) are not likely to be associated with adverse health effects. As exposures increase above the RfC (i.e., hazard quotients are greater than 1), the potential for significant adverse effects also increases (BLM 2023a). The total respiratory hazard quotient in the state of Kansas was 0.28, which is lower than that of the nation (0.31). The total neurological hazard quotient in the state of Kansas was 0.023, which is lower than that of the nation (0.026). The Air Resources Technical Report includes additional information on HAPs and AirToxScreen trends (BLM 2023a).

REASONABLY FORESEEABLE ENVIRONMENTAL TRENDS AND PLANNED ACTIONS

Current estimated emissions across the analysis area (Cheyenne County) and air quality across the analysis area is generally good based on AQI ratings over the last 11 years (see Table 3.7). Current estimated emissions and AQI ratings are reflective of the effects of past and present actions. Over the last 6 years, 124 federal wells have been completed in the OFOTable 3.8, two of which occurred within the state of Kansas. Table 3.6Table 3.8.

Table 3.8. Past and Present Federal Well Completions in the OFO

Number of Federal Well Completions	2017	2018	2019	2020	2021	2022	Average
Texas (federal wells added annually)	2	7	7	11	27	29	14
Oklahoma (federal wells added annually)	4	11	13	7	0	4	7
Kansas (federal wells added annually)	0	0	2	0	0	0	<1
Total OFO (federal wells added annually)	**6**	**18**	**22**	**18**	**27**	**33**	**21**

The 2019 OFO RMP Final EIS predicts, over the period of 2014 through 2035, the approximate number of federal and trust wells to be drilled in the OFO planning area would range from 775 to 3,054 wells (BLM and BIA 2019a). This figure is based on information contained in the 2016 OFO RFD (BLM 2016). Based on the range estimates provided above, potential emissions from RFD in the OFO RMP Final EIS (low and high scenario) are listed in Table 3.9.

Table 3.9. Air Emissions from Annual Oil and Gas Well Development Associated with the RFD Scenario

Air Emissions		Lease Sale Emissions (tons per year)					
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Single well oil emission factors*	0.58	0.27	4.53	0.12	2.06	4.46†	0.31
Single well gas emission factors*	0.67	0.33	5.53	0.11	1.87	0.77	0.06
Total annual emissions from reasonably foreseeable federal well development estimated from 2016 OFO RFD/2020 OFO RMP (low scenario – approximately 39 wells per year)	22.62	10.53	176.67	4.68	80.34	173.94	12.09
Total annual emissions from reasonably foreseeable federal well development estimated from 2016 OFO RFD/2019 OFO RMP (high scenario – approximately 153 wells per year)	88.74	41.31	693.09	18.36	315.18	682.38	47.43

Note: The analysis contained in this table provides the percentage contribution rounded to two decimal points.

* The representative well used to calculate emissions is a horizontal oil well. Emissions for vertical wells were not used from this analysis due to current predominance in horizontal technological drilling methods and because presenting horizontal oil wells emissions estimates represents a more conservative summary of emissions compared with emissions from a vertical well, with the exception of SO2, which could be four to five times greater in a vertical well scenario. However, SO2 emissions are still estimated to be within the same magnitude and less than 1 ton per year of SO2 emissions per well. Estimated emissions from a typical horizontal gas well are higher for the criteria pollutants PM_{10}, $PM_{2.5}$, and NO_X. However, estimated emissions from horizontal oil wells are higher for CO, VOC, and HAP emissions. Because the overall magnitude of emissions from oil wells is estimated to be higher in terms of total criteria pollutant emissions, an oil well is evaluated for the purpose of this analysis.

† VOC emissions at the operational phase represent uncontrolled emissions and estimate potential emissions representing the contribution for "one oil well" from the emissions at storage tanks, gathering facilities, etc. However, federally enforceable regulations such as New Source Performance Standards (NSPSs) OOOO and OOOOa both require emission reduction of VOCs from well completions following hydraulic fracturing or refracturing and storage tanks with emissions greater than 6 tons per year after federally enforceable controls. Therefore, actual emissions from the one well scenario are likely be lower than represented.

It is unknown how many wells would be developed in Cheyenne County specifically. Future well development would contribute emissions to airsheds across Kansas, including the addition of criteria pollutants emissions. Emissions are anticipated to be at the most acute level during the construction and completion phases of implementation (estimated to be 30–60 days). Localized and short-term effects on

air quality for nearby residences from emissions of particulate matter, NO_X, VOCs, and HAPs are expected; however, because well development varies (i.e., permit approval, well pad construction, spudding, and completion), the phases of development may not occur in succession but may be spread out in development over time as a result of the varying development plans and approaches of lessees in the context of overall oil and gas development throughout the analysis area. The parcels may not be developed at all. Therefore, the incremental addition of criteria pollutants and VOCs over a period of 20 years would not be expected to result in any direct exceedances of the NAAQS for any criteria pollutants in the analysis area. Individual well projects would be expected to be under *de minimis* thresholds for NO_X and VOCs; larger well development projects, such as master development plans that do not meet *de minimis* thresholds, would be required to undergo additional coordination with the EPA and the Kansas Department of Health and Environment, Bureau of Air at the site-specific level to ensure that the project would not result in an exceedance of the NAAQS or state air quality standards.

Potential HAP emissions from annual oil and gas federal well development could range from 12.09 tons/year (low scenario) to 47.43 tons/year (high scenario). It is important to note that the well development in the OFO would not occur all at once, and the well development and associated emissions would be spread throughout the OFO.

3.6.1.2 *Environmental Effects*

METHODOLOGY AND ASSUMPTIONS

Methodology and assumptions for determining the per well emissions factors (GHG's and non-GHG's) by phase (well development and production operations) on an annual basis are described in the Air Resources Technical Report (BLM 2023a). Over time emissions factors may change due to new emissions regulations, development of control technologies, or data and information improvements for emissions.

Air pollutant emissions from oil and gas activities occur during construction and operations of a well. Construction related emissions occur from the use of heavy machinery during pad construction, drilling, testing and completion, venting and flaring, interim reclamation, and vehicles. Construction emissions are typically a onetime occurrence. Operation related emissions occur from well workovers, pump engines, heaters, tanks, truck loading, fugitive leaks, pneumatics, dehydrators, compressor engines, reclamation, and vehicle traffic. Emissions from operation activities occur throughout the life of a well. Several factors may influence actual emissions including location, geological formation, well depth, equipment used, supporting infrastructure, and other factors.

Single well emission factors were developed from the 2016 RFD/2020 OFO RMP. While this information provides an estimate of emissions based on typical development occurring in the OFO, actual emissions from the development of any given well may differ (BLM 2023a). Emissions estimates per well are included in Table 3.10.

Table 3.10. Percent Increase from Potential Future Development of the Lease Parcels

Future Potential Development		Lease Sale Emissions (tons per year)					
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Current emissions (Cheyenne County, Kansas)	3,135	525	826	1	1,581	3,635	3,635
One oil-well emission factors*	0.58	0.27	4.53	0.12	2.06	4.46†	0.31††
One gas-well emission factors*	0.67	0.33	5.53	0.11	1.87	0.77	0.06

Future Potential Development		Lease Sale Emissions (tons per year)					
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Total emissions from lease sale (8 wells)	**4.64**	**2.16**	**36.24**	**0.96**	**16.48**	**35.68**	**2.48**
Percent increase	**0.15%**	**0.41%**	**4.39%**	**96.00%**	**1.04%**	**0.98%**	**0.07%**

Note: The analysis contained in this table provides percentage contribution rounded to two decimal points.

* The emission estimates for a one-well (oil well) scenario include construction, operations, maintenance, and reclamation activities. Construction emissions include well pad construction (fugitive dust), heavy equipment combustive emissions, commuting vehicles, and wind erosion. Emissions from operations include well workover operations (exhaust and fugitive dust), well site visits for inspection and repair, recompletion traffic, water and oil tank traffic, venting, compression and well pumps, dehydrators, and compression station fugitives. Maintenance emissions for both oil and gas wells are for road travel, and reclamation emission activities are for interim and final activities and include truck traffic, a dozer, a blade, and track hoe equipment. The representative well used to calculate emissions is a horizontal oil well. Emissions for vertical wells were not used from this analysis due to current predominance in horizontal technological drilling methods and because presenting horizontal oil well emissions estimates represent a more conservative summary of emissions, compared with emissions from a vertical well, with the exception of SO_2, which could be four to five times greater in a vertical well scenario. However, SO_2 emissions are still estimated to be within the same magnitude and less than 1 ton per year of SO_2 emissions per well. Oil wells are used for this analysis because they are the more prevalent well type in the OFO area. However, note that emissions of some compounds (NO_X, SO_2, PM_{10}, and $PM_{2.5}$) tend to be higher for gas well development in the area, but gas wells emit lower amounts of VOCs, CO, and HAPs.

† VOC emissions at the operational phase represent uncontrolled emissions and estimate potential emissions representing the contribution for "one oil well" from the emissions at storage tanks, gathering facilities, etc. However, federally enforceable regulations such as New Source Performance Standards (NSPSs) OOOO and OOOOa both require emission reduction of VOCs from well completions following hydraulic fracturing or refracturing and storage tanks with emissions greater than 6 tons per year after federally enforceable controls. Therefore, actual emissions from the one well scenario are likely be lower than represented.

†† HAPs from the 2020 NEI are included for comparison at the county level, however, a large portion of the inventory includes only facility-level emissions emitted after controls are accounted for and only includes facility level or sources as required to be reported by the Oklahoma Department of Environmental Quality, Air Quality Division. HAP emissions could include 0.31 and 0.06 ton per well/year for an oil well and a gas well, respectively.

EFFECTS ANALYSIS

Future potential development of the nominated lease parcels would include increased criteria pollutant emissions, including increased particulate matter released from new well pads or roads, exhaust emissions from drilling equipment, compressor engines, vehicles, flares, dehydration and separation facilities, and VOCs during drilling and production activities. As stated above, the most substantial criteria pollutants and O_3 precursors emitted by oil and gas development and production are VOCs, particulate matter, and NO_2.

Future potential development on the nominated lease parcels is estimated at eight vertical wells (one well per parcel) (see Table 3.1). Depending on the RFD scenario range presented above, the Proposed Action could represent 0.26% of reasonably foreseeable wells built in the OFO planning area for the high development scenario of 3,054 wells, to 1.03% of reasonably foreseeable wells built in the OFO planning area for the low development scenario of 775 wells.

It is unknown how many of the RFD scenario wells would be developed in Cheyenne County. However, it is reasonable to assume that annual well development in Cheyenne County would continue to occur and that future well development would incrementally contribute to increases in criteria pollutant emissions to airsheds across Kansas.

VOCs and NO_2 contribute to the formation of O_3, and because O_3 is not a direct emission, emissions of NO_X and VOCs are used as proxies for estimating O_3 levels. Under the Proposed Action, the additional NO_X and VOC emissions (quantified in Table 3.10) from the wells would incrementally add to O_3 levels within the analysis area. Given that eight wells are expected to be developed as part of the Proposed Action, it is not expected that the Proposed Action would lead directly to additional NAAQS exceedances of O_3 in Cheyenne County. HAP emissions could include 0.31 and 0.06 ton per well per year for an oil well and a gas well, respectively. The CAA defines a major source for HAPs to be one emitting 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs (BLM 2023a). Emissions presented in this analysis conservatively represent uncontrolled emission rates prior to implementation of

applicable federally enforceable controls. Therefore, it is not expected that the Proposed Action would be a major source of HAP emissions.

Under the Proposed Action, particulate matter emissions (PM_{10} and $PM_{2.5}$) would increase by 0.15% and 0.41%, respectively. Construction activities would be one of the primary sources of particulate matter emissions as a result of dust and fine particles generated from on-site equipment use and related groundwork, as well as on and off–site vehicles (Araújo et al. 2014; Reid et al. 2010). How particulate matter interacts with the environment is dependent on a variety of factors, with the size and chemical composition of the airborne particles being the most important in terms of dispersion (distance from the source) and deposition from the atmosphere. Effects of particulate matter emissions would not be confined to the construction site because $PM_{2.5}$ (fine particles) can travel farther in terms of distance than PM_{10} (dust) and other total suspended particulates (particles measuring up to 50 micrometers) and therefore can affect residents in the surrounding area (Araújo et al. 2014). According to Araújo et al. (2014), construction site activities may influence the environment in the immediate area or neighborhood through emissions of total suspended particulates. Total suspended particulates are particles that have lower permanence in the atmosphere, thereby depositing near the emission sources (Araújo et al. 2014). The dispersion and concentration of particulate matter emissions depend on the technology and management control methods used by each project and the weather condition variables (i.e., wind speed, wind direction, and humidity/moisture) (Araújo et al. 2014). The nominated lease parcels do not contain any residences. The nearest residence to any of the nominated lease parcels is approximately 0.24 mile south (parcel 0035). However, the use of BMPs as described in Section 3.6.1.3 can reduce off-site effects from fugitive dust.

The Proposed Action may also result in localized effects on air quality at nearby residences due to O_3 precursors and HAP emissions. A significant portion of the criteria pollutants, VOCs, and HAP emissions would be from construction and completion from future potential development of the nominated lease parcels; therefore, the Proposed Action would result in short-term increases in these emissions, lasting an average of 30 to 60 days. As stated above, air quality is dependent not only on the quantity of air pollutants, but also environmental conditions (humidity, wind direction and speed, temperature) that influence the concentration and/or dispersion of pollutants.

Levels of HAPs would also temporarily increase during construction and completion activities under the Proposed Action, particularly in the form of diesel PM from the on and off–road construction equipment. However, concentrations of mobile source emissions of diesel PM are typically reduced by 60% at a distance of approximately 300 feet (Zhu et al. 2002). According to Zhu et al. (2002), the ultrafine particle (diameter <100 nanometers) concentration measured at 300 m (984 feet) downwind from the source of emissions was indistinguishable from the upwind background concentration. Additionally, a 2019 health assessment study completed by Colorado State University (ICF and Colorado State University 2019) during various stages of well development and production at oil and gas extraction facilities in Colorado found that chemical air concentrations for VOCs (including HAPs) and associated exposure levels decreased rapidly with distance. Simulated chronic cancer risks over a lifetime of exposure during production operations to average individuals were below 1 in 1 million at distances of 1,400 feet from the well pads, 4 in 1 million at 500 feet from the well pads, and 10 in 1 million at 300 feet from the well pads. Maximum exposed individuals were below 1 in 1 million at distances of 2,000 feet from the well pads, 7 in 1 million at 500 feet from the well pads, and 10 in 1 million at 400 feet from the well pads (ICF and Colorado State University 2019). The relatively steep drop-off with distance of diesel PM concentrations as well as the short duration of the activity make the effects from exposure to HAP emissions minimal during construction. HAP emissions could include 0.31 and 0.06 ton per well per year for an oil well and a gas well, respectively.

Ongoing operations of the well sites would be subject to state and federal permitting (unless emissions are so minimal the site qualifies as *de minimis*), recordkeeping, monitoring, and reporting requirements, which ensure compliance with air quality emission standards. Compliance with state and federal permitting requirements is designed to ensure that a proposed source would not cause or contribute to a violation of NAAQS standards.

3.6.1.3 *Mitigation Measures and Residual Effects*

The EPA has promulgated air quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs during gas well completions. Based on its authority under the standard terms and conditions, the BLM requires industry to incorporate and implement BMPs, which are designed to reduce effects on air quality by reducing emissions, surface disturbances, and dust from field production and operations. Typical measures include requirements for watering dirt roads or applying magnesium chloride dust suppressants on dirt roads during periods of high use to reduce fugitive dust emissions of PM_{10} (Intermountain Oil and Gas BMP Project 2013); colocation of wells and production facilities to reduce new surface disturbance; implementation of directional and horizontal drilling and completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores; suggestions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored; and interim reclamation to revegetate areas not required for production facilities and reduce the amount of fugitive dust.

In addition, the BLM encourages industry to participate in the Natural Gas STAR program, administered by the EPA. The Natural Gas STAR program is a flexible, voluntary partnership that encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce natural gas emissions (EPA 2022d).

Further, the EPA provides control measures for emission mitigation of various pollutants in the Menu of Control Measures. The Menu of Control Measures provides state, local, and tribal air agencies with information on existing emissions reduction measures, as well as relevant information concerning the efficiency and cost effectiveness of the measures. The Menu of Control Measures includes information on measures for large point sources of emissions, as well as some information on measures for nonpoint sources of emissions. State, local, and tribal agencies will be able to use this information in developing emissions reduction strategies, plans, and programs to assure they attain and maintain the NAAQS (EPA 2022e).

NO_X reductions can include several control measures from oil and gas–related point sources. One such measure is selective catalytic reduction (SCR) for natural gas compressors. This control is the reduction of NO_X through add-on controls. SCR controls are post-combustion control technologies based on the chemical reduction of NO_X into molecular nitrogen and water vapor. The SCR uses a catalyst to increase the NO_X removal efficiency, which allows the process to occur at lower temperatures. This control applies to compressors used in natural gas production operations, natural gas–fired and process gas–fired heaters with NO_X emissions greater than 10 tons per year. This method generally offers a 90% control efficiency for NO_X (EPA 2022e).

Another NO_X control measure for non-point sources is for process heaters using natural gas or process gas. This control is the use of low-NO_X burner technology to reduce NO_X emissions. Low-NO_X burners reduce the amount of NO_X created from reaction between fuel nitrogen and oxygen by lowering the temperature of one combustion zone and reducing the amount of oxygen available in another. This control is applicable to natural gas–fired and process gas–fired process heaters with uncontrolled NO_X emissions greater than 10 tons per year (EPA 2022e).

VOC control measures from oil and gas–related non-point sources include reducing emissions at storage tanks, use of flares, and a leak detection and repair program to capture fugitive emissions (leaks). The EPA has New Source Performance Standards (NSPSs) in place at 40 C.F.R. § 60, Subparts OOOO and OOOOa, to reduce VOCs from well completion operations and storage tanks constructed after August 23, 2011. NSPS OOOOa requires reduction of VOCs from well completion operations and storage tanks and imposes semiannual monitoring requirements for the collection of fugitive emission components at well sites constructed after September 18, 2015. Following the 2020 amendment to OOOO and OOOOa, fugitive emissions monitoring is only required for those wells producing greater than 15 barrels (bbl) per day.

Other emission controls of VOCs include vapor recovery units, enclosed combustors (vapor combustion unit), and open-tipped (pipe) flares. The most desirable control method is a vapor recovery unit since this recovers the natural gas production and sends the gas to the sales line or back to the process for facility use. Finally, flaring helps to reduce 98% of VOC emissions at petroleum flares (EPA 2022e). The specified emission control techniques have varying degrees of effectiveness as discussed above. Therefore, the mitigation measures applied to future potential development of the nominated lease parcels would reduce emissions of particulate matter and VOCs but would not completely eliminate these emissions. Emission control techniques would be further evaluated when specific lease development projects are proposed.

3.6.2 Issue 2: Greenhouse Gases and Climate Change

How would future potential development of the nominated lease parcels contribute to greenhouse gas emissions and climate change?

Future development of the lease parcels under consideration could lead to emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), the three most common GHGs 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 (Section 4.0), including past and present climate impacts (Section 4.2) and climate change impacts in select states with BLM-authorized fossil fuels (Section 4.3), as well as the existing and reasonably foreseeable GHG emissions associated with BLM's oil and gas leasing actions (Section 7.0), are included in the *2022 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (hereinafter referred to as the BLM Specialist Report) (BLM 2023b). This report presents the estimated emissions of GHGs attributable to the development and consumption of fossil fuels produced on lands and mineral estate managed by the BLM.

The BLM Specialist Report is incorporated by reference as an integral part of this analysis and is available at https://www.blm.gov/content/ghg/2022/. In addition, the Air Resources Technical Report includes additional information on GHG emissions and climate change projections at national, state, and regional scales (BLM 2023a).

3.6.2.1 *Affected Environment*

CLIMATE CHANGE AND GREENHOUSE GASES

Climate change is a global process that is affected by the total sum 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 potential contribution to climate change impacts.

Table 3.11 shows the total estimated GHG emissions from fossil fuels at the global, national, and state scales from 2017 through 2021. Emissions are shown in megatonnes (Mt) per year of carbon dioxide equivalent (CO_2e). Chapter 3 of the BLM Specialist Report contains additional information on GHGs and an explanation of CO_2e. State and national energy-related CO_2 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 BLM Specialist Report (see Chapters 5, 6, 7, and 9 in BLM 2023b).

Table 3.11. Global and U.S. Greenhouse Gas Emissions, 2017 through 2021

Scale	GHG Emissions (Mt CO_2e/year)				
	2017	2018	2019	2020	2021
Global	51,195	52,398	52,557	50,632	53,057
U.S.	6,561.8	6,754.8	6,617.9	6,026	6,340.2
State (Kansa)	108.96	113.24	110.91	106.86	109.01

Sources: BLM Specialist Report (BLM 2023b:Chapter 6, Table 5-1 [U.S.] and Table 5-2 [State]), Emissions Database for Global Atmospheric Research (EDGAR) 2023 [Global], and EPA FLIGHT Greenhouse Gas Emissions from Large Facilities (EPA 2023f).

Mt (megatonne) = 1 million metric 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 4 and 8 of the BLM Specialist Report (BLM 2023b). 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.

3.6.2.2 *Environmental Consequences*

PROPOSED ACTION ALTERNATIVE

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. 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 mid-stream operations) associated with production from the lease parcels. These sources may include emissions of CH_4 (a more potent GHG than CO_2 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 midstream 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, 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 20 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 EUR of produced oil and gas with emissions factors from the NETL life cycle analysis of U.S. oil and

natural gas. Additional information on emission factors can be found in the BLM Specialist Report (Chapter 6, Tables 6-8 and 6-10 in BLM 2023b).

- 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 C.F.R. § 98). Additional information on emission factors and EUR factors can be found in the BLM Specialist Report (Chapter 6 in BLM 2023b).

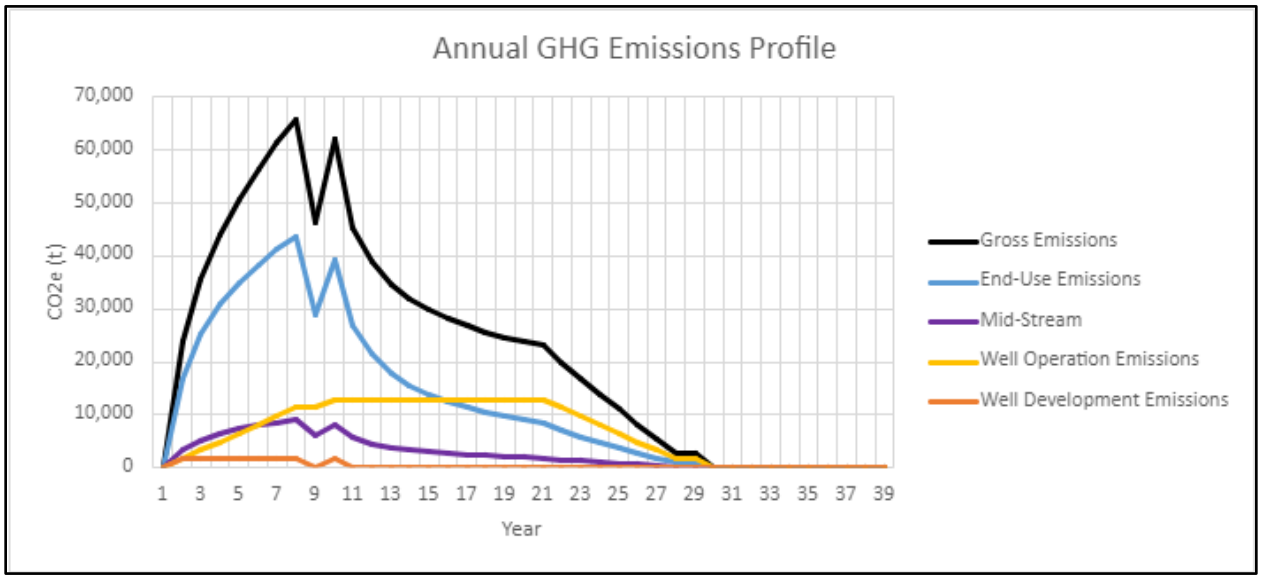
Table 3.12. lists the estimated direct (well development and production operations) and indirect (mid-stream and end-use) GHG emissions in metric tons (tonnes) for the subject leases over the average 20-year production life of a lease.

GHG emissions vary annually over the production life of a well due to declining production rates over time. Figure 3.1 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 activities, and end-use) emissions.

Table 3.12. Estimated Life-of-Lease Emissions from Well Development, Well Production Operations, Mid-Stream, and End Use

Activity	Life-of-Lease Emissions (tonnes)				
	CO_2	CH_4	N_2O	CO_2e (100-year)	CO_2e (20-year)
Well development	14,139	8.06	0.112	14,410	14,835
Well production operations	178,187	2,697.43	0.416	258,684	400,839
Mid-stream	77,364	801.50	1.147	101,562	143,801
End-use	483,086	13.47	2.168	484,079	484,789
Total	**752,776**	**3,520.46**	**3.843**	**858,735**	**1,044,263**

Source: BLM Lease Sale Emissions Tool



Source: BLM Lease Sale Emissions Tool

Figure 3.1. Estimated annual greenhouse gas emissions profile over the life of a lease.

To put the estimated GHG emissions for this lease sale in 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 (EPA 2023g). For instance, the projected average annual GHG emissions from potential development of the subject leases are equivalent to 6,825 gasoline-fueled passenger vehicles driven for 1 year, or the emissions that could be avoided by operating 8.5 wind turbines as an alternative energy source or offset by the carbon sequestration of 36,573 acres of forest land.

Table 3.13 compares emission estimates over the 30-year life of the lease compared to the 20-year projected federal fossil fuel emissions in the state and nation from existing wells, the development of approved APDs, and emissions related to reasonably foreseeable lease actions.

Table 3.13. Comparison of the Life of Lease Emissions to Other Federal Oil and Gas Emissions

Reference	Mt CO_2e (100-year)	Life of Lease Percentage of Reference
Lease sale emissions (life of lease)	0.859	100.0
Kansas reasonably foreseeable short-term federal (oil and gas)*	3.76	22.9
Kansas EIA projected long-term federal (oil and gas)†	10.62	8.1
U.S. short-term federal (oil and gas)	6,033.0	0.014
U.S. long-term federal (oil and gas)	16,523.0	0.005

Source: U.S. and federal emissions from BLM Lease Sale Emissions Tool and Tables 7-18 and 7-19 in the BLM Specialist Report (BLM 2023b).

* Short-term foreseeable is estimated federal emissions from existing producing wells, as well as projected APD approvals and leasing within the next 12 months.

† 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 8.1% and 22.9% of federal fossil fuel authorization emissions in the state and between 0.005% and 0.014% of federal fossil fuel authorization emission in the nation. In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 0.859 Mt CO_2e over the life of the lease.

MONETIZED IMPACTS FROM GREENHOUSE GAS EMISSIONS

The social cost of carbon dioxide (SC-CO_2), social cost of nitrous oxide (SC-N_2O), and social cost of methane (SC-CH_4)—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 SC-CO_2, SC-CH_4, and SC-N_2O developed by the Interagency Working Group on the SC-GHG (IWG). 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 (2021).

The SC-GHGs associated with estimated emissions from future potential development of the lease parcels are reported in Table 3.14. These estimates represent the present value (from the perspective of 2024) of future market and nonmarket costs associated with CO_2, CH_4, and N_2O emissions from potential well development and operations, and potential end-use, as described in Section 3.6.1.2. Estimates are calculated based on IWG estimates of the 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 that development will start in 2024 and end-use emissions will be complete in 2052, based on experience with previous lease sales.

Table 3.14. SC-GHGs Associated with Future Potential Development; Denominated in 2020$ and Discounted to the Year 2024.

	Social Cost of GHGs			
	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	$3,837,000	$12,943,000	$18,999,000	$37,907,000
Mid-stream and end-use	$7,765,000	$28,389,000	$42,585,000	$85,676,000
Total	$11,602,000	$41,332,000	$61,584,000	$123,583,000

As detailed in the BLM Specialist Report (BLM 2023b), which is incorporated by reference, the BLM also looked at other tools to inform its analysis, including the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC) (see Section 9.3 of the BLM Specialist Report). Using the projected emissions for the long-term onshore federal mineral emissions for 12 AEO scenarios, the BLM conducted MAGICC runs evaluating potential contributions to global climate change and related values for the SSP119 and SSP245 climate change projection scenarios. These two scenarios were chosen because they most closely approximate or frame the desired outcomes of the Paris Climate Accord, and would also reflect the greatest contribution as a percent of BLM's authorized cumulative emissions relative to the global emissions levels contained in the SSP scenarios (should provide for a conservative contribution analysis). MAGICC modeling was completed for two federal mineral emissions source groups separately, oil and gas, and oil, gas and coal. The SSPs are explained in Section 8.2 of the BLM Specialist Report and the following provides additional information regarding the SSP119 and SSP245 base scenarios used for the MAGICC modeling.

- SSP1-1.9: IPCC's most optimistic scenario describing a world where global CO_2 emissions are cut to net zero around 2050. This is the only scenario that meets the Paris Agreement's goal of keeping global warming to around 1.5 degrees Celsius above preindustrial temperatures, with warming hitting 1.5°C but then dipping back down and stabilizing around 1.4°C by the end of the century. The total CO_2 emissions (fossil and industrial) for this scenario in 2050 are 2,865.45 Mt.
- SSP2-4.5: This is a scenario where global CO_2 emissions hover around current levels before starting to fall mid-century, but do not reach net-zero by 2100. In this scenario, temperatures rise 2.7°C by the end of the century. The total CO_2 emissions (fossil and industrial) for this scenario in 2050 are 42,961.30 Mt.

Tables 9-3 and 9-4 of the BLM Specialist Report present the MAGICC modeling results for each baseline scenario (SSP119 and SSP245 - no changes to the modeling inputs) and for the modified AEO "high oil price" case (scenario with the highest predicted federal mineral emissions and global climate change impacts), and the AEO "low oil and gas supply" case (scenario with lowest predicted federal fossil fuel emissions and global climate change impacts). Because the projected federal mineral CO_2 emissions constitute a larger portion of the global levels in the modified SSP119 scenario, the modeled impacts are generally higher relative to the baseline as compared to the SSP245 scenario. The model results show that

regardless of the global climate change projection scenario (SSP119 or SSP245) and the pathway that federal fossil fuels emissions follow, federal minerals emissions are predicted to have minimal impacts to future global climate change through the end of the century. As this is an assessment of what BLM has projected could come from the entire federal fossil fuel program, including the projected emissions from the Proposed Action, over the next 20 years, the reasonably foreseeable lease sale emissions contemplated in this EA are not expected to substantially affect the rate of change in climate effects, bring forth impacts that are not already identified in existing literature, or cause a change in the magnitude of impacts from climate change at the state, national, or global scales.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not offer any of the nominated parcels in this lease sale. However, in the absence of a Land Use Plan Amendment, closing the lands to leasing, they could be considered for inclusion in future lease sales. Although no new GHG emissions associated with new federal oil and gas development for the subject leases would occur under the No Action Alternative in the foreseeable future, the cumulative demand for energy is not expected to differ regardless of BLM decision-making (EIA 2023a). The BLM has no information regarding what energy source could fill the energy demand if development does not occur on the subject leases. Although the change in emissions compared to the Proposed Action could range from a 98.5% decrease if hydro-electricity is substituted to a 110.7% increase if coal is substituted (see Table 10-3 in the BLM Specialist Report [BLM 2023b]). Over the past decade the increasing mix of natural gas has contributed to lower emissions as it has replaced energy produced from coal. In 2022, high prices for natural gas and demand exceeding supply have resulted in some countries reactivating or delaying planned closures of coal-fired power plants (Reuters 2022). In the future, renewable energy is anticipated to become a larger part of the U.S. energy mix, reducing energy-related carbon emissions. Relative to last year's data, the pending capacity of renewables has increased by approximately 400%. It has been estimated that with a 35% integration of wind and solar energy into the western U.S. electric grid, there would be an additional 25% to 45% reduction in carbon emissions (BLM 2023b). Based on this information there is potential for higher emissions over the short-term and reduced emissions over the long-term. The BLM cannot estimate the net effects across all energy markets to understand the mix of energy resources that will meet demand, and therefore cannot provide an estimate of SC-GHG for the No Action Alternative.

ESTIMATED GREENHOUSE GAS EMISSIONS FOR REASONABLY FORESEEABLE ENVIRONMENTAL TRENDS AND PLANNED ACTIONS

The analysis of GHGs contained in this EA includes estimated emissions from the lease 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 Chapter 7 of the BLM Specialist Report (BLM 2023b). The BLM Specialist 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 BLM Specialist 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 BLM Specialist Report includes a trends analysis of: 1) leased federal lands that are held-by-production, 2) approved 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 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 BLM Specialist Report and represent both a hard look at 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 3.15 shows the aggregate GHG emissions estimate that would occur from federal leases, existing and foreseeable, between the years 2023 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 MLA as well as other authorities, that have been issued over the last 5 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 lease. However, they may also overestimate 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 3.15. Reasonably Foreseeable Projected Emissions from Federal Lease Development

State (BLM administrative unit)	GHG Emissions from Past, Present, and Foreseeable Federal Lease Development (Mt CO_2e per year)
Alabama (Eastern States [ES])	9.88
Alaska	74.59
Arkansas (ES)	8.80
California	73.15
Colorado	577.69
Idaho	0.30
Illinois	0.12
Indiana	0.02
Kansas (New Mexico State Office [NMSO])	3.76
Kentucky (ES)	0.10
Louisiana (ES)	104.55
Michigan (ES)	1.85
Mississippi (ES)	2.29
Montana	321.90
Nebraska (Wyoming State Office)	0.24
Nevada	1.20
New Mexico	3,133.80
New York	0.01
North Dakota (Montana State Office)	469.06
Ohio (ES)	8.37
Oklahoma (NMSO)	14.58
Oregon	0.12
Pennsylvania	0.71
South Dakota (Montana State Office)	1.90

State (BLM administrative unit)	GHG Emissions from Past, Present, and Foreseeable Federal Lease Development (Mt CO_2e per year)
Texas (NMSO)	55.86
Utah	835.37
Virginia	0.16
West Virginia (ES)	0.64
Wyoming	7,394.21
Total	**13,096.22**

Note: Emissions obtained from BLM Specialist Report (see Figure 7-1 in BLM 2023b).

The most recent short-term energy outlook (STEO) published by the EIA (EIA 2023b) predicts that the world's oil and gas supply and consumption will increase over the next 18 to 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 2 years:

- U.S. liquid fuels consumption is projected to increase to 20.14 million barrels per day (b/d) in 2023, up from 20.01 million b/d in 2022, and is expected to further increase to 20.30 million b/d in 2024.
- U.S. crude oil production is expected to average 11.91 million b/d in 2022 and to rise to 12.78 million b/d in 2023 and 13.16 million b/d in 2024.
- U.S. natural gas consumption is expected to average 89.7 billion cubic feet per day (Bcf/d) in 2023, increasing from 88.6 Bcf/d in 2022 and decreasing to 88.8 Bcf/d in 2024.
- U.S. liquid natural gas exports are expected to increase from 10.59 Bcf/d in 2022 to 11.60 Bcf/d in 2023 and 13.15 Bcf/d in 2024.
- U.S. coal production is expected to total 583 million short tons (MMst) in 2023 and 464 MMst in 2024 and is expected to decrease to 16% of total U.S. electricity generation in 2023 compared to 20% in 2022, driven by the ongoing 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 and 2023 to 25% 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, political 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 (EIA 2023a) 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 is projected to increase 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, and domestic natural gas consumption for electricity generation is expected to decrease by 2050 relative to 2022. As a result, energy-related CO_2 emissions are expected to fall 25% to 38% below the 2005 level, depending on economic growth factors. Further discussion of past, present, and projected global and state GHG emissions can be found in Chapter 5 of the BLM Specialist Report (BLM 2023b).

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 or 2 degrees Celsius (°C) above preindustrial levels. The IPCC Special Report on Global Warming of 1.5ºC (IPCC 2018) 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°C or 2.0°C 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 9-1 in the BLM Specialist Report (BLM 2023b) provides an estimate of the potential emissions associated with BLM's fossil fuel authorizations in relation to IPCC carbon budgets. Total federal fossil fuel authorizations, including coal, natural gas, and oil, represent approximately 1.37% of a suggested global carbon budget of the 380 gigatonnes of CO2 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 IRA passed in 2022, the EIA International Energy Outlook expects renewable energy consumption to double between 2020 and 2050 and nearly equal liquid fuels consumption by 2050. The United States has committed to the expansion of renewable energy through infrastructure investments in clean energy transmission and grid upgrades included in the Bipartisan Infrastructure Investment and Jobs Act as well as clean energy investments and incentives included in the IRA. The Department of Energy's Office of Policy developed a preliminary assessment that finds the IRA and Bipartisan Infrastructure Investment and Jobs Act, 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.

3.6.2.3 *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 toward warming. Chapters 4 and 8

of the BLM Specialist Report (BLM 2023b) provide 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) 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) can remove GHGs from the atmosphere or reduce emissions in other areas. Chapter 10 of the BLM Specialist Report provides a more detailed discussion of GHG mitigation strategies (BLM 2023b).

Several federal agencies work in concert to implement climate change strategies and meet 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. The EPA has issued regulations that will reduce GHG emissions from any development related to the proposed leasing action. These regulations include the NSPS for Crude Oil and Natural Gas Facilities (49 C.F.R. § 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 BLM Specialist Report (BLM 2023b).

Most GHG emissions resulting from federal fossil fuel authorizations occur outside the BLM's authority and control. These emissions are referred to as indirect emissions and generally occur off-lease during the transport, distribution, refinement, 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 the BLM assesses the specific location, design, and plan of development. In carrying out its responsibilities under NEPA, the BLM has developed BMPs designed to reduce emissions from field production and operations. BMPs may include limiting emissions from stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions that may occur during development of the lease parcel. Analysis and approval of future development may include the application of BMPs within BLM's authority, included as COAs, 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 in Chapter 10 of the BLM Specialist Report (BLM 2023b).

3.6.3 Issue 3: Water Use and Quantity

How would future potential development of the nominated lease parcels affect surface water and groundwater quantity?

The analysis area for this issue encompasses Cheyenne County, Kansas. This analysis area is used because water sources used to support future potential development of the nominated lease parcels would likely be sourced from this county. Water use for development of the nominated lease parcels is assumed to primarily come from groundwater sources based on previous oil and gas development in the planning area.

Water uses associated with development of the nominated lease parcels would occur during the 30 to 60–day well construction and completion period (such as hydraulic fracturing), the 20-year

operation period (e.g., water use associated with dust control, recompletion and workover), and interim and final reclamation. While most of the water use associated with oil and gas development is expected to occur within a 30 to 60–day well construction and completion period, the effect of this use on groundwater aquifers is expected to last until recharge occurs. Due to uncertainty about water sources and recharge rates, it is assumed that all water use associated with oil and gas development is likely to be a long-term effect. Additionally, the ability for aquifer recharge may be affected by drought conditions associated with climate change.

3.6.3.1 *Affected Environment*

CURRENT TOTAL WATER USE IN THE ANALYSIS AREA

The USGS report, *Estimated Use of Water in the United States in 2015* (Dieter et al. 2018a; herein incorporated by reference), lists total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power. Water use for 2015 in Cheyenne County is summarized in Table 3.16. As shown in the table, total county water use in 2015 was estimated at 56,679 acre-feet (AF). Water withdrawals are entirely from groundwater and the largest water use category in Cheyenne County is for irrigation, comprising 96.9% of total county use. Mining use, which includes oil and gas development, comprises 0.1% of water use. All the water used for mining comes from groundwater and is fresh.

Table 3.16. Cheyenne County Water Use by Category, 2015

	Surface Water Withdrawals			Groundwater Withdrawals			Total Water Withdrawals			
Category	**Fresh (AF)**	**Saline (AF)**	**Total (AF)**	**Fresh (AF)**	**Saline (AF)**	**Total (AF)**	**Fresh (AF)**	**Saline (AF)**	**Total (AF)**	**Percent Total Use**
Aquaculture	0	0	**0**	0	0	**0**	0	0	**0**	**0%**
Domestic	0	0	**0**	247	0	**247**	247	0	**247**	**0.4%**
Industrial	0	0	**0**	0	0	**0**	0	0	**0**	**0%**
Irrigation	0	0	**0**	54,941	0	**54,941**	54941	0	**54,941**	**96.9%**
Livestock	0	0	**0**	930	0	**930**	930	0	**930**	**1.6%**
Mining	0	0	**0**	34	0	**34**	34	0	**34**	**0.1%**
Public water supply	0	0	**0**	527	0	**527**	527	0	**527**	**0.9%**
Thermoelectric power	0	0	**0**	0	0	**0**	0	0	**0**	**0%**
Basin Totals	**0**	**0**	**0**	**56,679**	**0**	**56,679**	**56,679**	**0**	**56,679**	**100%**

Source: Dieter et al. (2018b).

Notes: The mining category row (shaded in table) is the category in which water use associated with the Proposed Action would fall. Note that totals of individual categories may not add up to county totals due to rounding.

CURRENT WATER USE ASSOCIATED WITH OIL AND GAS DEVELOPMENT

As part of oil and gas development, water is used for drilling fluid preparation and make-up water for completion fluids, in well stimulation (of which the most common method is hydraulic fracturing), as rig wash water, as coolant for internal combustion engines, for dust suppression on roads or well pads, and equipment testing. Water use associated with stimulation activities, which is most of the water use during

the well development phase, is dependent on many factors, including the type and length of the well, and the type and depth of the geologic formation (EPA 2016). Horizontal wells typically have longer well lengths, and therefore require more water than vertical wells for well completion (EPA 2016).

Estimates of median water use per well for hydraulic fracturing in Kansas are not available due to the low number of oil and gas wells in the state; however, estimates of median water use per well in the neighboring state of Oklahoma range from 2.6 million gallons (8.00 AF) to 3 million gallons (9.21 AF) (EPA 2016). The average annual hydraulic fracturing water use in 2011 and 2012 was 66 million gallons for the state of Kansas (EPA 2016).

REASONABLY FORESEEABLE ENVIRONMENTAL TRENDS AND PLANNED ACTIONS

The 2019 OFO RMP Final EIS estimates that there could be between 775 and 3,054 new wells within the OFO planning area by 2040 (BLM and BIA 2019a). The RFD covers Kansas, Oklahoma, and Texas; it is unknown how many of these wells would be developed in each of the three states, or in Cheyenne County. Estimates of average water use per well in the Mississippian Limestone Play of Kansas range from 28,409 gallons (0.09 AF) to 2.3 million gallons (7.0 AF) (FracFocus 2022). Based on these estimates of median water use per well, development of the maximum RFD scenario would require between 275 and 21,378 AF over the next 20 years, or between 14 and 1,069 AF of water in any given year. Note that this includes both federal and non-federal wells.

The projected annual use associated with the RFD scenario comprises about 0.02% to 1.9% of Cheyenne County's 2015 total water withdrawals (56,669 AF, which already includes past and present water use). Irrigation would remain the largest water use within the analysis area (currently 97% of all water use within Cheyenne County).

As noted in Section 3.3.3, predicted effects from climate change for the analysis area include increases in temperatures, more frequent drought, and precipitation decreases, which would stress the region's primary water supply, the Ogallala Aquifer (BLM 2023a).

3.6.3.2 *Environmental Effects*

Drilling and completion of eight vertical wells on the nominated lease parcels is estimated to use 27.2 AF of groundwater. This calculation is based on a factor of 3.4 AF per vertical well, which the BLM continues to consider a reasonable current estimate of water use associated with drilling and completion of a single vertical well within the analysis area (EPA 2016). If more water-intensive stimulation methods (e.g., slickwater fracturing) are implemented or if laterals become longer, water use could increase. Alternatively, water use estimates could be lower if produced water is reused or recycled, or if less water-intensive stimulation methods are used (e.g., nitrogen) in hydraulic fracturing.

Water use associated with drilling and completion of each well is expected to occur within a 30 to 60–day period. If all wells were developed in a single year, groundwater water use associated with future potential development of the leases would result in a 0.05% increase of the Cheyenne County total water use (56,669 AF). Assuming a 20-year development scenario for the Proposed Action (consistent with the RFD time frame), the water use associated with development of the lease parcels would be approximately 1.36 AF for any given year, which represents approximately 0.002% of the County's total annual water use in 2015.

The demand from future potential development of the nominated lease parcels (27.2 AF) is negligible when contrasted with the estimated water demand of the full 2016 OFO RFD (up to 21,378 AF over

20 years or up to 1,069 AF in any given year) and the demands of other sectors (irrigation water use in particular, which used 54,941 AF in 2015) within Cheyenne County. Lease operators would be required to obtain water use permits for the withdrawal of water for well drilling, completion operations, and other water-related activities, unless the operator reports that water would be obtained from commercial permitted sources. All water uses would be evaluated at the time of proposed lease development in site-specific environmental review documentation and subject to standard lease terms and conditions and site-specific mitigation.

Produced water associated with development of the lease parcels is estimated at approximately 288,000 bbl of water. Produced water would be either recycled, reused, or disposed of in accordance with all applicable federal and state laws and regulations. Disposal of produced water would occur at regulated and permitted commercial facilities (such as saltwater disposal wells). Water sourced from outside the geological formation that is used in hydraulic fracturing, which remains in the geological formation after hydraulic fracturing is complete, is unlikely to be recovered for other uses (Kondash et al. 2018).

3.6.3.3 *Mitigation Measures and Residual Effects*

The BLM encourages the use of recycled water in hydraulic fracturing techniques but cannot require it. The Kansas Corporation Commission, which is responsible for permitting oil and gas wells in the state of Kansas, also does not require the use of recycled water in hydraulic fracturing. The BLM works with operators during their planning phases to collocate facilities for the management of water including extraction, reuse, treatment, storage, and disposal of water during the life cycle of lease development.

CHAPTER 4. CONSULTATION AND COORDINATION

The following consultation and coordination efforts with tribes, individuals, organizations, and agencies were conducted for the proposed leasing actions.

4.1 ENDANGERED SPECIES ACT CONSULTATION

The May 2023 EA, Section 4.1, states the following:

> *BLM OFO biologists have reviewed the proposed leasing and determined it would comply with threatened and endangered species management guidelines outlined in the 2020 Oklahoma, Kansas, and Texas BLM RMP. The BLM also completed a review of current species listings within the vicinity of the nominated lease parcels using the USFWS IPaC system in December 2022 under Consultation Code 2023-0021692 (USFWS 2022, accessed December 5, 2022). The BLM would initiate Section 7 consultation with the USFWS in compliance with the ESA for species not previously analyzed in the 2020 Oklahoma, Kansas and Texas BLM RMP's Biological Assessment (BLM and BIA 2019b) if during site selection federally listed species are found to have a potential to be present or impacted during lease development, if applicable. No further consultation with the USFWS is required at this stage.*

The BLM completed a review of species listings within the vicinity of nominated lease parcels using the USFWS IPaC system in September 2023 under Consultation Code 2023-0134971 (USFWS 2023a), and one additional species was identified (tricolored bat, proposed endangered), which the BLM determined has potential to occur in the nominated lease parcels due to its generalist habitat requirements (see AIB-4).

Although not expected to be present, any federally listed fish species found to have a potential to be present or impacted during site selection would require a separate "effects determination" made at a site-specific project level to ensure that water used for drilling operations is properly permitted from existing legal sources (no new water depletions) and is in compliance with the ESA. Any new water depletion would likely require Section 7 consultation under the ESA.

While federal regulations and policies require the BLM to make its public land and resources available on the basis of the principle of multiple uses, it is BLM policy to conserve special status species and their habitats, and to ensure that actions authorized by the BLM do not contribute to the need for the species to become listed as threatened or endangered by the USFWS. Official species lists, whether obtained via IPaC or local USFWS offices, are valid for 90 days. After 90 days, project proponents should confirm their results on IPaC by requesting an "updated" official species list for their project.

The BLM continues to review the available climate science in connection with its statutory responsibilities, including under NEPA, and has found that despite advances in climate science, global climate models are unable to forecast local or regional effects on resources as a result of specific emissions (IPCC 2013). Any contribution to global climate processes from the issuance of leases is simply too remote, speculative, and undetectable to trigger ESA Section 7 consultation, given accumulated and persisting GHGs already in the atmosphere, the annual volume of GHG emissions that will occur globally regardless of additional lease issuance, and projected continued climate change. The BLM Specialist Report (BLM 2023b) concludes that "unlike other common air pollutants, the ecological impacts that are attributable to the GHGs are not the result of localized or even regional emissions but are entirely dependent on the collective behavior and emissions of the world's societies" and notes "the lack of climate analysis tools and techniques that lend themselves to describing the physical climate or earth system responses, such as changes to sea level, average surface temperatures, or regional precipitation

rates, that could be attributable to emissions associated with any single [land management] action or decision" (BLM 2023b:16, 85). In addition, according to Federal Register 87:64700, *Threatened Species Status for Emperor Penguin With Section 4(d) Rule* (October 26, 2022), "based on the best scientific data available we [the USFWS] are unable to draw a causal link between the effects of specific GHG emissions and take of the emperor penguin in order to promulgate more specific regulations under [ESA Section] 4(d)."

4.2 TRIBAL CONSULTATION

Tribal consultation for the BLM is guided by a variety of laws, Executive Orders and Memoranda, as well as case law. Laws include the NHPA and subsequent amendments, Public Law (PL) 89-665, October 15, 1966; the Archaeological Resources Protection Act of 1979, PL 96-95, 16 U.S.C. § 470aa-mm, October 31,1979; the American Indian Religious Freedom Act of 1978, PL 95-341, U.S.C. § 1996 and 1996a, August 11, 1978; NEPA, PL 91-190, 42 U.S.C. §§ 4321-4347, January 1, 1970; the Native American Graves Protection and Repatriation Act of 1990, PL 101-601, November 16, 1990; and the FLPMA, PL 94-579, October 21, 1976. Executive orders and memoranda include a 1994 Memorandum on Government-to-Government Relations with Native American Tribal Governments (*Federal Register* 59:85, May 4, 1994), Executive Order 13007 on Accommodation of Sacred Sites (*Federal Register* 61:104, May 29, 1996), and Executive Order 12898 on Environmental Justice (Federal Register 59:32, February 16, 1994).

The Quarter 2 2024 lease sale is composed of eight parcels not sold during the May 2023 lease sale. Tribal consultation is a separate process from public scoping, due to the unique relationship between the U.S. Government and federally recognized tribes. The primary methods of tribal consultation include letters providing May 2023 lease sale information materials, telephone calls, and/or face-to-face meetings, if requested.

As stated in the May 2023 EA (Section 4.2, Tribal Consultation):

> *The BLM initiated government-to-government consultation under NEPA for the May 2023 Lease Sale on October 5, 2022, and Tribal Historic Preservation Office (THPO) consultation under NHPA Section 106 on November 16 and December 13, 2022, with the Apache Tribe of Oklahoma, Caddo Nation, Cheyenne and Arapaho Tribes of Oklahoma, Comanche Nation, Kaw Nation, Kiowa Tribe of Oklahoma, Northern Arapaho Tribe, Northern Cheyenne Tribe, Osage Nation, Otoe-Missouria Tribe, Ponca Tribe, Prairie Band Potawatomi Nation, Southern Ute Indian Tribe, Wichita & Affiliated Tribes, and Wyandotte Nation (see Section 4.2). On December 14, 2022, the Northern Cheyenne Tribe determined the project will have no effect and may proceed. No other tribe responded, and no Native American concerns were identified.*

No tribal concerns were identified during government-to-government consultation for the May 2023 lease sale. If there had been any Native American concerns for the May 2023 lease sale, the BLM OFO would have reinitiated government-to-government consultation on the subject lease parcels.

In addition, the BLM OFO conducted Section 106 consultation on these parcels in November 2022. The BLM OFO determined that if no newly recorded sites were reported in the currently proposed parcels or within 1 mile of them, then there was no need to reinitiate Section 106 for this project. The BLM reviewed survey and site information from the Kansas SHPO on July 20, 2023. The review showed no previously recorded sites within the proposed parcels and one previously recorded site within 1 mile of one of the parcels. This site was identified in the Section 106 analysis and analyzed in the May 2023 EA.

For these reasons, the BLM did not reinitiate government-to-government consultation under NEPA or Section 106 for the Quarter 2 2024 lease sale.

4.3 STATE HISTORIC PRESERVATION OFFICE AND TRIBAL HISTORIC PRESERVATION OFFICE CONSULTATION

The BLM completed NHPA Section 106 consultation for the May 2023 lease sale in October and November 2022, which included the eight nominated lease sale parcels for the Quarter 2 2024 lease sale.

As stated in the May 2023 EA (Section 4.3):

> *The BLM sent NHPA Section 106 consultation letters to the Kansas SHPO on November 16, 2022. In these letters, the BLM provided information on the proposed lease and a cultural resources literature review for the area where off-lease development has the potential to occur. In its correspondence, the BLM made a determination of No Historic Properties Affected, as defined in 36 C.F.R. 800.4(d)(1) for the lease sale. The Kansas SHPO responded on December 14, 2022, and recommended that a professional archeologist survey the following parcels in the proposed project area prior to beginning construction: KS-2023-05-0014, KS-2023-05-0021, KS-2023-05-0034, KS-2023-05-0035, and KS-2023-05-0039. These areas of Cheyenne County are relatively underrepresented in the archeological survey record, and this project thus represents an opportunity to survey areas with moderate to high potential for unrecorded archeological sites. The SHPO has determined that the remainder of the proposed project areas will not affect any property listed or determined eligible for listing in the National Register.*

In their response to the May 2023 lease sale Section 106 consultation letter, the Kansas SHPO requested that a survey be conducted prior to development of any oil and gas wells for several parcels in the May 2023 lease sale, including one parcel which is included in the Quarter 2 2024 lease sale (parcel 0035). As stated in the May 2023 EA (AIB-5) and AIB-1 of this EA, the BLM believes that future potential development in these parcels would be split-estate land, and on-the-ground surveys would be recommended as part of the Section 106 process.

The Quarter 2 2024 lease sale is composed of eight parcels not sold during the May 2023 lease sale; the BLM OFO conducted Section 106 consultation on these parcels in November 2022. The BLM OFO determined that if no newly recorded sites were reported in the currently proposed parcels or within 1 mile of them, then there was no need to reinitiate Section 106 for this project. The BLM reviewed survey and site information from the Kansas SHPO on July 20, 2023. The review showed no previously recorded sites within proposed parcels and one previously recorded site within 1 mile of one of the parcels. This site was identified in the Section 106 analysis and analyzed in the May 2023 EA. Therefore, the BLM OFO did not reinitiate Section 106 for the Quarter 2 2024 lease sale.

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CHAPTER 5. LIST OF PREPARERS

Table 5.1 contains a list of individuals that contributed to preparation or review of this EA.

Table 5.1. List of EA Preparers

Name	Area of Expertise	Organization
Erin Knolles	Archeologist	BLM OFO
Jeremiah Zurenda	Wildlife Biologist	BLM OFO
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Adam Deppe	Air Quality Specialist	BLM NMSO
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CHAPTER 6. LITERATURE CITED

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APPENDIX A. MAPS

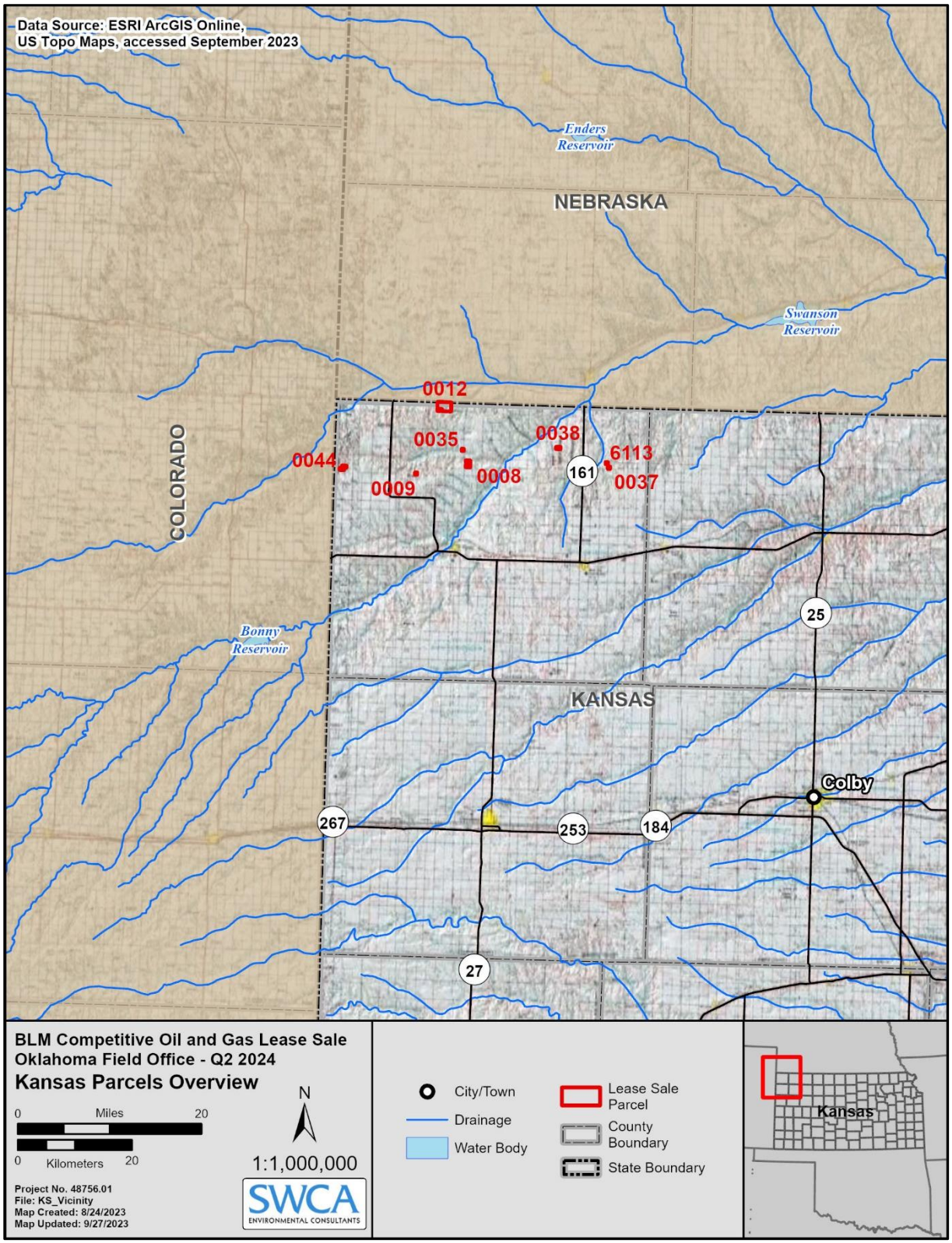

Figure A.1. Overview of the nominated lease parcels analyzed within this EA, within the BLM OFO.

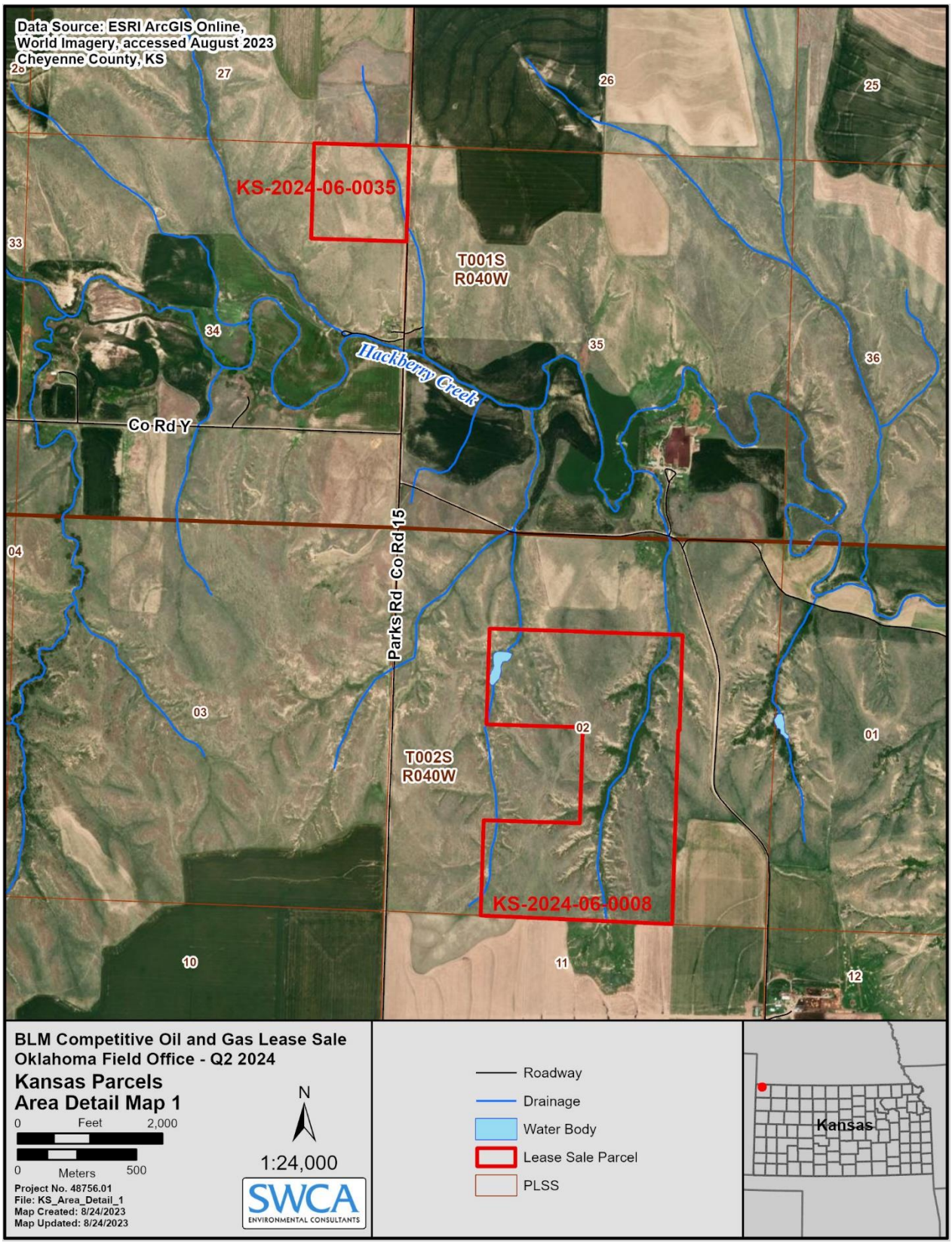

Figure A.2. Detailed map of nominated lease parcels 0035 and 0008 in Cheyenne County, Kansas.

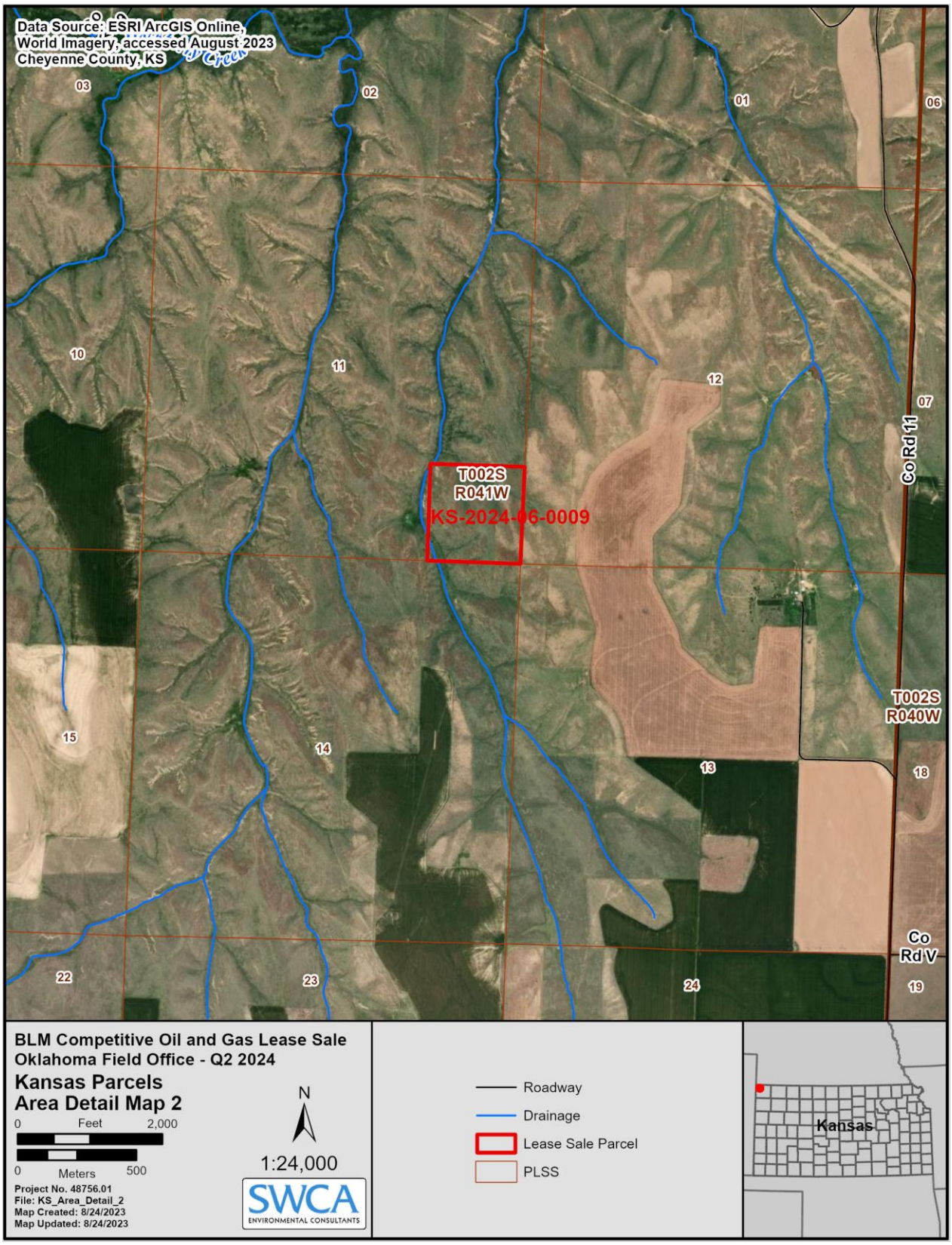

Figure A.3. Detailed map of nominated lease parcel 0009 in Cheyenne County, Kansas.

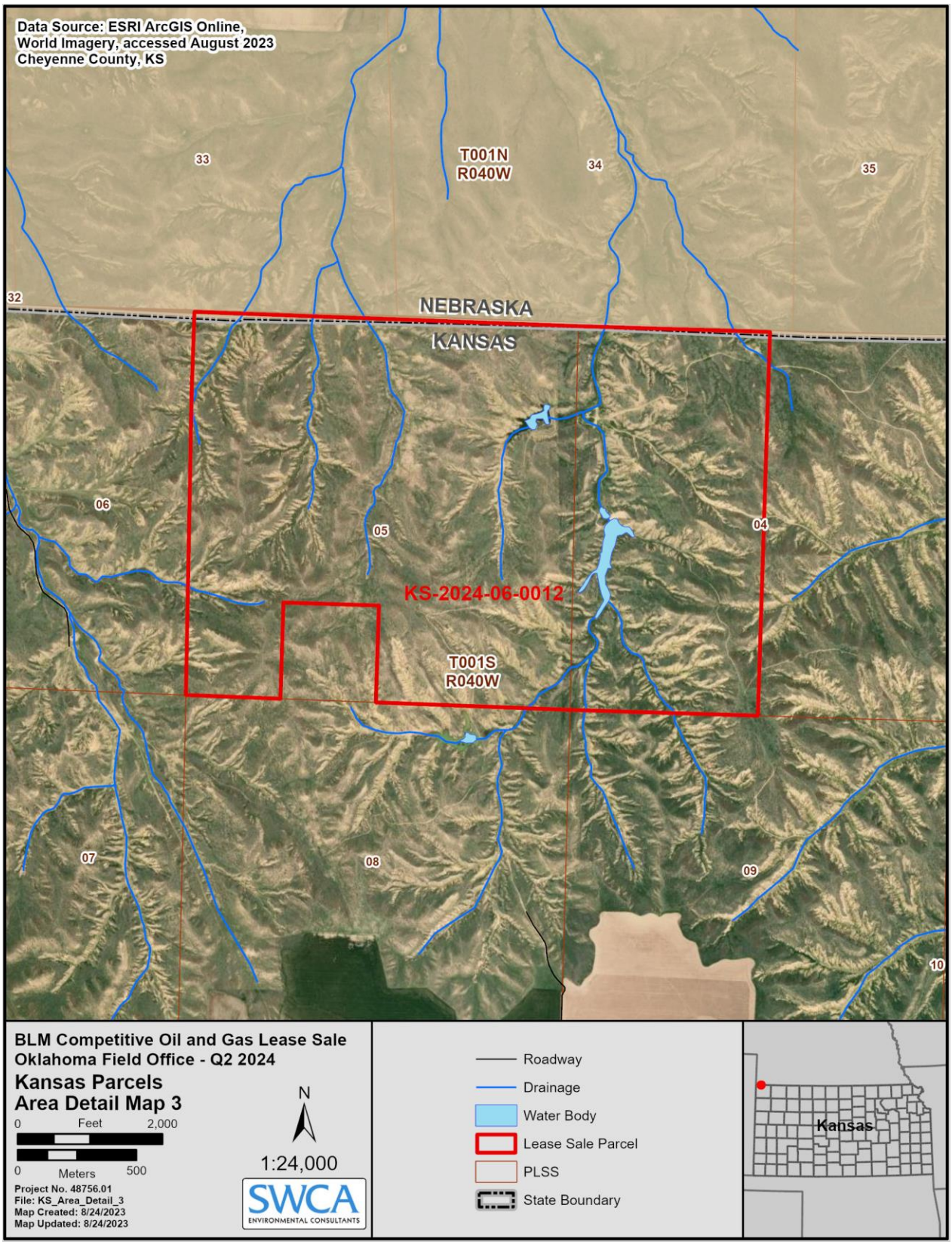

Figure A.4. Detailed map of nominated lease parcel 0012 in Cheyenne County, Kansas.

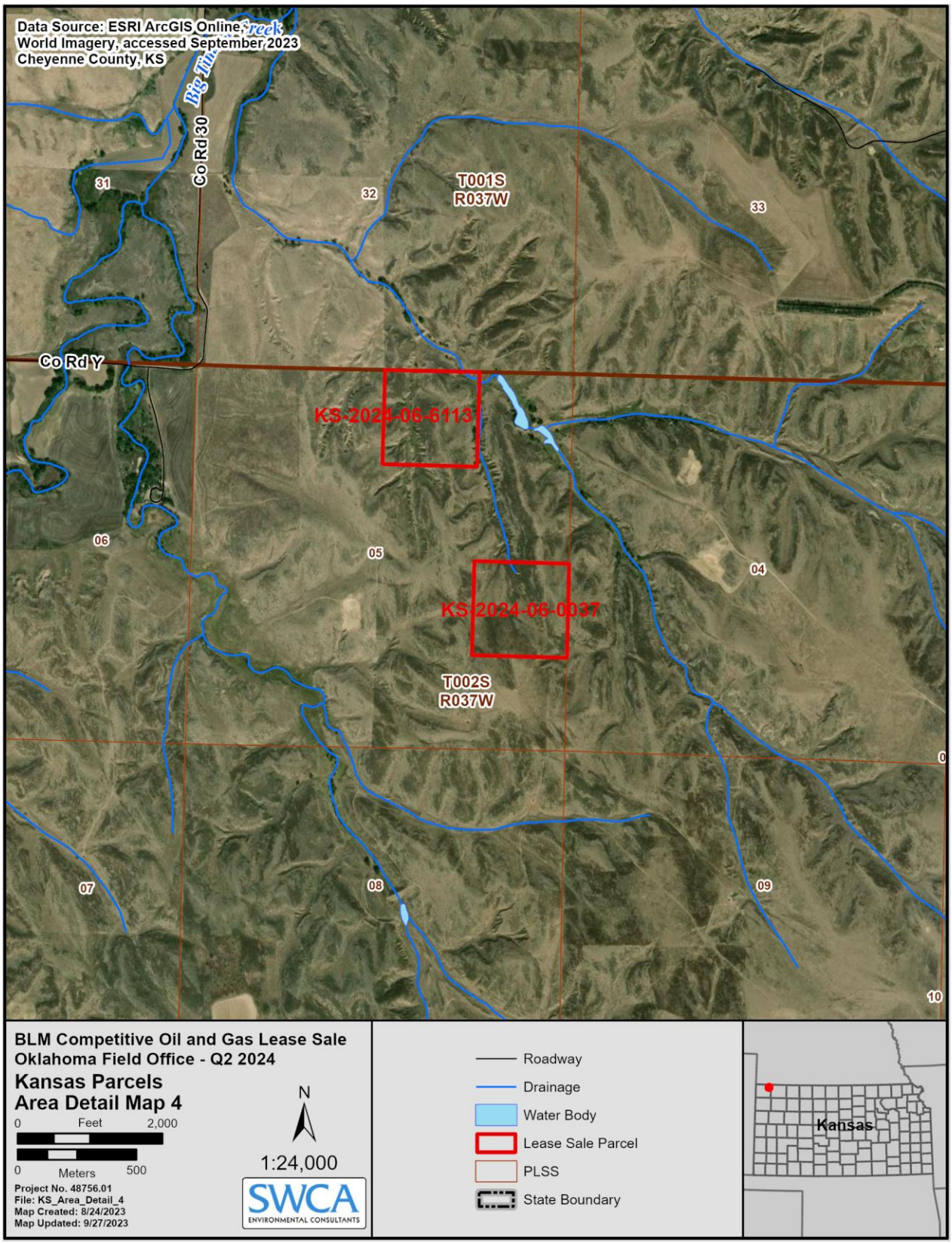

Figure A.5. Detailed map of nominated lease parcels 0037 and 6113 in Cheyenne County, Kansas.

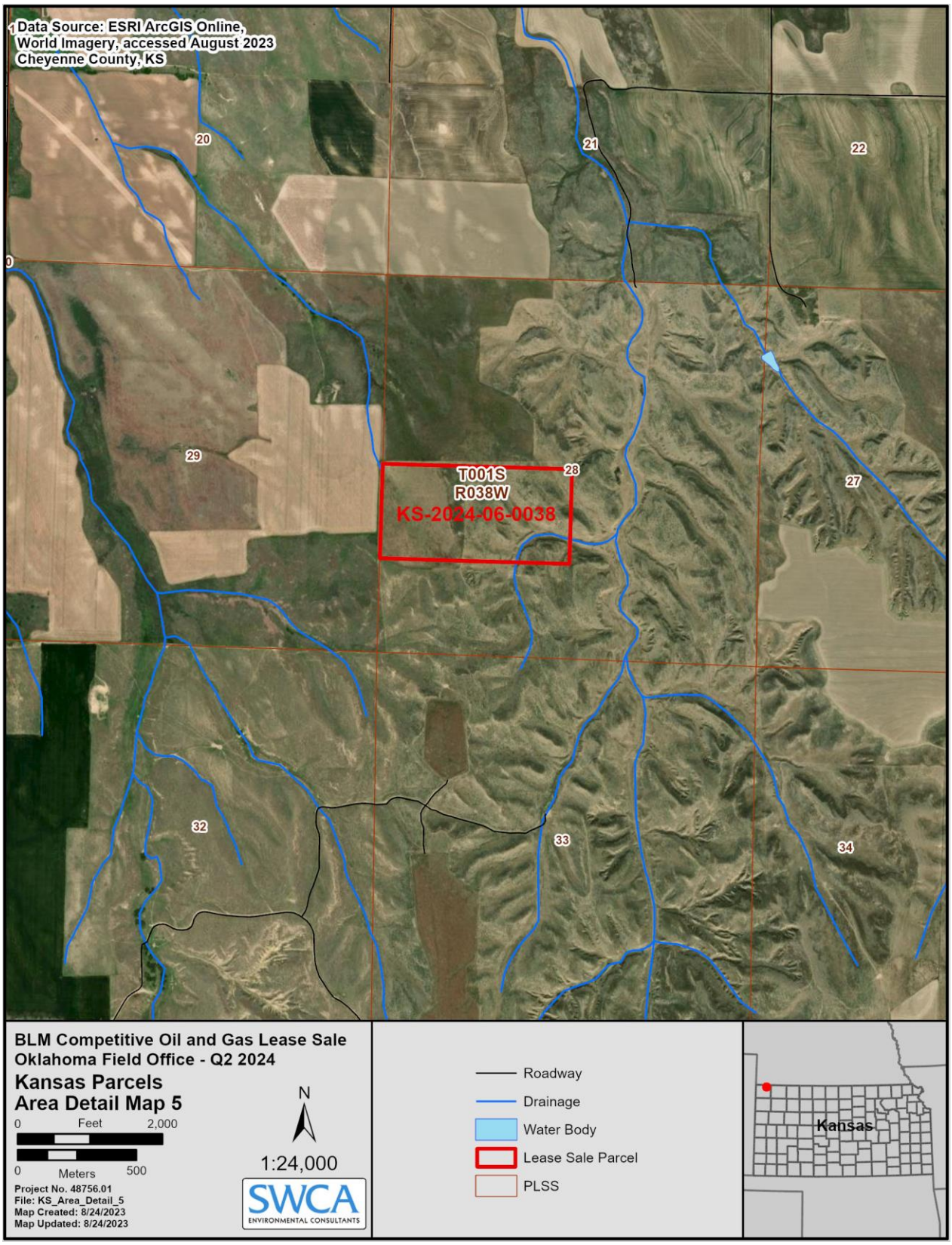

Figure A.6. Detailed map of nominated lease parcel 0038 in Cheyenne County, Kansas.

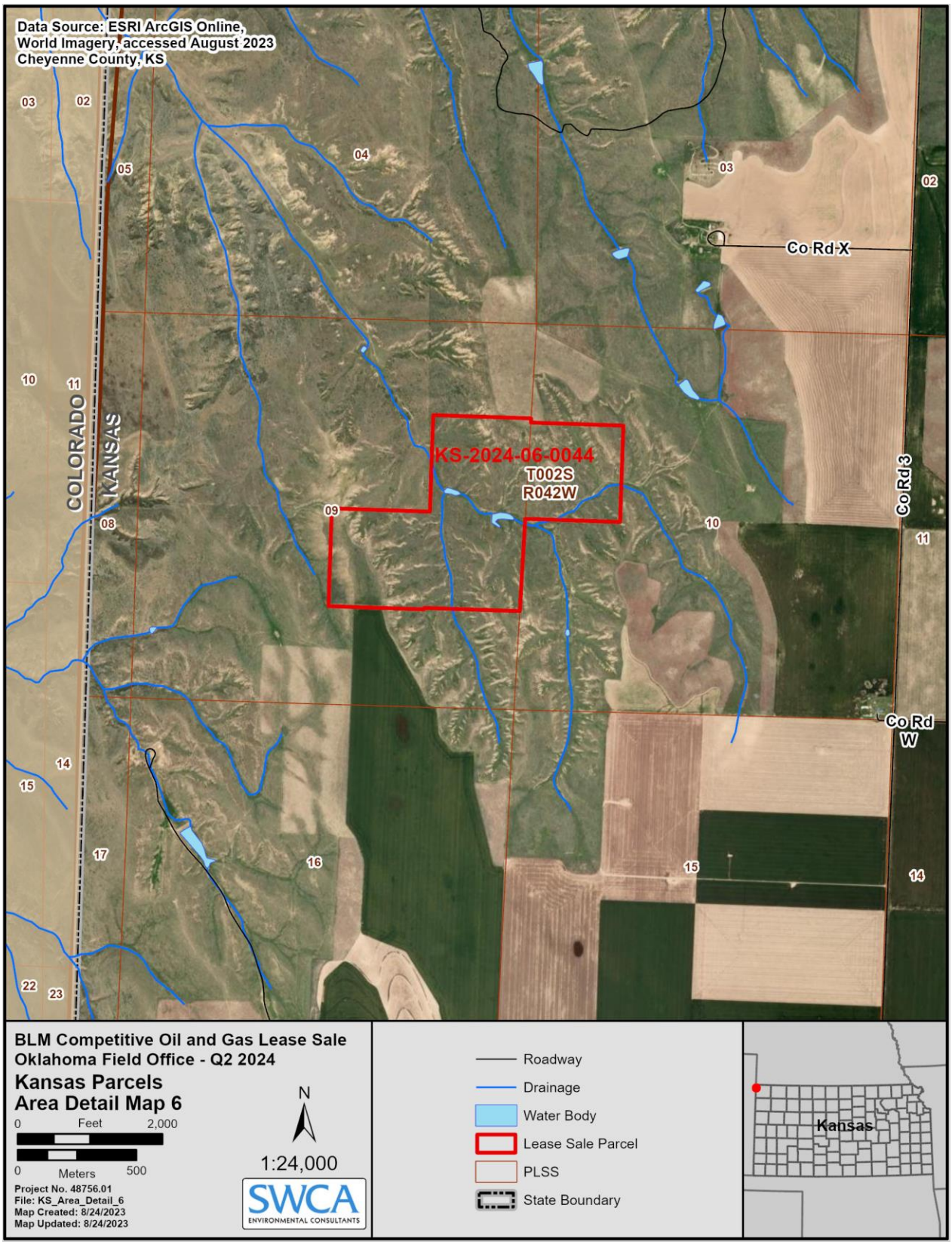

Figure A.7. Detailed map of nominated lease parcel 0044 in Cheyenne County, Kansas.

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APPENDIX B. OKLAHOMA FIELD OFFICE LEASE STIPULATION AND LEASE NOTICE SUMMARY

Table B.1. Lease Notices and Stipulations

Notice or Stipulation	Title and Description*
HQ-CR-1	**CULTURAL RESOURCES AND TRIBAL CONSULTATION**
	This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act of 1966 (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The Bureau of Land Management (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 Office [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	**LEASE NOTICE – MINERAL LEASING ACT SECTION 2(A)(2)(A)**
	Provisions of the Mineral Leasing Act of 1920 (MLA), 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 United States Code [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 Code of Federal Regulations (C.F.R.) § 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 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	**THREATENED AND ENDANGERED SPECIES CONSULTATION**
	The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. The 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.
NM-11-LN	**LEASE NOTICE (LN) – CULTURAL RESOURCES**
	All development activities proposed under the authority of this lease are subject to compliance with Section 106 of the NHPA and Executive Order 13007. The lease area may contain historic properties, traditional cultural properties, and/or sacred sites currently unknown to the BLM that were not identified in the Resource Management Plan or during the lease parcel review process. Depending on the nature of the lease developments being proposed and the cultural resources potentially affected, compliance with Section 106 of the NHPA and Executive Order 13007 could require intensive cultural resource inventories, Native American consultation, and mitigation measures to avoid adverse effects—the costs for which will be borne by the lessee. The BLM may require modifications to or disapprove proposed activities that are likely to adversely affect traditional cultural properties or sacred sites for which no mitigation measures are possible. This could result in extended time frames for processing authorizations for development activities, as well as changes in the ways in which developments are implemented.
NM-13-CSU	**CONTROLLED SURFACE USE (CSU) – PROTECTION OF PALEONTOLOGICAL RESOURCES**
	All development in this lease will be subject to compliance with the Paleontological Resources Preservation Act, the National Environmental Policy Act of 1969 (NEPA), and the Federal Land Policy and Management Act of 1976 (FLPMA). Surface occupancy or use is subject to special operating constraints.

Notice or Stipulation	Title and Description*
NM-14-LN	**LEASE NOTICE – PALEONTOLOGICAL RESOURCES**
	All development in this lease will be subject to compliance with the NEPA and FLPMA. The lessee shall immediately notify the BLM Authorized Officer (AO) of any paleontological resources discovered as a result of approved surface-disturbing operations. The lessee shall suspend all activities in the vicinity of such discovery until notified to proceed by the AO and shall protect the discovery from damage or looting. The AO will evaluate, or will have evaluated, such discoveries after being notified and determine after consulting with the operator and the BLM Regional Paleontologist, the appropriate measures to mitigate adverse effects on significant paleontological resources. Upon approval of the AO, the operator will be allowed to continue construction through the site or will be given the choice of either following the AO's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or following the AO's instructions for mitigating impacts on the fossil resource prior to continuing construction through the project area. The lessee is responsible for any cost associated for mitigating paleontology resources discovered as a result of their activities. In addition, surface occupancy or use may be subject to special operating constraints.
OFO-1-CSU	**CONTROLLED SURFACE USE – SENSITIVE SOILS**
	The lease or portions of the lease contain sensitive soils. Soils susceptible to erosion at excessive rates (per the Natural Resources Conservation Service's Highly Erodible Land definition and Skidmore Wind Erodibility Groups 1 or 2) and/or biological soil crusts (per Technical Reference 1730-2, *Biological Soil Crusts: Ecology and Management* [U.S. Department of the Interior 2001]), which are found to be sensitive to surface disturbance, shall be avoided. Parcels exhibiting sensitive soil characteristics shall undergo a site-specific survey by a BLM-approved specialist to identify necessary special design, construction, implementation, mitigation, and/or reclamation measures. Surface-disturbing activities may require relocation beyond standard lease terms and conditions (i.e., 200 m [656 feet]). The mandated relocation, beyond standard lease terms and conditions, shall be communicated to the lessee/operator through conditions of approval at the Application for Permit to Drill (APD) stage to avoid adverse impacts on sensitive soils on or near the lease parcel. If avoidance of sensitive soils is unattainable under standard lease terms and conditions, the operator/lessee shall be required to submit an operation plan to the BLM AO. The operation plan shall require, but is not limited to, special design, construction, and implementation measures describing how impacts on sensitive soils would be prevented or minimized, and how disturbed sites would be successfully reclaimed, in accordance with federal and state reclamation mandates.
OFO-1-TL	**TIMING LIMITATION (TL) – BALD AND GOLDEN EAGLE NESTS**
	The lease or portions of the lease contain known bald eagle and/or golden eagle nests. Parcels containing known bald or golden eagle nests, either occupied or unoccupied, shall undergo a site-specific survey by a BLM-approved specialist/biologist to identify any required buffers, special design, construction, implementation, and/or mitigations measures necessary to protect bald and golden eagle nests. Unless a lesser restrictive protective zone is authorized by the BLM specialist/biologist, with U.S. Fish and Wildlife Service (USFWS) concurrence, surface-disturbing activities shall not be allowed within 0.5 mile of an occupied bald or golden eagle nest during the ordinary nesting period (December 15–July 15). This stipulation does not apply to the operations and maintenance of production facilities.
OFO-4-LN	**LEASE NOTICE – MIGRATORY BIRDS AND BIRDS OF CONSERVATION CONCERN**
	The lease or portions of the lease fall within the Central Flyway for migratory birds. As defined in the requirements for the BLM site survey, which will be conducted at the APD stage, the BLM may require the project proponent to follow additional conditions of approval. These would be imposed to mitigate impacts on migratory birds under the Migratory Bird Treaty Act and USFWS Birds of Conservation Concern. If surface-disturbing activities occur during the migratory birds' nesting season (which varies by species and could be any time between December 15 and July 30), surveys for ground and tree–nesting birds may be required to be conducted by an entity approved by the BLM AO. If active nests are identified, surface-disturbing activities may be delayed until the nesting activities are complete. The project proponent must consult with the BLM to determine whether a survey is required, the extent of the survey, and the timing of the nesting season.
OFO-4-NSO	**NO SURFACE OCCUPANCY – RIPARIAN-WETLAND AREAS AND WATERBODIES**
	All or portions of the lands under this lease contain wetland-riparian areas and/or waterbodies. Riparian-wetland areas and/or waterbodies include, but are not limited to, perennial, ephemeral, or intermittent streams, and springs, seeps, lakes, ponds, reservoirs, and playas. No surface occupancy is allowed within these areas and within an area that begins and extends up to 126 m (415 feet) landward from the outside edge of the riparian-wetland area or waterbody, as determined by the BLM biologist prior to any surface-disturbing activities. **Modification:** A modification may be granted if it is determined that a portion of the area does not qualify as a riparian-wetland area or waterbody, or if scientific research indicates that a lesser or more restrictive buffer is appropriate for managing these riparian-wetland/waterbody areas.

Notice or Stipulation	Title and Description*
OFO-7-LN	**LEASE NOTICE – POTENTIAL CAVE OR KARST OCCURRENCE AREA**
	All or a portion of the lease is in a potential cave or karst occurrence area. Within this area, caves or karst features, such as sinkholes, passages, and large rooms, may be encountered within surface areas ranging from a few acres to hundreds of acres. Due to the sensitive nature of the cave or karst systems of this area, special protective measures (i.e., operational constraints) may be developed during environmental analyses and be required as part of the approvals for drilling or other operations for this lease. These measures could include, but are not limited to, the following: changes in drilling operations; special casing and cementing programs; modifications in surface activities; or other reasonable measures to mitigate impacts on cave or karst values. These measures may be imposed in accordance with 43 C.F.R. § 3101.1-2; 43 C.F.R. § 3162.5-1; Onshore Oil and Gas Order No. 1; and Section 6 of the lease terms. In addition, third-party clearances surveys may be required, and as various geophysical techniques are proven useful for detection, they may be required on a case-by-case basis.
OFO-8-LN	**LEASE NOTICE – CULTURAL RESOURCES AND TRIBAL CONSULTATION**
	This lease may be found to contain historical properties or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM would not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations, for example, to consult with the SHPO and tribes, under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties or may disapprove any activity that is likely to result in adverse effects that could not be successfully avoided, minimized, or mitigated.

*Stipulation descriptions are summarized for brevity. The full text of all stipulations, including all modifications, waiver, and exceptions, can be found in the Oklahoma, Kansas, and Texas BLM ROD and Approved RMP (BLM 2020).

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APPENDIX C. LEASING PREFERENCE RATINGS FOR NOMINATED LEASE PARCELS

In accordance with IM 2023-007, *Evaluating Competitive Oil and Gas Lease Sale Parcels for Future Lease Sales* (BLM 2022b), the BLM has evaluated the nominated lease parcels against five criteria to determine each parcel's leasing preference (Table C.1). The parcels nominated are rated as low preference based on one or more criteria. The IM states that if no high-preference parcels are available for the sale, the office will select one or more low-preference parcels that present the least number of conflicts based on the criteria listed. Given the low resource concerns with these parcels and protections offered through stipulations and COAs, the BLM is moving them forward for leasing, furthering the intent of Section 50265 of the IRA, which states that the BLM may not issue a right-of-way for wind or solar energy development on federal land unless it has: 1) held an onshore oil and gas lease sale during the past 120 days, and 2) offered the lesser of a "sum total" of either 2,000,000 acres or 50% of the acreage for which EOIs have been submitted for lease sales during the previous 1-year period.

Table C.1. Leasing Preference Ratings for Nominated Lease Parcels

Leasing Preference Rating based on the Following Criteria								
Parcel Information		**Preference Criteria**					**Preference for Leasing[#]**	
Office	**Parcel**	**1 Proximity to Existing Development***	**2 Habitat[†]**	**3 Cultural Resources[‡]**	**4 Recreation/ Other Resources[§]**	**5 High Potential[¶]**	**High**	**Low**
OFO	0008	Low	High	High	Low	Low		X
OFO	0009	Low	High	High	Low	Low		X
OFO	0012	Low	High	High	Low	Low		X
OFO	0035	Low	High	High	Low	Low		X
OFO	0037	High	High	High	Low	High		X
OFO	0038	Low	High	High	Low	Low		X
OFO	0044	Low	High	High	Low	Low		X
OFO	6113	High	High	High	Low	High		X

*Determinations in this column are made by reviewing aerial imagery for signs of existing oil and gas development within 5 miles of the parcel boundaries.

†Low determinations in this column would indicate the presence of important fish and wildlife habitats or connectivity areas. Protections for ESA suitable habitat would be provided through stipulations and COAs attached to the parcels (see Table 2.1). See Appendix B for full descriptions of stipulations. Due to the protections offered through stipulations and COAs, potential conflicts with important habitats or connectivity areas are not anticipated in any of the lease parcels.

‡Low determinations in this column would indicate the presence of known cultural resources within the parcel, such as historic properties, sacred sites, and other high value cultural resources. No cultural resources were identified within the nominated lease parcels, and all parcels would be subject to HQ-CR-1, NM-11-LN, and OFO-8-LN for any on-parcel development (see Appendix B).

§Low determinations in this column indicate the presence of recreation or other important uses or resources which are incompatible with oil and gas development. These nominated lease sale parcels received low ratings due to the potential occurrence for cave or karst features or because of known surface water occurrences. Lease notice OFO-7-LN has been applied to all nominated lease parcels for potential cave or karst occurrence areas, which would allow BLM to develop special protective measures (i.e., operational constraints) at the APD stage (see Appendix B). Stipulation OFO-4-NSO would be applied to all the nominated lease parcels and would prohibit surface disturbance within riparian-wetland areas and waterbodies (see Appendix B). Due to the protections offered through stipulations and COAs, the BLM proposes moving these parcels forward for leasing.

¶Determinations in this column are made using the RFD scenario and considers site-specific changes that may have occurred since the RMP was signed.

#In accordance with the BLM's *Guidelines for Evaluating Lease Parcels in Expressions of Interest and Recording Preferential Status in NFLSS* (Attachment 1 to IM 2023-007 [BLM 2022b]), if a parcel receives a low preference value for any single criterion, it will receive an overall low preference value regardless of the other criteria. If none of the criterion result in a low preference value, then the parcel would receive a high preference value for leasing. Other considerations that would warrant a different preference value can also be used but should be justified in the evaluation sheet.

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APPENDIX D. SUMMARY OF THE TYPICAL PHASES OF OIL AND GAS DEVELOPMENT

INTRODUCTION

The phases of oil and gas development include construction, drilling operations, completion operations, hydraulic fracturing, and production. During the construction activity phase, the area is cleared of vegetation and the pad is constructed. Throughout the drilling operation phase, equipment is moved on site and used to install the drill rig and other associated infrastructure. At this stage, the well is drilled. Well completion follows well drilling. Well completion includes setting the casing to depth, cementing the casing,[2] and perforating the casing in target zones. If a well is going to be drilled directionally,[3] horizontally,[4] or vertically[5] this phase may be followed by hydraulic fracturing which involves pumping fracturing fluid into a formation at a calculated, predetermined rate and pressure to generate fractures or cracks in the target formation. The production phase begins when the well starts producing. The well abandonment and reclamation phases occur after the productive life of the well has concluded. Well abandonment and reclamation involve plugging wells and reclaiming the surface according to BLM guidelines and requirements.

CONSTRUCTION ACTIVITIES

First, new construction areas need to be cleared of all vegetation. Clearing of the proposed well pad and access road are typically limited to the smallest area possible to provide safe and efficient work areas for all phases of construction. All clearing activities are accomplished by cutting, mowing, and/or grading vegetation as necessary. Cut vegetation may be mulched and spread on-site or hauled to a commercial waste disposal facility.

Next, heavy equipment, including but not limited to, bulldozers, graders, front-end loaders, and/or track hoes are used to construct the pad, along with other features, as needed for development. Other features may include, but are not limited to, an access road, reserve pit, pipeline, and/or fracturing pond. Cut and fills may be required to level the pad or road surfaces. Reserve pits, if authorized, are lined using an impermeable liner or other lining mechanism (i.e., bentonite or clay) to prevent fluids from leaching into the soil. Access roads may have cattle guards, gates, drainage control, or pull-outs installed, among a host of other features that may be necessary based on the site-specific situation. Long-term surface

[2] According to BLM regulations from 43 C.F.R. § 3172, casing and cementing programs are conducted to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. The casing setting depth is calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. Determination of casing setting depth is based on all relevant factors, including presence/absence of hydrocarbons; fracture gradients; usable water zones; formation pressures; lost circulation zones; other minerals; or other unusual characteristics. Any isolating medium other than cement shall receive approval prior to use. The deepest casing may not be cemented and may remain open hole depending on the type of formation it is located in.

[3] Vertical drilling is the process of drilling a well from the surface vertically to a subsurface location where the target oil or gas reservoir is located (U.S. Department of Energy 2015).

[4] Horizontal drilling is the process of drilling a well from the surface to a subsurface location just above the target oil or gas reservoir called the "kickoff point," then deviating the well bore from the vertical plane around a curve to intersect the reservoir at the "entry point" with a near-horizontal inclination, and remaining within the reservoir until the desired bottom hole location is reached (North Dakota Department of Mineral Resources 2008).

[5] Directional drilling is the process of controlling the direction and deviation of drilling a well from the surface to a subsurface location without disturbing the land directly above the target oil or gas reservoir (U.S. Department of Energy 2015).

disturbances such as pads and roads are typically surfaced with a layer of crushed rock. Areas not needed for long-term development are reclaimed by recontouring the surface and reestablishing vegetation.

A pipeline, if needed, is laid within a right-of-way that is first cleared of vegetation. A backhoe, or similar piece of equipment, digs a trench to a depth at least 36 inches below ground surface. After the trench is dug, the pipeline is assembled by welding pieces of pipe together to fit the contour of the pipeline's path. Once inspected, the pipe can be lowered into the trench and covered with stockpiled subsoil originally removed from the trench. Each pipeline undergoes hydrostatic testing prior to natural gas being pumped through the pipeline. This ensures the pipeline is strong enough and absent any leaks. Table D.1 includes some of the common wastes (hazardous and nonhazardous) that are produced during construction.

DRILLING OPERATIONS

When construction of the well pad is complete, the drilling rig and associated equipment are moved on-site and erected. Usually, a conventional rotary drill rig is used. The drill rig must be capable of withstanding all the anticipated conditions that may be encountered while drilling. Wells may be drilled directionally, horizontally, or vertically based on the target formation. The depth of the well is entirely dependent on the target formation depth and may be several hundred feet deep to over 20,000 feet deep.

When a conventional reserve pit[6] system is used, drilling fluid or mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the bore of the well, and finally to the surface. When drilling mud emerges from the hole, it enters the reserve pit where it remains until all fluids are evaporated and the solids can be buried.

A closed-loop system operates in a similar fashion except that when the drilling mud emerges from the hole, it passes through equipment used to screen and remove drill cuttings (rock chips) and sand-sized solids rather than going into a pit. When the solids have been removed, the drilling mud is placed into holding tanks, and from the tank, used again.

In either situation the drilling mud is maintained at a specific weight and viscosity to cool the bit, seal off any porous zones (thereby protecting aquifers and preventing damage to producing zone productivity), control subsurface pressure, lubricate the drill string, clean the bottom of the hole, and bring the drill cuttings to the surface. Water-based or oil-based muds can be used. This choice is dependent on the site-specific conditions.

Once a well has been drilled, completion operations begin. Well completion involves setting casing to depth and perforating the casing in target zones.

Wells are often treated during completion to improve the recovery of hydrocarbons by increasing the rate and volume of hydrocarbons moving from the natural oil and gas reservoir into the wellbore. These processes are known as well-stimulation treatments, which create new fluid passageways in the producing formation or remove blockages within existing passageways. They include fracturing, acidizing, and other mechanical and chemical treatments often used in combination. The results from different treatments are additive and complement each other.

[6] A conventional reserve pit is a lined earthen pit excavated adjacent to a well pad and is commonly used for the disposal of drilling muds and fluids in gas or oil fields (USFWS 2009).

HYDRAULIC FRACTURING

Hydraulic fracturing (HF) is a formation stimulation practice used to create additional permeability in a producing formation, thus allowing oil and/or gas to flow more readily toward and into the wellbore. Hydraulic fracturing can be used to overcome natural barriers, such as naturally low permeability or reduced permeability resulting from near wellbore damage, to the flow of fluids (gas or water) to the wellbore (Groundwater Protection Council 2017). The process has been a method for additional oil and gas recovery since the 1900s; however, with the advancement of technology in both hydraulic fracturing and horizontal drilling, it is more commonly used than previous hydraulic fracturing and horizontal drilling technologies.

Hydraulic fracturing uses high-pressure pumps to pump fracturing fluid into a formation at a calculated, predetermined rate and pressure to generate fractures or cracks in the target formation. For shale developments (within Mancos shale geologic formations, for example), fracture fluids are primarily water-based fluids mixed with additives that help the water to carry "proppants" into the fractures. Proppants, which may be made up of sand, walnut hulls, or other small particles, are needed to "prop" open the fractures once the pumping of fluids has stopped. Once the fracture has initiated, additional fluids are pumped into the wellbore to continue the development of the fracture and to carry the proppant deeper into the formation. The additional fluids are needed to maintain the downhole pressure necessary to accommodate the increasing length of opened fracture in the formation.

Hydraulic fracturing increases the flow rate and volume of reservoir fluids that move from the producing formation into the wellbore. The fracturing fluid is typically more than 99% water and sand, with small amounts of readily available chemical additives used to control the chemical and mechanical properties of the water and sand mixture. Because the fluid is composed mostly of water, large volumes of water are usually needed to perform hydraulic fracturing. However, in some cases, water is recycled or produced water is used.

The predominant fluids currently being used for fracture treatments in the shale gas plays are water-based fracturing fluids mixed with friction-reducing additives, also known as slick water (Groundwater Protection Council 2017). The number of chemical additives used in a typical fracture treatment varies depending on the conditions of the specific well that is to be fractured. A typical fracture treatment uses very low concentrations of between three and 12 additive chemicals, depending on the characteristics of the water and the shale formation being fractured. Each component serves a specific, engineered purpose, from limiting the growth of bacteria to preventing corrosion of the well casing. The make-up of fracturing fluid varies from one geologic basin or formation to another. Because the make-up of each fracturing fluid varies to meet the specific needs of each area, there is no one-size-fits-all formula for the volumes for each additive. In classifying fracture fluids and their additives, it is important to realize that service companies that provide these additives have developed a number of compounds with similar functional properties to be used for the same purpose in different well environments. The difference between additive formulations may be as small as a change in concentration of a specific compound (Groundwater Protection Council 2017).

Before operators or service companies perform a hydraulic fracturing treatment, a series of tests are performed. These tests are designed to ensure that the well, including casing and cement, well equipment, and fracturing equipment are in proper working order and would safely withstand the application of the fracture treatment pressures and pump flow rates.

Hydraulic fracturing of horizontal shale gas wells is most commonly performed in stages. Lateral lengths in horizontal wells for development may range from 1,000 feet to more than 5,000 feet. Depending on the lengths of the laterals, treatment of wells may be performed by isolating smaller portions of the lateral.

The fracturing of each portion of the lateral wellbore is called a stage. Stages are fractured sequentially beginning with the section at the farthest end of the wellbore, moving up hole as each stage of the treatment is completed until the entire lateral well has been stimulated. During drilling, the BLM is on location during the casing and cementing of the surface casing, which is often the string of casing that protects groundwater, along with other critical casing and cementing intervals. Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface. The cemented well is pressure tested to ensure there are no leaks, and in some cases a cement bond log is run to ensure the cement has bonded to the casing and the formation. If the fracturing of the well is considered to be a "non-routine" fracturing job for the area, the BLM would always be on-site during those operations as well as when abnormal conditions develop during the drilling or completion of a well.

Some soils and geologic formations contain low levels of radioactive material. This naturally occurring radioactive material (NORM) emits low levels of radiation, to which everyone is exposed on a daily basis. When NORM is associated with oil and natural gas production, it begins as small amounts of uranium and thorium within the rock. These elements, along with some of their decay elements, notably Radium-226 and Radium-228, can be brought to the surface in drill cuttings and produced water. Radon-222, a gaseous decay element of radium, can come to the surface along with the shale gas. When NORM is brought to the surface, it remains in the rock pieces of the drill cuttings, remains in solution with produced water, or, under certain conditions, precipitates out in scales or sludges. The radiation is weak and cannot penetrate dense materials such as the steel used in pipes and tanks.

The possession, use, transfer, transport, and/or storage of NORM or the recycling of certain NORM-contaminated materials is regulated by the Texas Department of Health. Disposal of oil and gas NORM waste and operations incidental to disposal are regulated by the Railroad Commission. Disposal of all other NORM is regulated by the Texas Natural Resource Conservation Commission (Railroad Commission of Texas 2021). In Oklahoma and Kansas, there are no state regulations regarding the handling and disposal of NORM wastes produced during the exploration and production of oil and gas (Kansas Department of Health and Environment 2017). However, testing is required prior to disposal of pipes, tanks, and pipe deposits per BLM's APD requirements.

PRODUCTION OPERATIONS

Production equipment used during the life of the well may include a three-phase separator-dehydrator, flowlines, a meter run, tanks for condensate, produced oil and water, and heater treater. A pumpjack may be required if the back pressure of the well is too high. Production facilities are arranged to facilitate safety and maximize reclamation opportunities. All permanent aboveground structures not subject to safety considerations are painted a standard BLM environmental color or as landowner specified.

Workovers may be performed multiple times over the life of the well. Because oil and gas production usually declines over the years, operators perform workover operations, which involve cleaning, repairing, and maintaining the well for the purposes of increasing or restoring production.

ABANDONMENT AND RECLAMATION

Well abandonment (whether dry hole or depleted producer) and reclamation of location, access road, and other facilities requires BLM approval. After approval, wellbores are plugged with cement as necessary to prevent fluid or pressure mitigation and to protect and isolate mineral and water resources. Wellheads are removed, and both the surface casing and the production casing are cut off below ground in compliance with federal and state regulations. The well pad, reserve pit, and access are reclaimed according to

BLM guidelines. This may include backfilling the pit, recontouring the surface to blend with natural surroundings and redistributing topsoil. All surfaces are then reseeded per BLM and state requirements specified in the Application for Permit to Drill (APD) approval.

COMMON WASTES

Table D.1 includes some of the common wastes (hazardous and nonhazardous) that are produced during oil and gas development.

Table D.1. Common Wastes Produced during Oil and Gas Development

Phase	Waste	
	Domestic wastes (i.e., food scraps, paper, etc.)	
	Excess construction materials	Woody debris
	Used lubricating oils	Paints
	Solvents	Sewage
Construction, Well Drilling and Completion (including hydraulic fracturing)	Drilling muds, including additives (i.e., chromate and barite) and cuttings Well drilling, completion, workover, and stimulation fluids (i.e., oil derivatives such as polycyclic aromatic hydrocarbons, spilled chemicals, suspended and dissolved solids, phenols, cadmium, chromium, copper, lead, mercury, nickel)	
	Equipment, power unit and transport maintenance wastes (i.e., batteries; used filters, lubricants, oil, tires, hoses, hydraulic fluids; paints; solvents)	
	Fuel and chemical storage drums and containers	
	Cementing wastes	Rig wash
	Production testing wastes	Excess drilling chemicals
	Excess construction materials	Processed water
	Scrap metal	Contaminated soil including hazardous and non-hazardous materials (potential)
	Sewage	Domestic wastes
	Power unit and transport maintenance wastes (i.e., batteries; used filters, lubricants, filters, tires, hoses, coolants, antifreeze; paints; solvents, used parts)	
Production	Discharged produced water	
	Production chemicals	
	Workover wastes (e.g., brines)	
	Construction materials	
Abandonment/Reclamation	Decommissioned equipment	
	Contaminated soil (potential)	
	Equipment or wastes that could contain hazardous and nonhazardous materials	

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APPENDIX E. ENVIRONMENTAL JUSTICE MAPS AND DATA

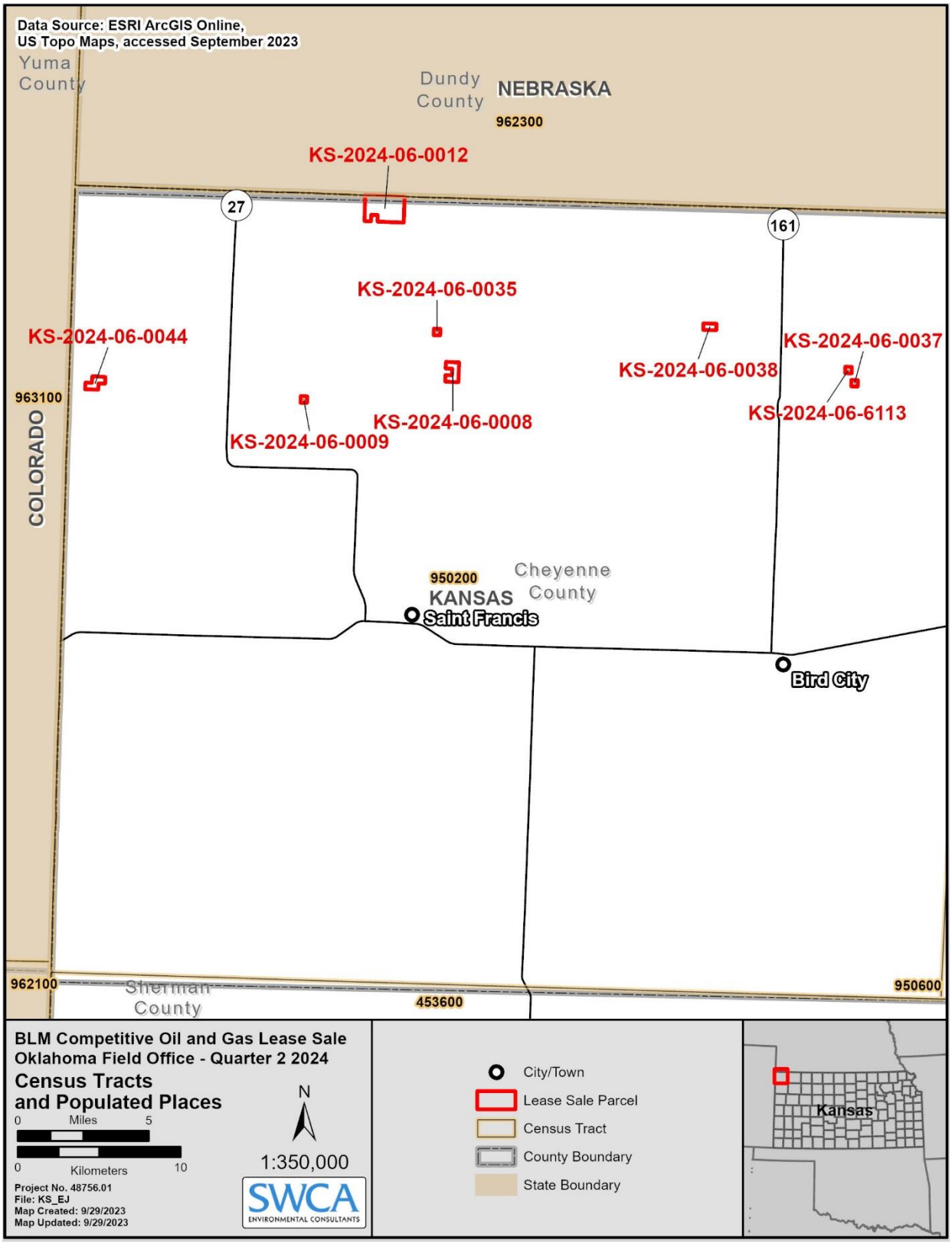

Figure E.1. Environmental justice analysis area and census tracts in Cheyenne County, Kansas.

Table E.1. Low-Income and Minority Communities of Concern Applicable to the Area of Analysis

Analysis Unit	Total Population	Minority Populations*									Low-Income Populations†	
		Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino (of any race)	White Alone‡	Total Minority Population§	Individuals	Families
United States¶	326,725,481	12.6%	0.8%	5.7%	0.2%	5.6%	7.0%	18.4%	59.4%	40.6%	29.2%	23.0%
Kansas (110% meaningfully greater threshold)#	2,932,099	5.6% (6.2%)	0.7% (0.8%)	3.0% (3.3%)	0.1% (0.11%)	3.0% (3.3%)	6.1% (6.7%)	12.3% (13.5%)	74.8%	25.2% (27.7%)	28.0%	21.2%
Cheyenne County, Kansas	2,647	0.0%	0.8%	0.0%	0.3%	3.6%	3.3%	7.3%	90.0%	10.0%	36.9%	28.2%
Census tract 9502, Cheyenne County	2,647	0.0%	0.8%	0.0%	0.3%	3.6%	3.3%	7.3%	90.0%	10.0%	36.9%	28.2%
Bird City, Kansas	501	0.0%	4.2%	0.0%	0.0%	4.0%	8.0%	13.8%	81.0%	19.0%	37.9%	24.1%
St. Francis, Kansas	1,331	0.0%	0.0%	0.0%	0.0%	5.7%	2.0%	8.6%	89.9%	10.1%	44.0%	36.2%

Note: Gray shaded cells indicate where EJ populations are present (i.e., the percentage of population meets or exceeds the criterion for identifying EJ populations).

* Source: ACS 2021 5-year estimates Table DP05 (U.S. Census Bureau 2022a).

† Defined as individuals or families with income below 200 percent of federal poverty level. Source: ACS 2021 5-year estimates Tables S1701 (Individuals) (U.S. Census Bureau 2022b) and S1702 (Families) (U.S. Census Bureau 2022c).

‡ White-alone (non-Hispanic) population does not constitute a minority EJ population and is provided for reference only.

§ Defined as the total population minus the white alone (non-Hispanic) population.

¶ National data are provided for context only and do not represent a reference area used in identifying EJ populations.

The state of Kansas is used as the reference area for determining whether minority or low-income EJ populations exist within the county, census tract, or census-mapped place.