Form 3160-3
(June 2015)

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
NOG13121857

6. If Indian, Allotee or Tribe Name
NAVAJO NATION

1a. Type of work: ☑ DRILL ☐ REENTER

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other

1c. Type of Completion: ☐ Hydraulic Fracturing ☐ Single Zone ☑ Multiple Zone

7. If Unit or CA Agreement, Name and No.
Greater Lybrook / NMNM 144419X

8. Lease Name and Well No.
GREATER LYBROOK UNIT
056H

2. Name of Operator
ENDURING RESOURCES LLC

9. API Well No.

3a. Address	3b. Phone No. *(include area code)*	10. Field and Pool, or Exploratory
200 ENERGY COURT, FARMINGTON, NM 87401	(505) 497-8574	LYBROOK MANCOS W

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface NWSE / 1365 FSL / 2007 FEL / LAT 36.208916 / LONG -107.756068

At proposed prod. zone SESE / 1029 FSL / 236 FEL / LAT 36.193465 / LONG -107.732314

11. Sec., T. R. M. or Blk. and Survey or Area
SEC 23/T23N/R9W/NMP

14. Distance in miles and direction from nearest town or post office*	12. County or Parish	13. State
43 miles	SAN JUAN	NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No of acres in lease	17. Spacing Unit dedicated to this well
440 feet		440.0

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	19. Proposed Depth	20. BLM/BIA Bond No. in file
1120 feet	4352 feet / 14941 feet	IND:

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
6802 feet	04/01/2022	30 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification.
6. Such other site specific information and/or plans as may be requested by the BLM.

25. Signature	Name *(Printed/Typed)*	Date
(Electronic Submission)	KHEM SUTHIWAN / Ph: (505) 386-8205	01/13/2022

Title
Regulatory Manager

Approved by *(Signature)*	Name *(Printed/Typed)*	Date
(Electronic Submission)	DAVE J MANKIEWICZ / Ph: (505) 564-7761	06/27/2023

Title	Office
AFM-Minerals	Farmington Field Office

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

APPROVED WITH CONDITIONS

(Continued on page 2)

*(Instructions on page 2)

Approval Date: 06/27/2023

INSTRUCTIONS

GENERAL: This form is designed for submitting proposals to perform certain well operations, as indicated on Federal and Indian lands and leases for action by appropriate Federal agencies, pursuant to applicable Federal laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from local Federal offices.

ITEM I: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

ITEM 4: Locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local Federal offices for specific instructions.

ITEM 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on the reverse side, showing the roads to, and the surveyed location of, the wen, and any other required information, should be furnished when required by Federal agency offices.

ITEMS 15 AND 18: If well is to be, or has been directionany drilled, give distances for subsurface location of hole in any present or objective productive zone.

ITEM 22: Consult applicable Federal regulations, or appropriate officials, concerning approval of the proposal before operations are started.

ITEM 24: If the proposal will involve hydraulic fracturing operations, you must comply with 43 CFR 3162.3-3, including providing information about the protection of usable water. Operators should provide the best available information about all formations containing water and their depths. This information could include data and interpretation of resistivity logs run on nearby wells. Information may also be obtained from state or tribal regulatory agencies and from local BLM offices.

NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.

AUTHORITY: 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160

PRINCIPAL PURPOSES: The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service wen or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts.

ROUTINE USE: Information from the record and/or the record win be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.

EFFECT OF NOT PROVIDING INFORMATION: Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:
The BLM conects this information to anow evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0137), Bureau Information Conection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

(Continued on page 3)

Approval Date: 06/27/2023

Additional Operator Remarks

Location of Well

0. SHL: NWSE / 1365 FSL / 2007 FEL / TWSP: 23N / RANGE: 9W / SECTION: 23 / LAT: 36.208916 / LONG: -107.756068 (TVD: 0 feet, MD: 0 feet)

PPP: NWNW / 0 FSL / 840 FWL / TWSP: 23N / RANGE: 9W / SECTION: 25 / LAT: 36.205157 / LONG: -107.746476 (TVD: 4760 feet, MD: 8800 feet)

PPP: SWSW / 837 FSL / 0 FWL / TWSP: 23N / RANGE: 9W / SECTION: 24 / LAT: 36.207477 / LONG: -107.749287 (TVD: 4767 feet, MD: 7600 feet)

PPP: NWSE / 2359 FSL / 1511 FEL / TWSP: 23N / RANGE: 9W / SECTION: 23 / LAT: 36.21165 / LONG: -107.754343 (TVD: 4703 feet, MD: 5147 feet)

BHL: SESE / 1029 FSL / 236 FEL / TWSP: 23N / RANGE: 9W / SECTION: 25 / LAT: 36.193465 / LONG: -107.732314 (TVD: 4352 feet, MD: 14941 feet)

Review and Appeal Rights

A person contesting a decision shall request a State Director review. This request must be filed within 20 working days of receipt of the Notice with the appropriate State Director (see 43 CFR 3165.3). The State Director review decision may be appealed to the Interior Board of Land Appeals, 801 North Quincy Street, Suite 300, Arlington, VA 22203 (see 43 CFR 3165.4). Contact the above listed Bureau of Land Management office for further information.

The holder or its contractors will notify the BLM of any fires and comply with all rules and regulations administered by the BLM concerning the use, prevention and suppression of fires on federal lands, including any fire prevention orders that may be in effect at the time of the permitted activity. The holder or its contractors may be held liable for the cost of fire suppression, stabilization and rehabilitation. In the event of a fire, personal safety will be the first priority of the holder or its contractors.

The holder or its contractors shall:

1. Operate all internal and external combustion engines (including off-highway vehicles, chainsaws, generators, heavy equipment, etc.) with a qualified spark arrester. Qualified spark arresters are maintained and not modified, and meet the Society of Automotive Engineers (SAE) Recommended Practices J335 or J350. Refer to 43 CFR §8343.1.
    a. *Refueling of any combustible engine equipment must be minimum of 3 meters away from any ignition source (open flame, smoking, etc.).*
2. Maintain and clean all equipment regularly to remove flammable debris buildup and prevent fluid leaks that can lead to ignitions.
3. Carry at least one shovel or wildland fire hand tool (combi, Pulaski, McLeod) per person working, minimum 5 gallons of water, and a fire extinguisher rated at a minimum as ABC - 10 pound on each piece of equipment and each vehicle.
4. When conducting "hotwork" such as, but not limited to welding, grinding, cutting, spark-producing work with metal, work that creates hot material or slag; choose an area large enough to contain all hot material that is naturally free of all flammable vegetation or remove the flammable vegetation in a manner compliant with the permitted activity. If adequate clearance cannot be made, wet an area large enough to contain all hot material prior to the activity and periodically throughout the activity to reduce the risk of wildfire ignition. Regardless of clearance, maintain readiness to respond to an ignition at all times. In addition, keep one hand tool per person and at least one fire extinguisher ready, minimum, as specified earlier (#3) during this activity.
5. Keep apprised of current and forecasted weather at https://www.weather.gov/abq/forecasts-fireweather-links and fire conditions at www.wfas.net and take additional fire precautions when fire danger is rated High or greater. Red Flag Warnings are issued by the National Weather Service when fire conditions are most dangerous, and ignitions escape control quickly. Extra precautions are required during these warnings such as additional water, designate a fire watch/patrol and tools. If work is being conducted in an area that is not clear of vegetation within 50 feet of work area; then, when fire danger is rated High or greater and 1. There is a predicted Red Flag warning for your area or 2. If winds are predicted to be greater than 10 mph, stop all hotwork activities for the day at 10 am.
6. In the event of an ignition, initiate fire suppression actions in the work area to prevent fire spread to or on federally administered lands. If a fire spreads beyond the capability of workers with the stipulated tools, all will cease fire suppression action and leave the area immediately via pre-identified escape routes.
7. Call **911** or the **Taos Interagency Fire Dispatch Center (575-758-6208)** immediately of the location and status of any fire.

    AND

    Notify the respective BLM field office for which the permit or contract was issued immediately of the incident.
    Farmington Field Office at 505-564-7600
    Taos Field Office at 575-758-8851

CONDITIONS OF APPROVAL

Operator:	**Enduring Resources, LLC**
Well Name:	**Greater Lybrook Unit (GLU) 053 Nos. 053H, 054H, 055H, 056H, 057H and One Future Well Oil and Natural Gas Project (GLU 053) Wells Project**
EA Number:	**DOI-BLM-NM-F010-2023-0040-EA**
Lease Number:	**N0G13121857 & NMNM144419X**

The following conditions of approval will apply to the Greater Lybrook Unit (GLU) 053 Oil and Natural Gas Well Project wells pad, access roads and pipeline and other associated facilities, unless a particular Surface Managing Agency or private surface owner has supplied to Bureau of Land Management and the operator a contradictory environmental stipulation. The failure of the operator to comply with these requirements may result in the assessment of liquidated damages or penalties pursuant to 43 CFR 3163.1 or 3163.2.

Special Stipulations

Copy of COA's: A copy of these stipulations, including exhibits and the Plan(s) of Operation (if required), shall be on the project area and available to person directing equipment.

Construction & Reclamation Notification: The operator or their contractor will contact the Bureau of Land Management, Farmington Field Office Environmental Protection Staff at (505) 564-7600 or by email, at least 48 hours prior to any construction or reclamation on this project. The operator or their contractor will contact the grazing permittee to give notice at least 10 days prior to start of construction operations.

Weather: No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet.

Paleontology: Any paleontological resource discovered by the Operator, or any person working on his behalf, on public or Federal land shall be immediately reported to the Authorized Officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant scientific values. The Holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the Holder.

Stockpile of Soil: The top 6 inches of soil material will be stripped and stockpiled in the construction zones around the pad (construction zones may be restricted or deleted to provide resource avoidance). The stockpiled soil will be free of brush and tree limbs, trunks and roots. The stockpiled soil material will be spread on the reclaimed portions of the pad (including the cut and fill slopes) prior to re-seeding. Spreading shall not be done when the ground or topsoil is frozen or wet.

Storage Tanks: All open top permanent production or storage tanks regardless of diameter made of fiberglass, steel, or other material used for the containment of oil, condensate, produced water and or other production waste shall be screened, netted, or otherwise covered to protect migratory birds and other wildlife from access.

Design Features

Enduring would adhere to any conditions required by the BLM FFO. Additional project-specific design features would be included as determined during the BLM on-site meeting. Enduring has also committed to the following design features and BMPs to lessen impacts to resources. Where applicable, additional details related to the design features may be found in the APDs on file at the BLM FFO.

Air Resources

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use (magnesium chloride, organic-based compounds, and/or polymer compounds could also be used on dirt roads upon approval of the BLM).
- BMPs provided in The Gold Book would be implemented for proposed and existing roads (BLM and U.S. Forest Service 2007).
- Where applicable, compressor engines 300 horsepower or less used during well production must be rated by the manufacturer as emitting NO_x at 2 grams per horsepower hour or less to comply with the NMED, Air Quality Bureau's guidance.

Water Resources

- To prevent erosion, certain areas surrounding the proposed site would be recontoured during interim reclamation.
- Culverts and silt traps would be installed as appropriate, and locations would be determined during the BLM on-site and/or facility on-site visits.

Wildlife, Migratory Birds, and Special-Status Species

- Any wildlife encountered within the proposed project area would be avoided and allowed to move out of the proposed project area. No wildlife would be intentionally harmed or harassed.
- Wildlife hazards, such as storage tanks, associated with the proposed project would be fenced or covered, as necessary.
- Because the proposed project would disturb more than 4.0 acres of vegetation, migratory breeding bird nesting surveys would be required if construction activities are scheduled to occur during the migratory bird nesting season (May 15–July 31). If an active nest is encountered, it would be avoided (avoidance buffer to be determined by BLM FFO) and left undisturbed until the nest has failed, or nestlings have fledged. If present, an inactive nest could be cleared by a BLM FFO–approved wildlife biologist.
- Enduring would notify the BLM and U.S. Fish and Wildlife Service (USFWS) upon discovery of a dead or injured migratory bird, bald eagle (*Haliaeetus leucocephalus*), or golden eagle (*Aquila chrysaetos*) within or adjacent to the proposed project area. If the BLM becomes aware of such mortality or injury, the BLM will inform Enduring. If Enduring fails to notify the USFWS of the mortality or injury, the BLM would notify the USFWS. The BLM and the USFWS would then attempt to determine the cause of mortality and identify appropriate mitigation measures to avoid future occurrences.
- Should other special-status species be observed within the proposed project area prior to or during the proposed project, construction would cease, and the BLM FFO would be immediately contacted. The BLM FFO would then evaluate the resource. Should a discovery be evaluated as significant (protected under the Endangered Species Act, etc.), it would be protected in place

until mitigation could be developed and implemented according to guidelines set by the BLM FFO.

- Per BLM FFO Instruction Memorandum No. NM-200-2008-001 (BLM 2008b), an updated pre-construction biological survey could be required for the proposed project if vegetation removal would occur more than 1 year following the previous biological survey.

Soil, Upland Vegetation, and Noxious Weeds and Invasive Species

- No construction or routine maintenance activities would be performed during periods when the soil is too wet to adequately support construction equipment. If equipment creates ruts deeper than six inches, the soil would be deemed too wet for construction or maintenance.
- Reclamation would follow the guidance provided in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013). These procedures are referenced in Enduring's Surface Reclamation Plan.
- During the pre-disturbance on-site meeting with BLM, a suitable vegetation community from the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013) would be selected by the BLM. Plant species would be chosen from the BLM FFO's seed pick list for the selected community.
- A noxious weed inventory utilizing the New Mexico Noxious Weed List (New Mexico Department of Agriculture 2020) and the U.S. Department of Agriculture's (USDA's) Federal Noxious Weed List (USDA 2010) will be conducted during the pre-disturbance on-site meeting.
- Identified noxious weeds would be treated prior to new surface disturbance, as determined by the BLM FFO Noxious Weed Specialist (505-564-7600). A pesticide use proposal (PUP) would be submitted to and approved by the BLM FFO Noxious Weed Specialist prior to application of any pesticide.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.
- See the above water resources section for erosion-control features.

Cultural Resources

- All cultural resources stipulations would be followed as indicated in the BLM Cultural Resource Records of Review and the conditions of approvals. These stipulations may include, but are not limited to, temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, project area reduction and/or specific construction avoidance zones, and employee education.

- Known sites and sites identified during the pre-construction cultural resources inventory surveys would be avoided.
- If heritage resources are discovered during the project, all work in the immediate vicinity will stop, and the district archaeologist or forest archaeologist will be notified immediately. Significant cultural resources will not be affected, archaeological clearance is recommended for the project.
- **Discovery of Cultural Resources in the Absence of Monitoring:** If, in its operations, operator/holder discovers any previously unidentified historic or prehistoric cultural resources, then work in the vicinity of the discovery will be suspended and the discovery promptly reported to BLM Field Manager. BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, the BLM will evaluate the significance of the discovery in accordance with 36 CFR Section 800.13, in consultation with the appropriate State or Tribal Historic Preservation Officer(s) and Indian tribe(s) that might attach religious and cultural significance to the affected property, or in accordance with an approved program alternative. Minor recordation, stabilization, or data recovery may be performed by BLM or a third party acting on its behalf, such as a permitted cultural resources consultant. If warranted, more extensive archaeological or alternative mitigation, likely implemented by a permitted cultural resources consultant, may be required of the operator/holder prior to allowing the project to proceed. Further damage to significant cultural resources will not be allowed until any mitigations determined appropriate through the agency's Section 106 consultation are completed. Failure to notify the BLM about a discovery may result in civil or criminal penalties in accordance with the Archeological Resources Protection Act (ARPA) of 1979, as amended, the Native American Graves Protection and Repatriation Act (NAGRPA) of 1990, as amended, and other applicable laws.

- **Discovery of Cultural Resources during Monitoring:** If monitoring confirms the presence of previously unidentified **historic or prehistoric** cultural resources, then work in the vicinity of the discovery will be suspended and the monitor will promptly report the discovery to the BLM Field Manager. BLM will then specify what action is to be taken. **If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, the BLM will evaluate the significance of the discovery in accordance with 36 CFR Section 800.13, in consultation with the appropriate State or Tribal Historic Preservation Officer(s) and Indian tribe(s) that might attach religious and cultural significance to the affected property, or in accordance with an approved program alternative. Minor recordation, stabilization, or data recovery may be performed by BLM or a third party acting on its behalf, such as a permitted cultural resources consultant. If warranted, more extensive archaeological or alternative mitigation, likely implemented by a permitted cultural resources consultant, may be required of the operator/holder prior to allowing the project to proceed. Further damage to significant cultural resources will not be allowed until any mitigations determined appropriate through the agency's Section 106 consultation are completed.**

- **Damage to Sites:** If, in its operations, operator/holder damages, or is found to have damaged any previously documented or undocumented historic or prehistoric cultural resources, excluding "discoveries" as noted above, the operator/holder agrees at his/her expense to have a permitted cultural resources consultant prepare a BLM approved damage assessment and/or data recovery plan. The operator/holder agrees at his/her expense to implement a **mitigation** that the agency finds appropriate given the significance of the site, which the agency determines in consultation with the appropriate State or Tribal Historic Preservation Officer(s) and Indian tribe(s) that might attach religious and cultural significance to the affected property. **This mitigation may** entail

execution of the data recovery plan by a permitted cultural resources consultant and/or alternative **mitigations**. Damage to cultural resources may result in **civil or criminal penalties in accordance with the Archeological Resources Protection Act (ARPA) of 1979, as amended, the Native American Graves Protection and Repatriation Act (NAGRPA) of 1990, as amended, and other applicable laws**.

- **EMPLOYEE EDUCATION**: All employees of the project, including the Project Sponsor and its contractors and sub-contractors will be informed **and educated** that cultural sites are to be avoided by all personnel, personal vehicles and company equipment. This includes personnel associated with construction, use, maintenance and abandonment of the well pad, well facilities, access and pipeline. They will also be notified that it is illegal to collect, damage, or disturb **historic or prehistoric** cultural resources, and that such activities are punishable by criminal and or administrative penalties under the provisions of the **ARPA (16 U.S.C. 470aa-mm), NAGPRA (25 U.S.C. 3001-3013), and other laws, as applicable (for example, NM Stat. § 18-6-9 through § 18-6-11.2, as amended, and NM Stat. § 30-12-12, as amended).**

Paleontological Resources

If any paleontological resources are discovered during activities associated with the proposed project:

- Enduring would immediately inform the BLM Authorized Officer.
- Activities in the vicinity of the discovery would be immediately suspended until written authorization to proceed is issued by the BLM Authorized Officer.
- The discovery would be protected from damage or looting.
- The Authorized Officer would ensure evaluation of the discovery as soon as possible.
- Appropriate measures to mitigate adverse effects to significant paleontological resources would be determined by the Authorized Officer after consulting with the operator.
- Any paleontological resource discovered by the Operator, or any person working on his behalf,
- An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant scientific values.
- The Holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the Holder.

Visual Resources and Dark Skies

- Equipment not subject to safety requirements would be painted a BLM Standard Environmental Color (Juniper Green) to minimize contrast with the surrounding landscape.
- If applicable, during reclamation, stockpiled rocks, if available, would be placed within the reclaimed area for erosion control and/or to discourage off-highway vehicle traffic (if requested by the BLM FFO). Rocks would be placed in a manner that visually blends with the adjacent, undisturbed landscape.
- Lights would be limited to those needed for safety during construction and operations.
- Lighting would be downward-facing or shielded where possible.

Livestock Grazing and Rangeland Health Standards

- Livestock grazing operators in the vicinity of the proposed project area would be contacted prior to construction.
- Safety meetings would be conducted prior to construction to increase awareness of livestock, such as the presence of open range and driving speed to avoid livestock collisions.
- To the extent feasible, construction activities would not be conducted when livestock are present within the proposed project area.
- If livestock are present during construction, barriers would be placed to ensure that livestock do not come in contact with potential hazards. Barrier examples could include fencing of exposed ditch-type holes, covering of holes when personnel are not present on-site, and containment of contaminants, fluid leaks, or hazards that could cause injury to livestock.

Public Health and Safety

- The hauling of equipment and materials on public roads would comply with New Mexico Department of Transportation regulations. Any accidents involving persons or property would be reported to the BLM FFO. Enduring would notify the public of potential hazards by posting signage, having flaggers, or using lighted signs, as necessary.
- Worker safety incidents would be reported to the BLM FFO as required under NTL–3A (BLM 2019b). Enduring would adhere to company safety policies and Occupational Safety and Health Administration regulations.
- Vehicles would be restricted to proposed and existing disturbance areas.
- The proposed site would have an informational sign, delineating operator, legal description, etc.
- Oil and gas industry traffic is expected to adhere to all posted speed limits and signs. Drivers would be appropriately licensed and inspected.

Lay-Flat Pipeline BMPs

- If a temporary lay flat line would be authorized to move water for completion activities, the lay flat will reduce the amount of truck traffic to move water. The lay flat will be authorized for no more than 60 days from the date of installation or development. Request for an extension of the 60-day authorization, would require a sundry application be submitted to the BLM-FFO including justification for the request.

- Time construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g., buried pipelines, culverts) to avoid high-flow conditions. When construction disturbs a flowing stream, utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

- Design and construct surface pipelines at drainage crossings at an adequate height above possible flood levels. Bore/bury pipeline crossings below the surface deep enough to remain undisturbed by scour and fill processes typically associated with peak flows. Complete a hydraulic analysis during the pipeline design phase to avoid repeated maintenance of such a crossing and eliminate costly repairs and potential environmental degradation associated with pipeline breaks at stream crossings. Utilize horizontal directional boring techniques below perennial water bodies and/or wetland complexes when environmental circumstances allow.

- X-ray pipeline welds within 100 feet of a perennial stream to prevent leakage into the stream. Where pipelines cross streams that support Federal or State-listed threatened or endangered species

or BLM-listed sensitive species, utilize additional safeguards (such as double-walled pipe, and remotely actuated block or check valves) on both sides of the stream.

- Avoid water courses when locating pipelines and flowlines; utilize road corridors wherever possible to minimize surface disturbance and provide better leak detection and access for installation and repair activities.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

Finding of No Significant Impact

DOI-BLM-NM-F010-2023-0040-EA

June 2023

Enduring's Greater Lybrook Unit 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and One Future Well Oil and Natural Gas Wells Project

Applicant: ***Enduring Resources, LLC***

Preparing Office: *Farmington Field Office*

6251 College Blvd, Suite A

Farmington, NM 87402

Phone: 505-564-7600

BACKGROUND

On August 2022, the Bureau of Land Management (BLM) Farmington Field Office (FFO) began the process of preparing an Environmental Assessment (EA), DOI-BLM-NM-F010-2023-0040-EA. The EA analysis addresses the potential impacts of the drilling, production, and final abandonment of the Greater Lybrook Unit 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and one future well Oil and Natural Gas Wells Project (the Proposed Action), which is located within Enduring's approved Greater Lybrook Unit ([GLU] No. NMNM-144419X). The Proposed Action consists of one well pad, including six wells (053H, 054H, 055H, 056H, 057H, and one future well), associated access road, well-tie pipeline corridor, temporary lay flat pipeline, and one temporary use permit area (TUPA), located on Navajo Allotted surface (Allotment Number 791-52) in San Juan County, New Mexico.

To inform its impacts analysis for the EA, the BLM analyzed development of six Applications for Permit to Drill (APDs) for the development of the Proposed Action, subject to lease stipulations and mitigation measures derived from the current 2003 BLM FFO Resource Management Plan (RMP) and Record of Decision (BLM 2003a[1]) for the area.

This Finding of No Significant Impact (FONSI) has been prepared for the Proposed Action.

FINDING OF NO SIGNIFICANT IMPACT

Based on the EA (DOI-BLM-NM-F010-2023-0040-EA), which analyzes potential impacts from the proposed well pad, associated access road, well-tie pipeline corridor, and TUPA, and an evaluation of the criteria for considering the potentially affected area and degree of the effects of a specific action provided by the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) 1501.3 (a) and (b), I have determined that developing the disturbance as analyzed under the Proposed Action does not constitute a major federal action that would have a significant effect on the quality of the human environment. Therefore, an environmental impact statement (EIS) is not required.

The Proposed Action and its effects have been evaluated in a manner consistent with the CEQ regulations for determining the potentially affected area and the degree of the effects. Per 40 CFR 1501.3 (a) and (b), a determination of the degree of the effects of the action as used in the National Environmental Policy Act (NEPA) requires consideration of both the affected area and the degree of the effect. The affected area refers to the setting in which the action would occur (national, regional, or local) and its resources. Significance varies with the setting of the Proposed Action. The degree of the effect refers to the severity of the impact. The degree of the effect relates to four criteria outlined in 40 CFR 1501.3 (b) (2) i-iv. This FONSI is based on the affected area and degree of the effects of the Proposed Action.

AFFECTED AREA

Under the Proposed Action, the BLM would approve the APDs. Each oil and natural gas well would access federally managed and Navajo Allotted minerals permitted by the BLM FFO under an approved APD with concurrence with the Bureau of Indian Affairs, Federal Indian Minerals Office (FIMO). Enduring Resources, LLC (Enduring) has submitted six APDs for the GLU 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and one future well Oil and Natural Gas Wells Project, Lease No. NOG-1312-1857.

The Proposed Action would involve the construction, use, and final abandonment of the aforementioned surface features/components, as well as the drilling, operation, and plugging of six oil and natural gas wells. The wells would be horizontally drilled from the proposed well pad. The Proposed Action would be located in Section 23, Township 23 North, Range 9 West, New Mexico Principal Meridian, San Juan County, New Mexico.

The APDs were evaluated under the current BLM FFO RMP and Record of Decision (BLM 2003a). The APDs are issued with lease stipulations consistent with the BLM FFO RMP and Record of Decision (BLM 2003a). APD mitigation measures, conditions of approval, and lease stipulations were applied to approval of the APDs in accordance with the RMP and Record of Decision (BLM 2003a), and Operator-

[1] A list of the full references is included in the EA.

proposed design features were incorporated into the Proposed Action, with the potential impacts of the Proposed Action analyzed accordingly. Design features can be found in Appendix H of the EA.

The Proposed Action falls within San Juan County in northwestern New Mexico. Within this county, as well as in the area immediately surrounding the Proposed Action, oil and gas development already exists. All of the APDs analyzed under the Proposed Action fall within the San Juan Basin, which has been producing oil since a discovery near the Chaco Slope in 1911. The San Juan Basin is now one of the largest petroleum-producing basins in the United States, containing over 300 oil fields and nearly 40,000 oil/gas wells, producing 42.6 trillion cubic feet of gas and 381 million barrels of oil. Federal, private, tribal trust, Indian-allotted, and state wells are also found in this area. Oil and gas development and its attendant industry have become identifying components of the economic and social fabric of the region. Affected interests include public health, water quality and quantity, air quality, climate, cultural resources, vegetation removal, and the economics of the community.

DEGREE OF EFFECTS

The following discussion is organized around the four criteria described at 40 CFR 1501.3 (b) (2) i-iv.

1. ***Both short- and long-term effects.***

Table 1. Summary of Duration of Effects and Associated Significance Conclusions

Issue (EA Section 3)	Short-term Effects and Significance Conclusions	Long-term Effects and Significance Conclusions
Issue 1: How would emissions generated by equipment with the Proposed Action impact air quality? (EA Section 3.2)	The Proposed Action would result in increases in criteria pollutant emissions ranging between 0.02% (PM_{10}) and 0.22% (NO_x) over existing emissions; and localized temporary impacts from construction, particularly dust, lasting approximately 4 to 5 months. Based on the current rate of development (the projected reasonably foreseeable development [RFD]) and the RFD projections compared to the CARMMS 2.0 modeling), the corresponding CARMMS 2.0 low modeling scenario, which represents a conservative estimate of federal impacts through 2025, indicates that the emissions from this project would not be expected to result in any exceedances of the National Ambient Air Quality Standards (NAAQS) or New Mexico Ambient Air Quality Standards (NMAAQS) for any criteria pollutants in the analysis area. Potential health risks associated with hazardous air pollutants (HAPs) released into the air from oil and gas operations have been evaluated by review of existing studies. A 2019 health assessment study was completed, the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* (ICF and CSU 2019) conducted on-site air monitoring and dispersion modeling for 47 volatile organic compounds (VOCs) (including HAPs) during various stages of well development and production at oil and gas extraction facilities in Colorado.	It is not anticipated that the Proposed Action would result in any long-term exceedances of NAAQS or state air quality standards or changes in the Air Quality Index for the analysis area. The farthest distance from the extent of production activities to the modeled cancer risk of 1 in 1 million detailed in the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* was 2,000 feet (ICF and CSU 2019). The project area is in an oil and gas field approximately 0.5 mile (3,000 feet) from the nearest houses or residential buildings. There are seven existing wells within a 1-mile radius of the project area. BLM has included a mitigation measure of restricting well development 2,000 feet from the nearest residential building. HAP modeling for specific locations in New Mexico is ongoing and this restrictive distance may change depending on the results of this modeling.

Issue (EA Section 3)	Short-term Effects and Significance Conclusions	Long-term Effects and Significance Conclusions
	Results of the study indicate that acute (1-hour) exposures were below guideline levels (hazard index under 1 indicating short-term health impacts are unlikely to occur) for most chemicals. At the 500-foot distance, for a small number of chemicals (including benzene, toluene, and ethyltoluenes), the highest estimated acute exposures exceeded guideline levels at the most-exposed (downwind) locations, in isolated cases by a factor of 10 or more, particularly during flowback activities at smaller well pads. For a relatively small number of development scenarios, those highest predicted acute exposures decreased rapidly with distance but remained above guideline levels out to 2,000 feet (ICF and CSU 2019). As noted by the study, the identification of these estimated exceedances of acute health guidelines (hazard index above 1) is highly conservative and the highest exposures occur rarely. The project area is in an oil and gas field approximately 0.5 mile (3,000 feet) from the nearest houses or residential buildings. There are seven existing wells within a 1-mile radius of the project area. The HAP impacts would be local and not affect nearby communities. Design features (detailed in Appendix H of the EA) have been established to minimize dust by limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads. Typical design features include watering dirt roads during periods of high use, performing interim reclamation to revegetate areas not required for production facilities, co-locating wells and production facilities to reduce new surface disturbance, implementing 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, limiting nitrogen oxide (NO_x) emissions from compressors with engines of 300 horsepower or less, and maintaining and ensuring functionality of vapor recovery systems in areas where petroleum liquids are stored. Green completions would be used for all well completion activities where technically feasible, in accordance with the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa) or other regulations that replace or exceed OOOOa. BLM has also included a mitigation measure of restricting well development 2,000 feet from the nearest residential building. HAP modeling for specific locations in New Mexico is ongoing and this restrictive distance may change depending on the results of this modeling.	

Issue (EA Section 3)	Short-term Effects and Significance Conclusions	Long-term Effects and Significance Conclusions
Issue 2: How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change? (EA Section 3.3)	All GHG emissions are assumed to be long-term effect.	The total lifetime emissions from development and production over the 20-year well life period would be 2,474,085 tonnes CO_2e of annual GHG emissions during well development, operations, mid-stream activities and end-use activities. The average direct and indirect life of well emissions projected on an annual basis from this six-well Proposed Action is 117,785 tonnes CO2e/year. Compared with emissions from other existing and foreseeable federal oil and gas development, the life of project emissions for the Proposed Action is between 0.041% and 0.121% of federal fossil fuel authorization emissions in the state and between 0.017% and 0.051% of federal fossil fuel authorization emissions in the nation (EPA 2022e). SC-GHG values associated with estimated emissions from the proposed development range from $36,013,000 (5% discount rate) to $370,674,000 (a high damage scenario representing the 95th percentile of damages estimated, applying a 3% annual discount rate). The federal government has issued regulations that will reduce GHG emissions from any development related to the Proposed Action. These regulations include the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa), which imposes emissions limits, equipment design standards, and monitoring requirements on oil and gas facilities. Provisions in New Mexico Oil Conservation Division's (NMOCD's) Statewide Natural Gas Capture Requirements, NMAC 19.15.27.9, include prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to route the gas to pipeline or to use this gas for some other beneficial purpose (such as on-site fuel consumption). In all cases, operators must flare rather than vent natural gas except where this is technically infeasible or would pose a safety risk. These provisions will reduce VOC emissions due to stringent limitations on natural gas venting which results in un-combusted VOC emissions. Additionally, it proposes that natural gas be recovered and reused rather than flared, which would result in reductions of VOC, NO_X, carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter emissions.

Issue (EA Section 3)	Short-term Effects and Significance Conclusions	Long-term Effects and Significance Conclusions
		The BLM's regulatory authority is limited to those activities authorized under the terms of the APD that primarily occur in the "upstream" portions of natural gas and petroleum systems. The BLM requires industry to incorporate and implement BMPs, which are designed to reduce effects to air quality, and subsequently GHGs, by reducing emissions from field production and operations. Typical measures include adherence to 43 CFR 3179 concerning the venting and flaring of gas on federal leases for natural gas emissions that cannot be economically recovered, flaring hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion, implementing 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, and provisions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored..
Issue 3: How would future drilling and completion operations associated with the Proposed Action impact water quality and quantity? (EA Section 3.4)	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.	Enduring estimates total water usage for the Proposed Action would be 120.62 acre-feet (AF) (118.58 AF of non-potable groundwater for well drilling and completion, and 2.04 AF of potable groundwater for construction of the well pad, associated access road, pipelines, and dust control). The Proposed Action would increase New Mexico San Juan Basin total water use within the mining category by 1.03%, total non-potable groundwater use within the San Juan Basin by 2.26%, and total potable groundwater use within the San Juan Basin by 0.06%. The water uses described above would occur during the 4- to 5-month construction period and 30- to 60- day well completion period (such as hydraulic fracturing), and during the 20-year operation period (e.g., ongoing water use associated with dust control). Water used for the Proposed Action would be purchased legally from those who hold water rights in or around the San Juan Basin. Development of the Proposed Action is not expected to affect water quality. Cementing and casing of the well bore before any hydraulic fracturing activities ensures that communication of fracturing fluids, as well as production fluids, does not occur.

2. ***Both beneficial and adverse effects.***

Potentially beneficial and adverse impacts related to the Proposed Action are disclosed and analyzed in EA Section 3.

Table 2. Summary of Issues Analyzed in Detail

Issue (EA Section)	Summary of Issues Analyzed in Detail (further discussed in EA Chapter 3) and Significance Conclusions
Issue 1: How would emissions generated by equipment associated with the Proposed Action impact air quality? (EA Section 3.2)	1. The Proposed Action would result in increases in criteria pollutant emissions ranging between 0.02% (PM_{10}) and 0.22% (NO_x) over existing emissions; and localized temporary impacts from construction, particularly dust, lasting approximately 4 to 5 months. 2. Based on the current rate of development (the projected RFD) and the RFD projections compared to the CARMMS 2.0 modeling), the corresponding CARMMS 2.0 low modeling scenario, which represents a conservative estimate of federal impacts through 2025, indicates that the emissions from this project would not be expected to result in any exceedances of the NAAQS or NMAAQS for any criteria pollutants in the analysis area. 3. The project area is in an oil and gas field approximately 0.5-mile (3,000 feet) from the nearest houses or residential buildings. There are seven existing wells within a 1-mile radius of the project area. The HAP impacts would be local and not affect nearby communities. The farthest distance from the extent of production activities to the modeled cancer risk of 1 in 1 million detailed in the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* was 2,000 feet (ICF and CSU 2019). This is provided to give an estimate of the potential impact area and to show that this project may have a larger or smaller impact area based on differences in emissions and other HAPs sources in the area. As a result of this study, a mitigation measure of restricting well development 2,000 feet from the nearest residential building has been included in Section 3.2.2.2 of the EA. HAP modeling for specific locations in New Mexico is ongoing and this restrictive distance may change depending on the results of this modeling. 4. Design features (detailed in Appendix H of the EA) have been established to minimize dust by limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads. Typical design features include watering dirt roads during periods of high use, performing interim reclamation to revegetate areas not required for production facilities, co-locating wells and production facilities to reduce new surface disturbance, implementing 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, limiting nitrogen oxide (NO_x) emissions from compressors with engines of 300 horsepower or less, and maintaining and ensuring functionality of vapor recovery systems in areas where petroleum liquids are stored.
Issue 2: How would the future potential development of the Proposed Action contribute to GHG emissions and climate change? (EA Section 3.3)	1. The total lifetime emissions from development and production over the 20-year well life period would be 2,474,085 CO_2e of annual GHG emissions during well development, operations, mid-stream activities and end-use activities. The average direct and indirect life of well emissions projected on an annual basis from this six well Proposed Action is 117,785 tonnes CO_2e/year. 2. Compared with emissions from other existing and foreseeable federal oil and gas development, the life of project emissions for the Proposed Action is between 0.041% and 0.121% of federal fossil fuel authorization emissions in the state and between 0.017% and 0.051% of federal fossil fuel authorization emissions in the nation (EPA 2022e). 3. SC-GHG values associated with estimated emissions from the proposed development range from $36,013,000 (5% discount rate) to $370,674,000 (a high damage scenario representing the 95th percentile of damages estimated, applying a 3% annual discount rate). 4.The federal government has issued regulations that will reduce GHG emissions from any development related to the Proposed Action. These regulations include the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa), Additionally, NMOCD's Statewide Natural Gas Capture Requirements (NMAC 19.15.27.9) prohibits operators of unnecessary venting and flaring of waste natural gas where it is technically feasible; it proposes that natural gas be recovered and reused rather than flared, which would result in reductions of VOC, NO_x, CO, SO_2, and particulate matter emissions. 5. The BLM's regulatory authority is limited to those activities authorized under the terms of the APD that primarily occur in the "upstream" portions of natural gas and petroleum

Issue (EA Section)	Summary of Issues Analyzed in Detail (further discussed in EA Chapter 3) and Significance Conclusions
	systems. The BLM requires industry to incorporate and implement best management practices (BMPs), which are designed to reduce effects to air quality, and subsequently GHGs, by reducing emissions from field production and operations. Typical measures include adherence to 43 CFR 3179 concerning the venting and flaring of gas on federal leases for natural gas emissions that cannot be economically recovered, flaring hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion, implementing 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, and provisions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored. 6. In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is administered by the U.S. Environmental Protection Agency (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 2006, 2022c).
Issue 3: How would future drilling and completion operations associated with the Proposed Action impact water quality and quantity? (EA Section 3.4)	1. Enduring has provided updated water usage estimates for well development that are projected at ranging from 190,648.9 barrels (bbl [18.43 AF]) to 215,992.9 bbl (20.88 AF) per well, depending on the depth of formation and length of wellbore lateral. Drilling and development of each well are estimated to take place within 30- to 60- days. 2. The estimated total water use for the Proposed Action would be 120.62 AF and would comprise between 0.09% and 1.07% of the total water use associated with the 2018 and 2019 RFDs and between 1.92% and 21.41% of annual water use associated with the RFDs. This usage would increase New Mexico San Juan Basin total water use within the mining category by 1.03%, total non-potable groundwater use within the San Juan Basin by 2.26%, and total potable groundwater use within the San Juan Basin by 0.06%. Water used for the Proposed Action would be purchased legally from those who hold water rights in or around the San Juan Basin. 3.Cementing and casing of the well bore before any hydraulic fracturing activities ensures that communication of frac fluids as well as production fluids does not occur. Thus, development of the Proposed Action is not expected to affect water quality.

3. ***Effects on public health and safety.***

The following project elements have been included in the Proposed Action to address any impacts to public health and safety and are described in the EA. The nearest hospital is in Farmington, New Mexico, and is approximately 45 air miles from the Proposed Action. The Proposed Action achieves the balance of resource protection and beneficial use of the human environment envisioned by NEPA:

- Worker safety incidents would be reported to the BLM FFO as required under Notice to Lessees 3A (U.S. Geological Survey 1979). The Operator would adhere to company safety policies, Occupational Safety and Health Administration regulations, and Department of Transportation regulations.
- During the drilling, completion, and production of the wells, there would not be any hazardous substances, as defined in 40 CFR 355, or subject to reporting under Superfund Amendments and Reauthorization Act Title III greater than 10,000 pounds in weight, used, produced, stored, transported, or disposed of annually at the well site. Waste resulting from project activities would be removed from the proposed project area and disposed of in an authorized area, such as an approved landfill, and would be handled and disposed of according to federal law. Any spills of non-freshwater liquid would be reported to the BLM FFO and the New Mexico Oil Conservation District office within 48 hours. Spills would be cleaned up immediately and transferred to an approved disposal facility. The proposed project area would be maintained in a sanitary condition. The Operator would provide self-contained portable toilets for human waste disposal. Upon

completion of operations, or as needed, the Operator would pump the toilet holding tanks and haul the contents to an approved disposal facility. The Operator would observe all applicable regulations pertaining to disposal of human and solid wastes.

- The Operator would have inspectors present during construction. Any accidents involving persons or property would be immediately reported to the BLM FFO.
- Design features would minimize the impact to potential vehicle accidents due to project-related traffic.

4. ***Effects that would violate federal, state, tribal, or local law protecting the environment.***

None of the effects associated with the Proposed Action would violate any federal, state, tribal, or local law protecting the environment.

Impacts to federally listed species from BLM FFO–wide oil and gas development were analyzed in the Proposed RMP and Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003b), as amended. SWCA performed a biological survey of the proposed project area on September 14, 2022. No federally listed endangered or threatened species listed under the Endangered Species Act, Navajo Nation Endangered Species, or designated critical habitat was observed during the biological survey, nor does the proposed project area provide habitat that could be used for potential foraging for any federally listed species that could be impacted by increased noise during construction activities. More information can be found in the biological evaluation report for the proposed project on file with the BLM FFO.

Additionally, the Proposed Action would not use any surface water that could affect federally or Navajo Nation listed threatened, endangered, and candidate species; all groundwater used for well pad, access road, or pipeline construction, and well drilling and completion would be taken from one or more permitted private wells or private water holes. All non-potable saline groundwater used for well drilling and completion would be taken from a non-potable water-bearing formation (Mancos Shale and Gallup Sandstone Formations). Enduring may also utilize produced water gathered from their existing wells within the Mancos Gallup area. Produced water may be gathered via existing underground pipeline infrastructure and temporary surface line infrastructure and trucked. Produced water gathered at Shiprock San Juan, LLC's 4-1 CDP may also be trucked and used during completion operations. Flowback water from completion operations would be recycled for reuse. These non-potable sources would be gathered, stored, treated, and recycled at the Enduring Resources NEU 2207-16B, WLU 2309-24N, KWU 2390-19K, or SEU 2206-20O water recycling facilities. All potable groundwater used for the well pad, access road, pipeline construction, and dust abatement would be taken from one or more existing private water wells or private water hole, such as the Blanco Wash Trading Post (point of division number SJ 2105). There would be no new water depletions associated with the Proposed Action. Further detailed analysis is not warranted. The Proposed Action would be in compliance with the Endangered Species Act and with the PRMP/FEIS and associated biological assessment (BLM 2002). No further consultation with the U.S. Fish and Wildlife Service is required.

Tribal consultation for the Proposed Action was initiated on a government-to-government basis by the BLM FFO with various Pueblos and Tribes of New Mexico and southern Colorado. A letter and map describing the Proposed Action and inviting consultation with the BLM FFO was sent via certified mail to each of the various Pueblos and Tribes listed in the EA Table 4.1 on November 14, 2022, with a request for response within 30 days of receipt.

The entire area of potential effect associated with the Proposed Action was archeologically surveyed by the Division of Conservation Archeology at a BLM Class III Level (100%), and the report was prepared and submitted to the BLM and Navajo Nation Heritage and Historic Preservation Department (NNHHPD).

One Class III Archeological Survey (NNHHPD No. HPD-22-660) was conducted in the proposed project area, and during the survey, two isolated occurrences were recorded and none were determined eligible for listing in the National Register of Historic Places (NRHP). The Proposed Action would have no direct or indirect impact on significant cultural sites.

An informational letter was sent to the New Mexico State Historic Preservation Officer, notifying the Officer of the no effects to historic properties finding. None of the effects associated with the Proposed Action would violate any federal, state, tribal, or local law protecting the environment.

CONCLUSION

Therefore, on the basis of the information contained in the EA (DOI-BLM-NM-F010-2023-0040-EA) and all other information available to me at this time, it is my determination that:

- The degree of the effects of the Proposed Action do not rise to the level of significance requiring preparation of an EIS. (See criteria 1–4 explained in detail.)
- The Proposed Action is in conformance with the 2003 BLM FFO RMP (BLM 2003a). Therefore, preparation of an EIS is not necessary.

06/26/23

Maureen Joe **Date**
Farmington Field Manager

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

Decision Record

DOI-BLM-NM-F010-2023-0040-EA

June 2023

Enduring's Greater Lybrook Unit 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and One Future Well Oil and Natural Gas Wells Project

Applicant: ***Enduring Resources, LLC***

Preparing Office: *Farmington Field Office*
6251 College Blvd, Suite A
Farmington, NM 87402
Phone: 505-564-7600

1. Decision

I have decided to select the Proposed Action for the Enduring Resources, LLC (Enduring) Greater Lybrook Unit (GLU) 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and One Future Well Oil and Natural Gas Wells Project (project). I have concluded that Environmental Assessment (EA) DOI-BLM-NM-F010-2023-0040 analyzed the impacts on the human environment in sufficient detail to allow me to make an informed decision for this project. I have selected the Proposed Action because it would allow Enduring Resources, LLC access to its valid Indian Mineral Lease number NO-G-1312-1857 and transport federally managed minerals (one well-tie pipeline corridor) from the proposed wells to its existing infrastructure on land administered by the Bureau of Land Management (BLM) Farmington Field Office (FFO) and Indian Allotted land managed by the Bureau of Indian Affairs (BIA) Federal Indian Mineral Office (FIMO), while remaining in conformance with applicable resource management plans, statutes, and regulations and minimizing adverse effects to resources and resource uses.

2. Authorities

The authority for this decision is contained in the Mineral Leasing Act of 1920, as amended; the Mining and Minerals Policy Act of 1970 (30 United States Code [USC] 21); Federal Land Policy and Management Act of 1976 (43 USC 1761-1777) (FLPMA); the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 USC 195 et seq.); applicable BLM Onshore Oil and Gas Orders (43 Code of Federal Regulations [CFR] 3160); the Act of March 3, 1909, 35 Stat. 783, 25 U.S.C. 396 (as amended); as implemented by Title 25, Code of Regulations (CFR), Part 12 (allotted land), 25 CFR 212-Leasing of Allotted Lands for Mineral Development, and the 2003 BLM FFO Resource Management Plan (RMP)/Final Environmental Impact Statement (FEIS).

3. Compliance and Monitoring

Monitoring will be conducted during the construction and drilling phase in compliance with Permanent Instruction Memorandum 2018-014 to ensure that all terms and conditions specified in the lease and the approved Applications for Permit to Drill (APDs), and the Surface Use Plan of Development (SUPO) are followed.

The well pad, wells, access road, and associated infrastructure will be monitored during the life of the project for compliance with pertinent regulations until final abandonment is approved. Responsibility for implementation of the compliance schedule and monitoring plan will be assigned to the inspection and enforcement, surface protection, and/or realty staff in the BLM FFO with FIMO's concurrence.

During drilling, operations will be checked by the BLM FFO to ensure that environmental protective measures conform to what was approved. During the lifetime of the well, periodic inspections will be conducted by the BLM FFO to ensure continued APD and National Environmental Policy Act (NEPA) accountability.

Copy of Plans: A complete copy of the APD packages, SUPO, conditions of approval (COAs), cultural resources records of review, and project stipulations shall be at the project area at all times and available to all persons.

Review of NEPA Documents: It is the responsibility of Enduring to follow all the design features, best management practices, and mitigation measures as contained in EA DOI-BLM-NM-F010-2023-0040, entitled "Enduring's Greater Lybrook Unit 053H Well Pad, Nos. 053H, 054H, 055H, 056H, 057H, and One Future Well Oil and Natural Gas Wells Project." Copies of the EA, as well as the Decision Record (DR) and Finding of No Significant Impact (FONSI), may be obtained from the BLM FFO Public Room.

Design Features and Mitigation Measures: See attached Appendix A.

4. Plan Conformance and Consistency

The Proposed Action and alternatives have been reviewed and found to be in conformance with one or more of the following BLM Land Use Plans and the associated decision(s):

Plan: 2003 BLM FFO RMP/FEIS

Date: December 2003

Conformance Review: BLM 2003b[1], pages 2-2–2-3

[1] A list of the full references is included in the EA.

Specifically, the Proposed Action is in conformance with the following objectives:

"It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands." (BLM 2003b:2-2–2-3)

5. Alternatives Considered

The EA considered two alternatives: the Proposed Action and the No Action Alternative. The Proposed Action would involve construction of one well pad, development of six wells (053H, 054H, 055H, 056H, 057H, and one future well), associated access road, well-tie pipeline corridor, one temporary use permit area (TUPA), and one temporary layflat water pipeline. If approved, the BLM would issue the APDs for the Proposed Action. Under the No Action Alternative, the BLM would not approve the submitted APD grant applications. Enduring would retain its lease rights but would not be allowed to construct the project. Oil and natural gas production in the area would continue at its current rate, and other current land use in the area would continue.

No other alternatives were considered in the EA; however, prior to identifying the proposed project location, the BLM and Enduring reviewed resource data to identify avoidance areas for previously recorded cultural resources sites, areas with potential for paleontological resources, sensitive habitats, hydrological features, and other issues. Enduring then sited the proposed project area within and adjacent to existing disturbance, to the greatest extent possible.

6. Rationale for Decision

The Proposed Action, including the COAs in Attachment A, has been selected because it meets the underlying purpose and need for the applicant to exercise its oil and gas lease rights, which allows for the exploration and development of the oil and gas resources. The BLM is approving the private exploration and production from the federal oil and gas lease, because the activity is an integral part of the BLM's oil and gas leasing and development program under authority of the Mineral Leasing Act of 1920, as amended by FLPMA and the Federal Onshore Oil and Gas Leasing Reform Act of 1987.

7. Public Involvement

The public availability for the EA is adequate for the Proposed Action. The BLM invited stakeholders and interested parties to a pre-disturbance on-site meeting, which was held at the proposed project location on September 22, 2021. The Proposed Action was posted for an external scoping period starting August 1, 2022, on the BLM E-Planning website at: EplanningUi (blm.gov).

The EA, DR, and FONSI documents will be posted in the BLM FFO Public Room and to the BLM E-Planning website once the Authorized Officer has rendered a final decision.

8. Administrative Remedies

Under regulations addressed in 43 CFR 3165.3, any adversely affected party that contests a decision of the Authorized Officer may request an administrative review, before the State Director, either with or without oral presentation. Such request, including all supporting documentation, shall be filed in writing with the BLM New Mexico State Office at 301 Dinosaur Trail, Santa Fe, NM 87508, within 20 business days of the date such decision was received or considered to have been received. Upon request and showing of good cause, an extension may be granted by the State Director. Such review shall include all factors or circumstances relevant to the particular case.

9. Appeal

Any party who is adversely affected by the decision of the State Director after State Director review, under 43 CFR 3165.3, of a decision may appeal that decision to the Interior Board of Land Appeals pursuant to the regulations set out in 43 CFR Part 4. In accordance with 43 CFR 4.401, the BLM does not accept fax or email filing of a protest, notice of appeal, and petition for stay. Any notice of protest, appeal, and/or petition for stay must be sent or delivered to the office of the Authorized Officer by mail or personal delivery. The BLM cannot accept electronic submissions of protest or appeal documents due to the Federal Information Systems Security Awareness guidance. Please submit relevant protest or appeal documents in hard copy form for consideration. Any notice of protest, appeal, and/or petition for stay must be sent or delivered to the office of the Authorized Officer by mail or personal delivery, including any attachments to the protest or appeal.

Maureen Joe
Farmington Field Manager

06/26/23
Date

Attachments:

Appendix A – Design Features and Mitigation Measures

APPENDIX A: DESIGN FEATURES

Enduring would adhere to any conditions required by the BLM FFO. Additional project-specific design features would be included as determined during the BLM on-site meeting. Enduring has also committed to the following design features and BMPs to lessen impacts to resources. Where applicable, additional details related to the design features may be found in the APDs on file at the BLM FFO.

Air Resources

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use (magnesium chloride, organic-based compounds, and/or polymer compounds could also be used on dirt roads upon approval of the BLM).
- BMPs provided in The Gold Book would be implemented for proposed and existing roads (BLM and U.S. Forest Service 2007).
- Where applicable, compressor engines 300 horsepower or less used during well production must be rated by the manufacturer as emitting NO_x at 2 grams per horsepower hour or less to comply with the NMED, Air Quality Bureau's guidance.
- Green completions would be used for all well completion activities where technically feasible, per the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa) or other regulations that replace or exceed OOOOa.
- The operator would obtain an air permit, if required by the regulatory agency, for equipment operating under this Proposed Action and would follow regulatory requirements.
- A set-back distance restricting well development 2,000 feet from the center of the well pad to the nearest residential building would be used (based on the study: *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* [ISF and CSU 2019]).

Water Resources

- To prevent erosion, certain areas surrounding the proposed site would be recontoured during interim reclamation.
- Culverts and silt traps would be installed as appropriate, and locations would be determined during the BLM on-site and/or facility on-site visits.

Wildlife, Migratory Birds, and Special-Status Species

- Any wildlife encountered within the proposed project area would be avoided and allowed to move out of the proposed project area. No wildlife would be intentionally harmed or harassed.
- Wildlife hazards, such as storage tanks, associated with the proposed project would be fenced or covered, as necessary.
- Because the proposed project would disturb more than 4.0 acres of vegetation, migratory breeding bird nesting surveys would be required if construction activities are scheduled to occur during the migratory bird nesting season (May 15–July 31). If an active nest is encountered, it would be avoided (avoidance buffer to be determined by BLM FFO) and left undisturbed until the nest has failed, or nestlings have fledged. If present, an inactive nest could be cleared by a BLM FFO–approved wildlife biologist.

- Enduring would notify the BLM and U.S. Fish and Wildlife Service (USFWS) upon discovery of a dead or injured migratory bird, bald eagle (*Haliaeetus leucocephalus*), or golden eagle (*Aquila chrysaetos*) within or adjacent to the proposed project area. If the BLM becomes aware of such mortality or injury, the BLM will inform Enduring. If Enduring fails to notify the USFWS of the mortality or injury, the BLM would notify the USFWS. The BLM and the USFWS would then attempt to determine the cause of mortality and identify appropriate mitigation measures to avoid future occurrences.
- Should other special-status species be observed within the proposed project area prior to or during the proposed project, construction would cease, and the BLM FFO would be immediately contacted. The BLM FFO would then evaluate the resource. Should a discovery be evaluated as significant (protected under the Endangered Species Act, etc.), it would be protected in place until mitigation could be developed and implemented according to guidelines set by the BLM FFO.
- Per BLM FFO Instruction Memorandum No. NM-200-2008-001 (BLM 2008b), an updated pre-construction biological survey could be required for the proposed project if vegetation removal would occur more than 1 year following the previous biological survey.

Soil, Upland Vegetation, and Noxious Weeds and Invasive Species

- No construction or routine maintenance activities would be performed during periods when the soil is too wet to adequately support construction equipment. If equipment creates ruts deeper than six inches, the soil would be deemed too wet for construction or maintenance.
- Reclamation would follow the guidance provided in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013). These procedures are referenced in Enduring's Surface Reclamation Plan.
- During the pre-disturbance on-site meeting with BLM, a suitable vegetation community from the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013) would be selected by the BLM. Plant species would be chosen from the BLM FFO's seed pick list for the selected community.
- A noxious weed inventory utilizing the New Mexico Noxious Weed List (New Mexico Department of Agriculture 2020) and the U.S. Department of Agriculture's (USDA's) Federal Noxious Weed List (USDA 2010) will be conducted during the pre-disturbance on-site meeting.
- Identified noxious weeds would be treated prior to new surface disturbance, as determined by the BLM FFO Noxious Weed Specialist (505-564-7600). A pesticide use proposal (PUP) would be submitted to and approved by the BLM FFO Noxious Weed Specialist prior to application of any pesticide.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.

- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.
- See the above water resources section for erosion-control features.

Cultural Resources

- All cultural resources stipulations would be followed as indicated in the BLM Cultural Resource Records of Review and the conditions of approvals. These stipulations may include, but are not limited to, temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, project area reduction and/or specific construction avoidance zones, and employee education.
- All employees, contractors, and subcontractors would be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment; that it is illegal to collect, damage, or disturb cultural resources; and that such activities on federal and tribal lands are punishable by criminal and or administrative penalties under the provisions of Archaeological Resources Protection Act (ARPA) (16 USC 470aa–mm).
- In the event of a cultural resource's discovery during construction, construction activities would immediately cease in the immediate vicinity of the discovery, and Enduring would immediately notify the archaeological monitor, if present, or the BLM. The BLM would then ensure the site is evaluated. Should a discovery be evaluated as significant (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act of 1990, ARPA), it would be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.
- Known sites and sites identified during the pre-construction cultural resources inventory surveys would be avoided.

Paleontological Resources

If any paleontological resources are discovered during activities associated with the proposed project:

- Enduring would immediately inform the BLM Authorized Officer.
- Activities in the vicinity of the discovery would be immediately suspended until written authorization to proceed is issued by the BLM Authorized Officer.
- The discovery would be protected from damage or looting.
- The Authorized Officer would ensure evaluation of the discovery as soon as possible.
- Appropriate measures to mitigate adverse effects to significant paleontological resources would be determined by the Authorized Officer after consulting with the operator.
- Any paleontological resource discovered by the Operator, or any person working on his behalf,
- An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant scientific values.
- The Holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the Holder.

Visual Resources and Dark Skies

- Equipment not subject to safety requirements would be painted a BLM Standard Environmental Color (Juniper Green) to minimize contrast with the surrounding landscape.
- If applicable, during reclamation, stockpiled rocks, if available, would be placed within the reclaimed area for erosion control and/or to discourage off-highway vehicle traffic (if requested by the BLM FFO). Rocks would be placed in a manner that visually blends with the adjacent, undisturbed landscape.
- Lights would be limited to those needed for safety during construction and operations.
- Lighting would be downward-facing or shielded where possible.

Livestock Grazing and Rangeland Health Standards

- Livestock grazing operators in the vicinity of the proposed project area would be contacted prior to construction.
- Safety meetings would be conducted prior to construction to increase awareness of livestock, such as the presence of open range and driving speed to avoid livestock collisions.
- To the extent feasible, construction activities would not be conducted when livestock are present within the proposed project area.
- If livestock are present during construction, barriers would be placed to ensure that livestock do not come in contact with potential hazards. Barrier examples could include fencing of exposed ditch-type holes, covering of holes when personnel are not present on-site, and containment of contaminants, fluid leaks, or hazards that could cause injury to livestock.

Public Health and Safety

- The hauling of equipment and materials on public roads would comply with New Mexico Department of Transportation regulations. Any accidents involving persons or property would be reported to the BLM FFO. Enduring would notify the public of potential hazards by posting signage, having flaggers, or using lighted signs, as necessary.
- Worker safety incidents would be reported to the BLM FFO as required under NTL–3A (BLM 2019b). Enduring would adhere to company safety policies and Occupational Safety and Health Administration (OSHA) regulations.
- Vehicles would be restricted to proposed and existing disturbance areas.
- The proposed site would have an informational sign, delineating operator, legal description, etc.
- Oil and gas industry traffic is expected to adhere to all posted speed limits and signs. Drivers would be appropriately licensed and inspected.

Lay-Flat Pipeline BMP's

- If a temporary lay flat line would be authorized to move water for completion activities, the lay flat will reduce the amount of truck traffic to move water. The lay flat will be authorized for no more than 60 days from the date of installation or development. Request for an extension of the 60-day authorization, would require a sundry application be submitted to the BLM-FFO including justification for the request.

- Time construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g., buried pipelines, culverts) to avoid high-flow conditions. When construction disturbs a flowing stream, utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.
- Design and construct surface pipelines at drainage crossings at an adequate height above possible flood levels. Bore/bury pipeline crossings below the surface deep enough to remain undisturbed by scour and fill processes typically associated with peak flows. Complete a hydraulic analysis during the pipeline design phase to avoid repeated maintenance of such a crossing and eliminate costly repairs and potential environmental degradation associated with pipeline breaks at stream crossings. Utilize horizontal directional boring techniques below perennial water bodies and/or wetland complexes when environmental circumstances allow.
- X-ray pipeline welds within 100 feet of a perennial stream to prevent leakage into the stream. Where pipelines cross streams that support Federal or State-listed threatened or endangered species or BLM-listed sensitive species, utilize additional safeguards (such as double-walled pipe, and remotely actuated block or check valves) on both sides of the stream.
- Avoid water courses when locating pipelines and flowlines; utilize road corridors wherever possible to minimize surface disturbance and provide better leak detection and access for installation and repair activities.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.

Weeds

Farmington Field Office Standard Noxious/Invasive Weeds Design Features and Best Management Practices

Noxious/Invasive Weeds: Enduring will inventory the proposed site for the presence of noxious and invasive weeds. Noxious weeds are those listed on the New Mexico Noxious Weed List and USDA's Federal Noxious Weed List. The New Mexico Noxious Weed List or USDA's Noxious Weed List can be updated at any time and should be regularly checked for any changes. Invasive species may or may not be listed as noxious weeds but have been identified to likely cause economic or environmental harm or harm to human health. The following noxious weeds have been identified as occurring on land within the boundaries of the FFO. Numerous invasive species occur in the BLM FFO area, such as Russian thistle (*Salsola* spp.) and field bindweed (*Convolvulus arvensis*).

African rue (*Peganum harmala*)	Leafy spurge (*Euphorbia esula*)
Bull thistle (*Cirsium vulgare*)	Musk thistle (*Carduus nutans*)
Camelthorn (*Alhagi pseudalhagi*)	Perennial pepperweed (*Lepidium latifolium*)
Canada thistle (*Cirsium arvense*)	Russian knapweed (*Centaurea repens*)
Dalmation toadflax (*Linaria genistifolia*)	Saltcedar (*Tamarix* spp.)
Diffuse knapweed (*Centaurea diffusa*)	Scotch thistle (*Onopordum acanthium*)
Halogeton (*Halogeton glomeratus*)	Spotted knapweed (*Centaurea maculosa*)
Hoary cress (*Cardaria draba*)	Yellow toadflax (*Linaria vulgaris*)

a. Any identified weeds will be treated prior to new surface disturbance if determined by the FFO Noxious Weed Specialist. If a Weed Management Plan is not on file, a Weed Management Plan will be created. A PUP will be submitted to and approved by the FFO Noxious Weed Specialist prior to application of pesticide. The FFO Noxious Weed Specialist (505-564-7600) can provide assistance in the development of the PUP.

b. Vehicles and equipment should be inspected and cleaned prior to coming onto the site. This is especially important for vehicles from out of state or if coming from a weed-infested site.

c. Fill dirt or gravel may be needed for excavation, road construction/repair, or as a surfacing material. If fill dirt or gravel will be required, the source shall be noxious weed free and approved by the FFO Noxious Weed Specialist.

d. The site shall be monitored for the life of the project for the presence of noxious weeds (includes maintenance and construction activities). If weeds are found, the FFO Noxious Weed Specialist shall be notified at (505) 564-7600 and provided with a Weed Management Plan and, if necessary, a PUP. The FFO Noxious Weed Specialist can provide assistance developing the Weed Management Plan and/or the PUP.

e. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. Enduring's weed-control contractor would contact the BLM FFO prior to using these chemicals.

Noxious/invasive weed treatments must be reported to the FFO Noxious Weed Specialist. A pesticide use report (PUR) is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate and/or control noxious or invasive species. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Specialist.

Bare ground vegetation trim-out:

Enduring Resources, LLC

BARE GROUND VEGETATION TRIM-OUT DESIGN

ATTACHED TO

SURFACE USE PLAN OF OPERATIONS

Facility/ Structure	Required Trim-Out Buffer Distance	Pesticide Use for Vegetation Control	Pesticide Use Plan On file with BLM
Well Head	10'	Yes	Yes
Tanks/Containment	10'	Yes	Yes
Pumps	10'	Yes	Yes
Other Equipment	10'	Yes	Yes

a. Pesticide use for trim-out will require a PUP submitted for approval by the FFO Noxious Weed Specialist. A PUP is required prior to any treatment. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. Enduring's weed-control contractor would contact the BLM FFO Noxious Weed Specialist prior to using these chemicals and provide PURs post treatment.

A PUR is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate, or control vegetation on site. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Specialist.

U.S. Department of the Interior

Bureau of Land Management

June 2023

Greater Lybrook Unit 053 Well Pad, Nos. 053H, 054H, 055H, 056H, 057H and One Future Well Oil and Natural Gas Wells Project

Environmental Assessment
DOI-BLM-NM-F010-2023-0040-EA
Applicant: Enduring Resources, LLC
Lease No. NOG-1312-1857
Unit No. NMNM-144419X

Bureau of Land Management Farmington Field Office
6251 College Boulevard, Suite 1A
Farmington, New Mexico 87402

Approval Date: 06/27/2023

TABLE OF CONTENTS

Appendices

Tables

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1 Introduction

1.1 Summary of Proposed Action

Enduring Resources, LLC (Enduring), has submitted Applications for Permit to Drill (APDs; Form 3160-3) to the Bureau of Land Management (BLM) Farmington Field Office (FFO) for the development of the Greater Lybrook Unit (GLU) 053 Nos. 053H, 054H, 055H, 056H, 057H and One Future Well Oil and Natural Gas Project (GLU 053) in San Juan County, New Mexico. The GLU 053 would consist of one well pad housing six wells, one access road with one road pullout, well-tie pipeline, fiber optic, one temporary use permit area (TUPA), and one temporary lay-flat waterline. The decision to be made is the BLM's approval of the APDs.

The Proposed Action is located within Enduring's permitted GLU (Unit No. NMNM-144419X; Lease No. NO-G-1312-1857). The project is located on Indian Allotted surface (Allotment Number 791-52) and managed by the Bureau of Indian Affairs (BIA) Federal Indian Minerals Office (FIMO), in Township 23 North, Range 9 West Section 23, Quarter/Quarter SESE. The BLM FFO is the lead agency for the Proposed Action because it manages the subsurface minerals associated with the proposed project as defined in the Tripartite Memorandum of Understanding (MOU).

The Proposed Action would involve drilling, operation, and plugging of six wells, as well as associated infrastructure. The wells would be horizontally drilled from the proposed well pad and would access federally managed and Indian Allotted minerals permitted by the BLM FFO under the approved APDs, with concurrence of FIMO. Photographs and maps of the proposed project are provided in Appendices D and E, respectively.

1.2 Purpose and Need

The purpose of the Proposed Action is to allow Enduring Resources LLC reasonable access to Indian Allotted land to develop its federally managed and Indian Allotted mineral leases, while protecting the surface resources to the maximum extent possible.

The need for the Proposed Action is established by the BLM's responsibility under the Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.) and under the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.); 43 Code of Federal Regulations (CFR) 3160 (Onshore Oil and Gas Operations), the Act of March 3, 1909. The FIMO responsibilities for the proposed action are identified under the 25 CFR Subpart A, General; Part 212, Leasing of Allotted Lands for Mineral Development.

This environmental assessment (EA) complies with the requirements of the National Environmental Policy Act of 1969 (NEPA) and federal regulations found in 40 CFR Chapter V. This EA analyzes the site-specific impacts associated with the Proposed Action and its alternative, identifies mitigation measures to potentially reduce or eliminate those impacts, and provides agency decision-makers with detailed information with which to approve or deny the Proposed Action or an alternative.

1.3 Decision to Be Made

Based on the information detailed in this EA, the BLM FFO will decide whether to approve the APDs, and if so, under what terms and conditions as delineated in any applicable conditions of approval and/or stipulations with FIMO's concurrence.

1.4 Land Use Conformance

The Proposed Action is in conformance with the September 2003 FFO Resource Management Plan (RMP) with Record of Decision, as updated in December 2003 (BLM 2003a). The Proposed Action conforms to the objectives of the RMP, which states the following:

> It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. (BLM 2003a:2-2–2-3).
>
> The objective of the FFO lands program is to facilitate the acquisition, exchange, or disposal of public lands in order to provide the most efficient management of public resources. The program is responsible for processing land withdrawals, granting rights-of-way (ROWs) and easements on public lands, and acquiring easements on non-public lands where necessary (BLM 2003b:2-8).

As required by NEPA, this site-specific EA addresses resources and impacts of the Proposed Action that were not specifically addressed within the FFO's Proposed Resource Management Plan and Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003b). The Proposed Action would not conflict with any local, county, or state plans.

1.5 Relationship to Statutes, Regulations, and Other NEPA Documents

Various federal and state agencies regulate different aspects of oil and gas infrastructure development. Table 1.1 provides a selected listing of relevant permits, regulations, and approvals that could be required for the proposed project (all tables in this EA are also provided in Appendix F).

Table 1.1. Permits, Regulations, and Approvals Relevant to the Proposed Action

Permit/Regulation/Approval	Issuing Agency	Status
Federal Permit, Approval, or Clearance		
APD	BLM	The applications are currently under review by the BLM and are the subject of this EA.
Executive Order 12898	BLM	Impacts to minority and low-income populations are described in Table 1.4.

Permit/Regulation/Approval	Issuing Agency	Status
Section 7 of the Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)	The Proposed Action is in conformance with the biological assessment conducted for the 2003 FFO RMP (BLM 2002). No endangered or threatened species listed under the Endangered Species Act or designated critical habitat were observed during the general biological survey conducted on September 14, 2022 (SWCA Environmental Consultants [SWCA] 2022). No new water depletions would occur from groundwater systems that have the potential to be source water for vegetation, and subsequently for species, within or adjacent to the proposed project area. All groundwater used for pads, road construction, and well drilling and completion would be taken from one or more permitted private wells or private water holes. Water used for drilling and completion activities would be hauled via truck from Enduring's Blanco Trading Post Well point of diversion No. SJ-4348. No further consultation with the USFWS is required.
BLM 6840 Manual	BLM	Manual 6840 directs the BLM to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the Endangered Species Act.
Federal Noxious Weed Act (Public Law 93-629; 7 USC 2801 et seq. 88 Statute 2148)	BLM	Prior to construction activities, the proponent would adhere to the BLM's standard noxious weed procedures. Enduring will follow all guidance outlined in its Pesticide Use Proposal approved by the BLM FFO.
Clean Water Act (CWA) Section 402 General Construction (Stormwater) Permit	U.S. Environmental Protection Agency and New Mexico Environment Department (NMED)	The Proposed Action is exempt based on the 1987 Water Quality Act and Section 323 of the Energy Policy Act of 2005.
Migratory Bird Treaty Act of 1918 (MBTA) (16 USC 703–712)	USFWS – Migratory Bird Permit Office R2	The BLM would comply with MBTA preconstruction nesting survey requirements as the proposed project would impact more than 4 acres of vegetation; therefore, a preconstruction survey would be required during the nesting season (May 15–July 31). See Appendix G for more details.
Paleontological Resources Preservation Act of 2009 (Sections 6301–6312 of the Omnibus Public Lands Act of 2009, 16 USC 470aaa)	BLM	The BLM FFO geologist/paleontologist reviewed the proposed project and determined that there were no paleontological resources that would be impacted from development of the proposed project. Table 1.4 describes potential impacts to paleontological resources. With consideration of project design features and best management practices (detailed in Appendix H), the Proposed Action would be in compliance with the Act.
CWA Section 404 Permitting Discharges of Dredge or Fill Material into Waters of the U.S. (including wetlands)	U.S. Army Corps of Engineers	Section 3.4 describes impacts to water resources. The Proposed Action does not intersect potentially jurisdictional waters of the U.S. that could be impacted by development activities. The proponent will be responsible for adhering to Section 404 (dredge and fill) of the CWA, including any required permitting actions with the U.S. Army Corps of Engineers for any impacts within any surface water features prior to construction.
CWA Section 401 Permitting Water Quality Certification	NMED Surface Water Quality Bureau	Section 3.4 describes impacts to water resources. There are no potentially jurisdictional waters of the U.S. that intersect the Proposed Action. The Proponent will be responsible for adhering to Section 401 (water quality certification) of the CWA, including any required permitting actions with the NMED Surface Water Quality Bureau for any impacts within surface water features prior to construction.

Permit/Regulation/Approval	Issuing Agency	Status
Section 106 of the National Historic Preservation Act of 1966	BLM*	Table 1.4 describes potential impacts to cultural resources. Any required further consultation with the State Historic Preservation Office would be conducted by the BLM.
State Permit, Approval, or Clearance		
New Mexico Executive Order 00-22 (regarding noxious weeds)	New Mexico Department of Agriculture	Prior to construction activities, the proponent would adhere to the BLM's standard noxious weed procedures. Enduring will follow all guidance outlined in its Pesticide Use Proposal approved by the BLM FFO.
Clean Air Act New Mexico Air Quality Control Act	NMED	Impacts to air quality are described in Sections 3.2 and 3.3. The Proposed Action would be approved under separate APDs and would be considered a minor source unit and may be permitted with a General Construction Permit per 20.2.72 New Mexico Administrative Code. Prior to construction activities, a notice of intent for the proposed project would need to be filed with the NMED.
Local Permit, Approval, or Clearance		
Executive Order 11988 Floodplain Management	County Floodplain Commission	Section 3.4 describes impacts to water resources. There are no Federal Emergency Management Agency floodplains within the project area.

*The BLM is the agency that oversees compliance.

1.6 Scoping and Issues

1.6.1 Internal Scoping

As part of its review of the Proposed Action, the BLM FFO Interdisciplinary Team (IDT) conducted internal scoping to identify potentially affected resources and land uses. The IDT meeting was held on July 11, 2022. The IDT Checklist (Appendix G) provides a summary of the issues that were considered, along with the rationale for further analysis or dismissal from further analysis in this EA.

1.6.2 External Scoping

The BLM FFO initiated external scoping for the Proposed Action by posting the Proposed Action on the BLM National NEPA Register ePlanning website EplanningUi (blm.gov) for a public scoping period beginning on April 26, 2023, which included the BLM Authorized Officer's contact email and phone number for interested parties. This listing included a description of the Proposed Action and a map of the proposed project area.

As part of external scoping, BLM FFO invited stakeholders and interested parties to a pre-disturbance on-site meeting, which was held at the proposed project location on September 22, 2021. Attendees included representatives from BLM FFO, FIMO, Enduring, and WSP. No representatives from Navajo Nation chapter houses, grazing allottees, or other groups or citizens attended the meeting (Table 1.2)

Table 1.2. Individuals and Groups Invited to the On-Site Meeting

Name	Group
Charlie Barrett, Kendra Pinto	Earthworks
Thomas Singer, Erik Schlenker-Goodrich, Kyle Tisdale	Western Environmental Law Center
Mike Eisenfeld	San Juan Citizens Alliance
Jeremy Nichols, Rebecca Sobel	WildEarth Guardians

Name	Group
Anson Wright	Chaco Alliance
Lori Goodman	Diné Care
Don Schrieber	Devil Springs Ranch
Joe Trudeau	Center for Biological Diversity
Miya King-Flaherty	Sierra Club
Tweetie Blancett	Interested Public
Henry Wait	Pueblo of Isleta
Pinu'u Stout	Pueblo of San Felipe
Sonia Grant	Interested Public
Daniel Tso	Interested Public
Teran Villa	All Pueblo Council of Governors
Michael Casaus	New Mexico Wilderness Society
Samuel Sage	Counselor Chapter

1.6.3 Issues Identified for Analysis

Using internal and external scoping in accordance with guidelines set forth in the BLM NEPA Handbook (BLM 2008a), the BLM FFO developed a list of issues to analyze in detail in this EA. The key issues identified during agency scoping are summarized in Table 1.3. The impact indicators provided are used to describe the affected environment for each issue in Chapter 3, to measure change in the issue for different alternatives, and to assess impacts of alternatives.

Table 1.3. Issues Identified for Detailed Analysis

Issue Number	Issue Statement	Impact Indicator
Issue 1	How would emissions generated by equipment associated with the Proposed Action impact air quality?	Emissions
Issue 2	How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change?	Emissions
Issue 3	How would future drilling and completion operations associated with the Proposed Action impact water quality and quantity?	Water volumes Use of wells

1.6.4 Issues Identified but Eliminated from Further Analysis

As described in Section 1.6.3, agency scoping was utilized to determine the issues that require detailed analysis in this EA. Table 1.4 below includes a detailed explanation of remaining issues that were discussed but that will not be further analyzed in this EA. A checklist summarizing the BLM FFO's NEPA IDT discussions is included in Appendix G.

Table 1.4. Issues Identified but Eliminated from Detailed Analysis

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would ground-disturbing construction, operation, and maintenance activities from the Proposed Action impact cultural resources?	Impacts to cultural resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. There are no Chaco Culture Archaeological Protection Sites or United Nations Educational, Scientific and Cultural Organization World Heritage Sites within or near the proposed project area. A Class III Archaeological Survey (Navajo Nation Heritage and Historic Preservation Department [NNHHPD] No. HPD-22-660) was conducted in the proposed project area. No cultural sites were discovered. Two isolated occurrences were recorded, and none are eligible for the National Register of Historic Places. The BLM and NNHHPD determined that the proposed project will have no effect to historic properties (see Appendix G). In the event of a cultural resource's discovery during construction, construction activities would immediately cease in the immediate vicinity of the discovery, and Enduring would immediately notify the archaeological monitor, if present, or the BLM. The BLM would then ensure the site is evaluated. Should a discovery be evaluated as significant (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act of 1990, Archaeological Resources Protection Act), it would be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM. Details of the cultural resources survey of the Proposed Action, as well as results of Section 106 consultation and government-to-government consultation, are detailed in Chapter 4. With consideration of the above requirements, other design features, and best management practices (BMPs) provided in Appendix H, such as educating/informing all employees, contractors, and subcontractors that cultural sites are to be avoided and that it is illegal to collect, damage, or disturb cultural resources and may be punishable by law under the provision of the Archaeological Resources Protection Act (16 USC 470aa–mm), would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The Proposed Action would be in compliance with Section 106 of the National Historic Preservation Act.
How would ground-disturbing construction, operation, and maintenance activities from the Proposed Action impact paleontological resources?	Impacts to paleontological resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The Proposed Action is not located within a BLM-designated area for paleontology; however, the proposed project is within an area known for high potential for paleontological resources within the Nacimiento Formation (Potential Fossil Yield Classification 5). The BLM FFO geologist/paleontologist reviewed the project area and determined that there are no mapped localities nearby, the project would avoid outcrops where fossils are commonly found, and potential for encountering paleo resources is low; therefore, paleontological clearance has been obtained (see Appendix G). Project design features and BMPs (detailed in Appendix H) would mitigate impacts to paleontological resources to the point that detailed analysis is not warranted. The Proposed Action would be in compliance with the Paleontological Resources Preservation Act of 2009.
How would the construction and operation phases of the Proposed Action impact Special Designation Areas (SDAs)?	Impacts to SDAs from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area is not located within a BLM-designated SDA. Additionally, there are no Special Recreation Management Areas within a 10-mile radius of the Proposed Action. No impacts to SDAs are anticipated to occur; therefore, detailed analysis is not warranted.
How would the proposed project activities and surface disturbance impact BLM FFO designated fragile soils?	Topography generally dictates development within this region to occur in soils not designated as fragile. The BLM FFO has identified six soil types as fragile depending on percent of slope: Badland, Gypsiorthids-Badlands-Stumble Complex, Rock Outcrop-Travessilla-Weska Complex, Rock Outcrop-Vessilla-Menefee Complex, Pinavetes-Florita Complex, and Sparand-San Mateo Silt Loam. There is one soil type mapped within the project area: Dakota-Sheppard Shiprock association, rolling, which is well drained and non-hydric (Natural Resources Conservation Service 2023). Surface disturbance associated with the Proposed Action would avoid BLM FFO–designated fragile soils. The BLM's authority under 43 CFR 3100 would result in the application of measures to mitigate impacts to the physical and biological integrity of soils during future development.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would the Proposed Action including surface disturbance and/or presence of facilities impact the viewshed in the region?	Impacts to visual resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. BLM does not assign Visual Resource Management classification to non-BLM lands. However, the BLM determined that visual contrast on this project can be reduced by utilizing best management practices such as painting aboveground infrastructure the Juniper Green BLM Environmental Color to blend in with the predominantly sagebrush environment (see Appendix G). The nearest residences are located approximately 3,000 feet to the north and could potentially see development of the proposed project. There is an existing oil and gas facility that lies between the residences and the proposed project that may lessen visual impacts from construction activities; visual impacts from construction would be temporary for a duration of approximately 3 to 5 months. Project design features and BMPs (detailed in Appendix H) such as any lighting installed would be downward-facing or shielded where possible and limited to those needed for safety during construction and operations would mitigate potential impacts to visual resources to the degree that detailed analysis is not warranted.
How would lighting associated with construction activities from the Proposed Action impact dark skies within the surrounding area?	The proposed project area is approximately 15 miles northeast of Chaco Culture National Historical Park. The BLM FFO does not have established dark skies management areas in the FFO management area; however, it is assumed that visual impacts from the development of the Proposed Action would not be visible to the naked eye or within line of sight from Chaco Cultural National Historic Park due to the distance and topographical constraints (BLM 2021a); thus, the Proposed Action would not impact stargazing from that area. Lighting associated with the construction phases of the proposed project would be temporary and/or limited to that needed for safety during construction and operations. Any permanent lighting associated with the aboveground appurtenances would be downward-facing or shielded where possible as described above. Project design features and the BMPs outlined in Appendix H would mitigate impacts to dark skies to a degree that detailed analysis is not warranted.
How would traffic, public safety, and noise issues associated with the development of the Proposed Action impact local residences or communities?	To mobilize construction equipment to the proposed project area, it is assumed that Enduring would travel south from Bloomfield, New Mexico, along U.S. Highway 550 and turn onto County Road 7890 for approximately 3.9 miles to an existing resource for 0.3 mile to the proposed access road. Construction equipment would consist of heavy and light vehicles, including 22 to 140 round trips per day during construction, drilling, and/or completions, two to four round trips during reclamation, and a maximum of three vehicle round trips per day during the first year of operations and maintenance and decreasing to one round trip per day after Year 3 of production (Enduring 2023a). There are 24 residences along County Road 7890 that may temporarily experience increased traffic during the construction phase (4–5 months), which would decrease during the operations and maintenance phase as described above. The BLM determined that project-specific design features (detailed in Appendix H), have been established to minimize potential vehicle collisions due to increased traffic. These design features include posting signage and instructing construction personnel on safe driving practices, thus reducing the construction impact to local residences and the Nageezi community. The closest residences from the proposed project area are located approximately 3,000 feet (0.5 mile) north of the proposed well pad; these residences could be impacted by increased noise from the development of the Proposed Action. Current noise levels in residential areas are assumed to be a mean value of 40 A-weighted decibel (dBA) average noise level (U.S. Environmental Protection Agency 1974, 1978). Construction noise levels would increase from 40 dBA to 50 dBA at 3,000 feet (La Plata County 2002). Noise levels from the well pad during the operations phase would dissipate to ambient noise levels at 1,000 feet; therefore, the residences located at 3,000 feet of the Proposed Action would not be impacted. The BLM determined that the Proposed Action adheres to Notice to Lessees (NTL) 04-2-FFO, Management of Sound Generated by Oil and Gas Production and Transportation, which states that noise levels are not to exceed 48.6 dBA over a continuous 24-hour period; the Notice to Lessees does not apply to transient operations such as construction activities (BLM 2004). Project design features and BMPs, provided in Appendix H, would mitigate potential impacts to traffic, public safety, and noise to the degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would the Proposed Action impact environmental justice communities?	Environmental justice is an important criterion of analysis because minority communities are often impacted disproportionately by adverse impacts such as noise, light pollution, dust, and emissions. These communities are not only often impacted to a disproportionate degree compared to other communities, but they are less able to avoid impacts by moving or apportioning extra funds for safety measures. The BLM has considered the aforementioned adverse impacts and has developed the following criteria to determine the radius of impact; - Air Emissions (hazardous air pollutants): 2,000 feet, (CSU, 2019) - Noise: 2 miles, NTL 04-2 FFO - Visual (light pollution): 3 miles (BLM VRM Manual 8400; minimum foreground distance) Based on the above analysis, and the analysis in the previous issue statement, there would be short-term impacts during construction such as fugitive dust and increased traffic that may be felt more by the residents in close proximity to future potential development. The BLM recognizes that its assessment of environmental justice impacts may not reflect the perspective of the environmental justice populations and/or environmental justice communities themselves and thus encourages operators to implement an outreach program with surrounding communities. Design features (detailed in Appendix H) include measures to reduce dust, noise, and light pollution, and to limit surface disturbance to protect natural and cultural resources, as well as the type of lighting (limited to downcast lighting with covers for safety purposes only). The BLM would ensure that all laws, regulations, and policies are adhered to for the life of the Proposed Action. Project design features (detailed in Appendix H) would further mitigate impacts to any nearby residents to a degree that detailed analysis is not warranted. The proposed project would be in compliance with Executive Order 12898. For additional Environmental Justice analyses see Appendix K for additional details.
How would the Proposed Action impact range improvements and livestock mobility associated with the existing allotments within the Proposed Action?	Impacts to rangeland resources, including grazing allotments, from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The Proposed Action is located within the 103,305-acre Kimbeto Community Allotment (No. 6013). The Proposed Action would disturb approximately 7.54 acres, which is less than 0.01% of the total allotment's acreage. The Proposed Action would not directly impact any existing range improvements or long-term trend plots. Long-term trend plots are monitoring plots the BLM uses to conduct land health evaluations to assess present and potential rangeland resources, provide data to identify and support needed management actions, and establish baselines for monitoring and evaluation (BLM 2009). With consideration of the design features in Appendix H, impacts to range improvements and livestock would be mitigated to the point that detailed analysis is not warranted.
What is the potential for the spread of noxious weeds and invasive plants as a result of the Proposed Action?	The spread of weeds associated with BLM FFO–wide oil and natural gas development was analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA Environmental Consultants (SWCA) biologists conducted noxious weed surveys for the Proposed Action on September 14, 2022. During the survey, two New Mexico Department of Agriculture (NMDA)–listed species were observed near the beginning of the GLU 053 proposed access road: saltlover (*Halogeton glomeratus*) and cheatgrass (*Bromus tectorum*) (SWCA 2022). Saltlover is an NMDA-listed Class B noxious weed species, and cheatgrass is an NMDA-listed Class C noxious weed species and was sparsely present. Additionally, prickly Russian thistle (*Salsola tragus*) was also observed during the biological survey near the beginning of the proposed access road. While this species is not a designated noxious weed, it has been noted within the BLM FFO management area as a species that may cause economic or environmental harm or harm to human health or safety. Enduring would follow all guidance outlined in its Pesticide Use Proposal (PUP) approved by the BLM FFO. The Surface Use Plan of Operations (SUPO) developed for this project details that a weed management plan and PUP will be provided for noxious and invasive weed control on location. Enduring will be responsible for weed control on location and actions that are associated with the proposed project. With consideration of the above and other project-specific design features detailed in Appendix H, the potential spread of noxious weeds would be mitigated to the degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the Federal Noxious Weed Act and New Mexico Executive Order 00-22.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
What vegetation impacts would occur as a result of proposed ground-disturbing activities?	Impacts to upland vegetation from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area consists of three land cover types as described and mapped by the Southwest Regional Gap Analysis Project (SWReGAP); Colorado Plateau Pinyon-Juniper Woodland (0.5 acre [6.2%]), Inter-Mountain Basins Big Sagebrush Shrubland (0.2 acre [2.5%]), and Inter-Mountain Basins Semi-Desert Shrub Steppe (6.9 acres [91.3%]) (SWReGAP 2004). These vegetation types are the predominant vegetative communities within the BLM FFO region (SWReGAP 2004). The dominant vegetation community consists of sagebrush shrublands, with foliar cover of approximately 35%; the remaining area was 65% bare ground, 5% grass, less than 1% forbs, and less than 1% tree cover (SWCA 2022). Vegetation clearing associated with the Proposed Action would impact <0.01% of these vegetation communities within the BLM FFO. With consideration of the design features provided in Appendix H, impacts to vegetation would be mitigated to the degree that detailed analysis is not warranted.
How would vegetation removal during construction activities from the Proposed Action impact suitable foraging for wildlife and nesting habitat for migratory birds?	Impacts to wildlife (including migratory birds) from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. Vegetation clearing associated with the Proposed Action would impact <0.01% of present vegetation communities within the BLM FFO (see above). Migratory bird nest surveys would be performed if construction activities are scheduled to occur during the migratory bird nesting season (March 1–August 31 [Navajo Nation Department of Fish and Wildlife]; May 15–July 31 [BLM FFO]). With consideration of the above requirements and other design features in Appendix H, impacts to foraging for wildlife and migratory birds would be mitigated to a degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the Migratory Bird Treaty Act (MBTA).
How would vegetation removal and increased noise during construction activities from the Proposed Action impact federally listed threatened, endangered, and candidate species?	Impacts to federally listed species from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation database (USFWS 2022) lists four endangered species (Mancos milkvetch [*Astragalus humillimus*], Colorado pikeminnow [*Ptychocheilus Lucius*], Razorback sucker [*Xyrauchen texanus*], southwestern willow flycatcher [*Empidonax traillii extimus*]); two threatened species (Mesa Verde cactus [*Sclerocactus mesae-verdae*], yellow-billed cuckoo [*Coccyzus americanus*]); and one candidate species (monarch butterfly [*Danaus plexippus*]) that could potentially occur in San Juan County. SWCA performed a biological survey of the proposed project on September 14, 2022, and no suitable or potential habitat for these species was observed (SWCA 2022). The proposed project area does not include critical habitat for any federally listed species (USFWS 2015). However, the monarch butterfly, a candidate species, could potentially forage within the proposed project area; no monarch butterfly individuals were observed during the general biological survey in September 2022. Although monarch butterflies could use the proposed project area for foraging, no milkweed species (*Asclepias* spp.), which are required for egg laying, were observed. Therefore, it is unlikely that breeding efforts of the species would be impacted by the Proposed Action. Removal of vegetation within the proposed project area could reduce the availability of flowering plants and thus possibly impact the species' food sources. However, seed mixtures used for reseeding often contain nectar-producing species that could provide food sources for adult butterflies during interim reclamation. The Proposed Action is not likely to contribute to a trend toward federal listing or cause a loss of viability to the population or species because, although the project would impact approximately 7.54 acres initially, approximately 5.34 acres of which would undergo interim reclamation, including reseeding, resulting in permanent impacts to only 2.2 acres. Additionally, the Proposed Action would not use any surface water that could affect federally listed threatened, endangered, or candidate species; all groundwater used for pipeline construction and/or dust abatement would be taken from one or more existing private water wells or private water holes, such as the Blanco Trading Post Water Well (point of diversion number SJ-4348), which is accessed from the Uinta-Animas aquifer at depths of less than 2,500 feet and is deemed potable (<1,000 milligrams/liter total dissolved solids) and suitable for vegetation (U.S. Geological Survey 2023). There would be no new water depletions associated with the Proposed Action. Further detailed analysis is not warranted. The Proposed Action would be in compliance with the Endangered Species Act and with the PRMP/FEIS and associated biological assessment (BLM 2002). No further consultation with the USFWS is required.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would vegetation removal and increased noise during proposed construction activities from the Proposed Action impact plant and animal species listed under the Navajo Nation Endangered Species List (NESL)?	The Navajo Nation Department of Fish and Wildlife (NNDFW) Data Response (DR) lists nine NESL species as having the potential to occur in the proposed project area: Aztec gilia (*Aliciella formosa*), Clover's cactus (*Sclerocactus cloverae*), San Juan milkweed (*Asclepias sanjuanensis*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), Kit fox (*Vulpes macrotis*), mountain plover (*Charadrius montanus*), southwestern willow flycatcher, and western burrowing owl (*Athene cunicularia*). The proposed project area is located within one NNDFW Biological Resource Land Use Clearance Policies and Procedures (RCP) area (Area 3: Less Sensitive Area), which has the fewest restrictions on development (NNDFW 2022). Based on current distribution, habitat requirements, and the results of the general biological surveys conducted by SWCA, eight of the nine NNDFW DR-listed species were found unlikely to occur in the proposed project area. However, the remaining NNDFW DR-listed species (golden eagle) was found to occur or have the potential to occur in the proposed project area. See the biological evaluation on file with the BLM FFO for additional details; below is a summary of the results (SWCA 2022). **Golden eagle**: The golden eagle is listed as an NESL Group 3 species. This species is also protected under the Bald and Golden Eagle Protection Act and MBTA. This eagle breeds from Alaska to central Mexico. Golden eagles are year-round residents in New Mexico, with known breeding locations occurring throughout the state (New Mexico Avian Conservation Partners 2017). During the breeding or nesting season (January 15 to July 15), golden eagles occur in areas of mountain cliffs or canyons adjacent to open desert or grassland vegetation communities that provide habitat for their primary prey of cottontails (*Sylvilagus* sp) and jackrabbits (*Lepus* sp.). Nests are typically on cliffs greater than 30 meters high, although shorter cliffs of 10 meters high are also infrequently used (NNDFW and Navajo Natural Heritage Program 2020). During the winter, golden eagles forage in open or shrubland habitats. Agricultural areas are often avoided by these eagles (New Mexico Avian Conservation Partners 2017). No golden eagles were observed during the general biological survey. SWCA biologists also did not observe any appropriate nesting sites in the immediate vicinity of the proposed project area; however, this species has the potential to forage in the proposed project area year-round. Per BLM habitat maps and biologist review of satellite imagery, the nearest mapped golden eagle nest is located approximately 14 miles northeast of the proposed project area (BLM 2018). There are no steep-walled canyons or cliffs within the vicinity of the proposed project area. Due to the mobility of adult birds, it is unlikely that golden eagles would be directly harmed by the proposed project. Noise and visual disturbances associated with project construction could temporarily deter this species from utilizing the proposed project area and immediately adjacent land. Once construction has been completed, the temporary disturbance would abate. The Proposed Action would be constructed adjacent to existing roads and oil and natural gas infrastructure, reducing impacts to these species. If ground- or vegetation-disturbing activities are scheduled to occur within the migratory bird nesting season (March 1–August 31 [NNDFW]; May 15–July 31 [BLM FFO]), preconstruction migratory bird nest surveys of the proposed project area would be performed. See also the biological survey report on file with the BLM FFO and NNDFW for additional details (SWCA 2022). Project design features (detailed in Appendix H) would mitigate potential impacts to NESL species to the degree that detailed analysis is not warranted.
How would storage of hydrocarbon liquids from the Proposed Action impact drinking water sources or surface waters?	The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. The total depth of the proposed well bores would be between approximately 6,000 and 11,000 feet below the ground surface. The producing zone targeted by the Proposed Action is well below any economically viable underground sources of drinking water (typically shallower than 2,000 feet). All chemicals stored on-site would be properly contained. On-site containment structures such as containment dikes, containment walls, and drip pans would be impervious and would be maintained to prevent a discharge to waters of the U.S. BMPs would ensure that no materials are discharged into downstream jurisdictional water features. Project design features (detailed in the project's SUPO on file with the BLM FFO) would mitigate impacts to drinking water and surface waters to the degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
What is the potential for impacts to oil and gas/energy production from the Proposed Action?	Impacts to oil and natural gas resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The commitment of these resources is also analyzed at the lease level. The Proposed Action would contribute to future mineral development within the BLM FFO management planning area. Further detailed analysis is not warranted.
What are potential impacts from waste (hazardous materials) associated with ground-disturbing activities from the Proposed Action?	Project design features (detailed in Appendix H), as well as the adherence to Onshore Oil and Gas Operations regulations (43 CFR 3160) would mitigate impacts associated with waste to the degree that detailed analysis is not warranted.
How would the construction and operation phases of the Proposed Action impact recreation and access to BLM land (for uses such as hunting, fishing, shooting, etc.)?	Impacts to recreation from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area is not located within a designated recreation SDA. Dispersed recreation opportunities similar to those found within the proposed project area are readily available across a wide area near the Proposed Action. The Proposed Action would not restrict recreation opportunities; therefore, detailed analysis is not warranted.
How would construction activities associated with the Proposed Action impact public access to BLM land?	Impacts to public access to BLM land from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. While public access roads and ROWs are present in the immediate area and would be used by personnel during all phases of the proposed project, access to the public would not be restricted (other than the usage of potential, temporary flaggers, or other safety features). The presence of the proposed project components would likewise not impact public use in the area. Additionally, the use of mitigation measures would minimize the impacts and protect the existing ROWs. With standard design features and stipulations, no further analysis is needed.

2 Alternatives

2.1 Alternative 1 – Proposed Action Alternative

The decision to be made is the BLM's approval, with concurrence of FIMO, of Enduring's APDs as submitted, with conditions of approval, stipulations, project-specific design features, and applicable mitigation measures that are developed as a result of this analysis. As a result of BLM approval, the proposed project would take place. Enduring would construct the GLU 053H well pad and access road to said pad; horizontally drill and operate a total of six oil and natural gas wells; construct and operate a well-tie pipeline corridor with three trenches that contain one liquids, one water, and one natural gas pipeline, which would transport oil and produced water, and natural gas, respectively, to existing infrastructure, one fiber optic line, and electric power lines. A temporary lay-flat waterline would be used to transport water to and from existing infrastructure during well completions. Each component is described in more detail in Sections 2.1.1 through 2.1.5 (see below).

Details of the proposed project can be found in the project's Surface Use Plan of Operations (SUPO) on file with the BLM FFO, including additional construction and maintenance activity details.

The Proposed Action would result in a total of approximately 7.54 acres of new surface disturbance, located entirely on Navajo Allotted surface. Of the 7.54 acres, approximately 5.34 acres would be fully reclaimed (recontoured and reseeded) for soil and vegetative stabilization during interim reclamation. The remaining 2.2 acres would remain disturbed throughout the life of the project and would be reclaimed when the wells are abandoned. Surface disturbance associated with the Proposed Action is summarized in Table 2.1.

Table 2.1. Proposed Action Surface Disturbance

Project Feature	Landowner/Land Manager	Dimensions of Project Features	New Surface Disturbance (acres)	Interim Reclamation (acres)	Final Reclamation (acres)
Well pad	Indian Allotted	650 feet × 415 feet	6.2	4.8	1.4
Access road and road pullout	Indian Allotted	1,041 feet	0.8	-	0.8
Buried pipelines	Indian Allotted	1,267 feet	1.2	1.2	-
TUPA	Indian Allotted	40 feet × 75 feet	0.1	0.1	-
Lay-flat pipeline	Indian Allotted	1,267 feet	-	-	-
Deduction for overlapping components			0.7	0.7	-
Total†*	-	-	***7.54***	***5.34***	***2.2***

* Total includes reduction in surface disturbance from overlapping project components.

† Totals may vary due to rounding discrepancies.

2.1.1 Well Pad and Construction Zone

The proposed well pad measures 650 × 415 feet (6.2 acres), including a 50-foot-wide construction zone surrounding the well pad perimeter. The working area for the pad (approximately 1.4 acres) would remain disturbed throughout the life of the project; this acreage would be reclaimed during final reclamation. The remaining disturbed area of the well pad and construction zone (4.8 acres) would be recontoured and reseeded during interim reclamation. See Table 2.1 for the proposed project's components and associated surface disturbance.

The production equipment for the well pad would include two compressor engines, four generator engines, eight process heaters, seven 500-barrel (bbl) oil storage tanks, one 500-bbl produced water storage tank, one 750-bbl separator tank, two enclosed combustion devices, and associated pneumatic controls.

2.1.2 Access Road

The proposed access road would be constructed in accordance with the BLM Gold Book Standards and BLM 9113-1 (Roads Design Handbook [BLM 2011]) and BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook [BLM 2015c]). The access road for the GLU 053H well pad would measure approximately 1,041 feet long on BLM FFO. The access road would be constructed within a 30-foot-wide corridor. The 14-foot-wide running surface of the access road with the bottoms of the 8-foot-wide bar ditches along each side of the running surface would remain disturbed throughout the life of the project; this acreage would be reclaimed during final reclamation.

One irregularly shaped road pullout (approximately 0.07 acre) would be constructed alongside the access road and would remain disturbed throughout the life of the project; final acreage would be reclaimed during final reclamation. See Table 2.1 for the proposed project's components and associated surface disturbance.

2.1.3 Buried Pipelines

The Proposed Action would involve construction and maintenance of one approximately 1,267-foot-long pipeline corridor. Enduring would excavate up to three trenches within the 40-foot-wide pipeline corridor, which would be offset from one another by 5 feet. Each trench would consist of up to three steel and/or poly gas/liquids pipelines up to 12 inches in diameter. In addition, a 6-inch or less poly or steel water pipeline, fiber optic line, and electric power line would be placed in one of the three trenches. The pipelines, fiber optic lines, and electric power lines will connect to Enduring's existing pipelines, fiber optic lines, and electric lines. The pipeline corridor parallels the entire length of access road, which reduces the surface disturbance to a 20-foot-wide corridor. Overlapping acreages where the pipelines parallel the existing and/or new access roads were deducted from the total disturbance acreage in Table 2.1. All pipeline disturbance would be recontoured and reseeded during interim reclamation.

2.1.4 Aboveground Temporary Lay-Flat Line

One temporary lay-flat water pipeline made of high-density polyethylene (HDPE) would be used to transport water during well drilling and completion activities to the proposed project. The temporary lay-flat water pipeline, 1,267 feet long, would connect the GLU 053H well pad to existing infrastructure. The lay-flat water pipeline would be temporarily laid on the surface and within an existing, previously disturbed ROW, thereby contributing no additional disturbed area. The temporary lay-flat water pipeline would be removed after the proposed well drilling and completion activities are complete.

2.1.5 Temporary Use Permit Area

One TUPA would be constructed on both sides of the proposed access road, at the intersection of the proposed access road and existing resource road to provide an additional turning area (turning apron) for the anticipated large truck traffic. The turning apron would be triangular in shape measuring 40 feet wide at the widest and would taper down in size for approximately 75 feet on each side of the start of access road and pipeline corridor. The TUPA would measure a total of approximately 0.06 acre; all TUPA disturbance would be recontoured and reseeded during interim reclamation.

2.1.6 Construction, Drilling, and Completion

Prior to construction, the Proposed Action would be staked to ensure that all activity would be confined to authorized areas. The pipeline centerline would be staked at 100- to 200-foot intervals, along with the approved TUPA, to delineate the limits of the pipeline construction corridor. When applicable, BLM boundaries would be marked with station numbers at the entrance to and exit from BLM-managed land. Staking would be maintained for the duration of construction activities.

The construction phase is anticipated to begin in June 2023 if the BLM approves the APDs. The proposed project would take approximately 4 to 5 months to complete, which includes access road and well pad construction, pipeline construction, and well drilling and completion. Within the approximately 4 to 5 months of construction activities, it would take 1 week to construct the access road and well pad, approximately 4 weeks for pipeline construction, and 2 to 3 weeks per wellhead (which could total 11–14 weeks for six wells) (Enduring 2023b). Enduring is proposing the well drilling activities within a closed loop system. Details of well drilling and completion activities can be found in Appendix J.

Equipment mobilization and demobilization would consist of 10 to 17 transport truckloads to deliver and remove heavy equipment to the proposed project area; this equipment would remain on-site until construction is complete. During construction of the access road, well pad, and pipeline corridor, it is estimated that up to 10 to 20 construction personnel would be on-site 7 days per week between the hours of 6:00 a.m. and 6:30 p.m.; they would be transported to and from the site by five to 10 standard-size pickup trucks. Construction personnel would be on-site 24 hours per day/7 days per week during the well drilling and completion phase (1–2 weeks per well) for the proposed project.

Construction methods would be in compliance with BLM FFO Gold Book Standards (BLM and U.S. Forest Service [USFS] 2007). Construction equipment may include chainsaws, a brush hog, scraper, maintainer, excavator, dozer, backhoe, hydrovac, welder, trencher, side-boom, and miscellaneous specialty equipment. Standard drilling operation equipment includes a drilling rig with associated equipment, temporary office trailers equipped with sleeping quarters for essential company personnel during the drilling and completion phase, toilet facilities, and trash containers.

Following construction activities, interim reclamation would occur within portions of the proposed project area not required for long-term operation. Enduring would adhere to any conditions required by the BLM FFO. A list of design features, also captured in the SUPO, and best management practices (BMPs) that Enduring has committed to is provided in Appendix H.

2.1.7 Operation

The projected in-service date for the Proposed Action is August 2023, and the anticipated lifespan is 20 years.

2.1.8 Final Reclamation

When a proposed well(s) is no longer needed, the well(s) would be plugged and abandoned following procedures approved by the BLM. Final reclamation of the pad would be performed once all well(s) on the well pad have been plugged and abandoned. Additional details are provided in the project SUPO and Reclamation Plan on file with the BLM.

2.2 Alternative 2 – No Action Alternative

Under this alternative, the BLM would deny approval of the APDs. Enduring would retain its lease rights, but the Proposed Action would not occur. Oil and natural gas production in the area would continue at its

current rate, and other current land use in the area would continue. The No Action Alternative is presented as the baseline for impacts analysis in Chapter 3 (Affected Environment and Environmental Consequences).

2.3 Alternatives Considered but Not Analyzed in Detail

Alternatives to the Proposed Action are developed to explore different ways to accomplish the purpose and need while minimizing environmental impacts and resource conflicts and meeting other objectives of the BLM FFO RMP (BLM 2003a, 2003b). Consistent with BLM NEPA Handbook H-1790-1, the agency "need only analyze alternatives that would have a lesser effect than the proposed action" (BLM 2008a:80). Those with greater adverse resource impacts or those that are not feasible because of existing physical constraints or infrastructure are not brought forward for detailed analysis in this EA.

Prior to identifying the proposed project location, the BLM and Enduring reviewed resource data to identify avoidance areas for previously recorded cultural resources sites, areas with potential for paleontological resources, sensitive habitats, hydrological features, and other issues. Enduring then worked to locate the proposed project area adjacent to existing disturbance, primarily associated with the well pad, access road, and pipelines, to the greatest extent possible.

2.3.1 Applicant's Pre-Planning and Well-Siting Process

In developing the initial proposed well pad location, Enduring conducted pre-planning siting tasks for the placement of the proposed wells and infrastructure, which included civil surveyor, topographic, archaeological, natural resource, and geologic considerations. This analysis was conducted at both a desktop level and a field reconnaissance level. A brief overview of the pre-planning process and alternative drilling locations considered is provided below.

For the proposed well pad location, a surface hole location (SHL) polygon, SHL feasibility map, and SHL polygon shapefile were created for Enduring's preferred wellhead locations. The polygon dimensions and the ideal wellhead footages were developed based on the following parameters:

- ***New Mexico Oil and Gas Conservation Commission Project Area Setbacks:*** Enduring's goal is to produce hydrocarbon resources in the most responsible and efficient way possible. Therefore, it is important to place the SHL far enough away from the section line so that when the horizontal lateral reaches the intended formation, it is as close to the outer perimeter of the project area as the setback allows (typically 330 feet from the outer perimeter of the project area). This allows for maximum recovery of the resource in a project area, prevents waste of hydrocarbon resources, and honors correlative rights.
- ***Technical Limitations of Horizontal Drilling***: For horizontal wells drilled to the target formation, there is a drilling and completion limitation of a maximum reach of 1,100 feet. The 1,100-foot maximum reach limitation is based on technical and safety risks that, if exceeded, can cause strain on drilling equipment and compromise the integrity of casing and potential resource waste.
- ***Resource Recovery Considerations:*** The ideal SHL is outside the project area to allow sufficient distance to land the lateral well bore at the current setback distance and to maximize resource recovery. A divergence of 250 feet from the ideal SHL would result in a 5.5% waste in resource recovery, and a divergence of 500 feet from the ideal SHL would result in an 11% waste in resource recovery for a 160-acre project area. If more than 11% of the resource could not be recovered, Enduring would consider alternate ways to develop the resource.

- ***Topography Considerations***: Topography was also considered while investigating the ideal SHL, maximum horizontal reach, and setbacks. The proposed well pad location is located adjacent to an existing resource road (San Juan County Road 7890) to minimize surface impacts.
- ***Correlative Rights***: In contrast to moving the SHL closer to (or within) the project area, if the SHL is moved too far away from the project area, there is the potential for correlative rights issues.

2.3.2 Alternative Locations Considered and Eliminated

With the above-listed SHL factors in mind, Enduring identified a drilling window (or tolerable well placement area), an ideal well placement location, and topographical constraints, and the proposed well locations were identified and proposed via a notice of staking to the BLM. SWCA Environmental Consultants (SWCA) conducted a field reconnaissance and subsequent biological survey during the project staking in September 2022 to identify potential natural resource issues and avoid known resources during the staking process. The field reconnaissance and biological survey did not identify any natural resource issues that would require adjustments to be made to avoid impacts to resources. The Division of Conservation Archeology conducted a cultural resources survey of the proposed project in June 2021; no cultural resources were observed and therefore no impacts to cultural resources at the proposed location are anticipated.

The BLM reviewed all possible well pad, access road, pipeline, and TUPA locations within the drilling windows in consideration of environmental constraints and feasibility to avoid impacts, particularly in regard to cultural resources and Clover's cactus. No other proposed locations or further adjustments were identified that would result in fewer impacts to the human environment while also meeting the purpose and need for the project. Therefore, only the Proposed Action (as presented) and No Action Alternative are analyzed in detail.

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3 Affected Environment and Environmental Consequences

3.1 Cumulative Impacts Scenario

The BLM FFO encompasses approximately 7.8 million acres within the planning area. This includes 1.4 million acres of BLM surface and 2.4 million acres of federally managed minerals, which are managed by the conditions and decisions of the BLM FFO RMP (BLM 2003a).

Most of the oil and gas development within the FFO takes place within the New Mexico portion of the San Juan Basin. The San Juan Basin is an asymmetrical syncline that extends from northwestern New Mexico into southwestern Colorado. Roughly circular in shape, it is approximately 200 miles long and 130 miles wide (including its Colorado portion), covering 15,000 to 25,000 square miles (BLM 2003a). The San Juan Basin has been a producing oil and natural gas field since the early to middle 1900s and is characterized by overlapping uses for oil and gas, grazing, and dispersed recreation. Within the New Mexico portion of the San Juan Basin (which includes portions of the FFO and the Rio Puerco Field Office [RPFO]), subsurface Mancos shale and Gallup sandstone are the primary target formations (hereafter referred to collectively as the Mancos-Gallup Formation) for developable oil and natural gas resources (Crocker and Glover 2018, 2019).

The following sections outline the reasonably foreseeable environmental trends and planned actions that are closely related to the Proposed Action. In general, the BLM is able to identify and disclose reasonably foreseeable environmental trends and planned actions expected to occur over the next 20 years, as this time period is aligned with operation of the Proposed Action. Since the majority of the FFO's federal mineral estate and fluid mineral resources occur within the Mancos-Gallup Formation of the San Juan Basin, related reasonably foreseeable development (RFD) scenarios applicable to this decision are specific to the resources of the Mancos-Gallup Formation. As such, a focused analysis area is also considered where applicable, consisting of 4.8 million acres of FFO- and RPFO-managed land overlaying the Mancos-Gallup Formation (see Section 3.1.1).

Additional information related to environmental impacts of current BLM management decisions can be found in the applicable RMP and Environmental Impact Statements (BLM 2003a, 2003b, 2014, 2015a, 2015b). More information related to air and water resources environmental trends is available in the 2021 BLM Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas and Kansas (BLM 2021b) and 2022 Water Support Document for Oil and Gas Development in New Mexico (BLM 2022a). The BLM acknowledges that these documents are incorporated by reference into the EA.

3.1.1 Oil and Gas Activities

The Mancos-Gallup Formation area includes approximately 4.8 million total acres (4.2 million acres in the FFO region and 600,000 acres in the RPFO region) of all mineral ownership types in portions of San Juan, Rio Arriba, Sandoval, and McKinley Counties (Crocker and Glover 2018, 2019). Federal oil and gas minerals in the Mancos-Gallup Formation cover 2.7 million acres, primarily in the FFO region (2.1 million acres) but also in a small area of the RPFO region (500,000 acres)[1] in northwestern Sandoval

[1] Due to a lack of data concerning the acreage of federal mineral estate within the Mancos-Gallup Formation area portion of the RPFO region, this value was based on total federal mineral estate within the Sandoval County portion of the RPFO region. Therefore, this is likely an over-estimate since a portion of Sandoval County in the RPFO region is outside of the Mancos-Gallup Formation area.

County (where most of the past and present RPFO-authorized oil and gas development has taken place) (BLM 2003a, 2012; Crocker and Glover 2018, 2019). Of the federal minerals, 1.9 million acres (70%) are leased (including 1.8 million in FFO and 75,000 in RPFO) and 725,000 acres (27%) are currently unleased (Crocker and Glover 2018, 2019). Native American–owned oil and gas minerals (allotted and tribal) cover 1.4 million acres within the FFO including San Juan, Rio Arriba, Sandoval, and McKinley Counties (Crocker and Glover 2018).

The FFO Mancos-Gallup RFD scenario (2018 RFD) (Crocker and Glover 2018) estimates existing long-term surface disturbance across the FFO portion of the Mancos-Gallup Formation from oil and gas development to be 56,500 acres (from 37,300 wells). The 2018 RFD projects 3,200 new oil and gas wells within the planning area in the next 20 years (2018–2037), the majority of which (2,300) are predicted to be horizontally drilled. Total anticipated new surface disturbance is estimated at approximately 18,500 acres for the FFO Mancos-Gallup RFD scenario (see Table 3.1) (Crocker and Glover 2018).

Additionally, the RPFO RFD scenario (2019 RFD) (Crocker and Glover 2019) estimates existing long-term surface disturbance within the RPFO administration portion of the Mancos-Gallup Formation to be 590 acres (from 919 wells) between 2020 and 2039. To date, most of the drilling in the RPFO has occurred in the portion of Sandoval County that is within the Mancos-Gallup Formation, and most of the projected future development is expected to occur in this same area (BLM 2021b; Crocker and Glover 2019). The RPFO RFD projects 200 new oil and gas wells to occur within the Mancos-Gallup Formation over the next 20 years (2020–2039), the majority of which (160) are predicted to be vertically drilled. Total anticipated new surface disturbance for the RPFO RFD scenario is estimated at approximately 2,160 acres (see Table 3.1) (Crocker and Glover 2019).

With consideration of both RFDs, the total amount of surface disturbance associated with past and planned oil and gas development is estimated to be 77,750 acres of surface disturbance (see Table 3.1). This represents a continued trend of human use of land and mineral resources. Such effects would correspond to the resources present at the location of development 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 pollutant emissions, 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 3.2 through 3.4 disclose the effects of these environmental trends and planned actions related to oil and gas development on resource issues analyzed in detail. Table 3.1 presents a summary of quantifiable surface disturbances associated with past, present, and reasonably foreseeable future actions within the New Mexico portion of the San Juan Basin.

3.1.2 Other Mineral and Energy Development

In addition to oil and gas development, BLM FFO–managed land provides additional surface and subsurface resources utilized for energy. The land also contains saleable and locatable minerals such as coal, sandstone pits, sand, gravel, and baked shale. Active and potential mineral operations have the potential to operate at a large commercial scale, aboveground and underground facilities, and/or smaller operation facilities of less than 5 acres.

Energy development includes BLM-issued ROWs for facilities such as water lines, transmission lines, roads, communication sites, or pipelines. Energy generation includes, but is not limited to, wholesale power generation and renewable energy such as solar and wind, as well as commercial-scale carbon-capture utilization and sequestration facilities, although not much information is available for this type of energy generation.

Energy generation and mineral development on federal land or mineral estate is expected to continue under the management and conditions outlined in the BLM FFO RMP (BLM 2003a). This represents a continued trend of anthropomorphous use of land and mineral resources. Such effects would correspond to the resources present at the location of development 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 3.2 through 3.4 disclose the effects of these environmental trends and planned actions closely related to other mineral and energy development on resource issues analyzed in detail.

3.1.3 Municipal and Other Land Uses

Based on trends of past and present activity, it can be expected that BLM FFO–managed land would continue to be used at current or slightly increased levels for municipal and other land uses such as urban development, agriculture, and grazing. Urban development is focused near the communities of Farmington, Aztec, Bloomfield, Blanco, Kirtland, Gobernador, Nageezi, Lindrith, and Counselor. Future expansion is expected in Farmington, Aztec, and Bloomfield, including development for roads, utilities, and communication lines. Within the FFO planning area, there are also 208 proximal grazing allotments that collectively cover approximately 1.4 million acres of BLM-managed land (BLM and BIA 2020). The BLM anticipates grazing to continue at current rates.

Such 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 pollutant emissions, 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 3.2 through 3.4 disclose the effects of these environmental trends and planned actions related to municipal and other land uses on resource issues analyzed in detail.

3.1.4 Quantification of Landscape Disturbance

To provide a focused and quantitative analysis of the contribution of the Proposed Action to the identified landscape-level environmental trends and planned actions, Table 3.1 summarizes the estimated acreage of landscape disturbance associated with energy and mineral development, as well as other land uses, within those portions of San Juan, Rio Arriba, Sandoval, and McKinley Counties that overlap the Mancos-Gallup Formation where oil and gas development such as the Proposed Action is most likely to occur. The information provided in Table 3.1 presents a quantification of past and planned actions that are associated with surface disturbance and correlated contribution to effects and environmental trends described above. Approximately 131,590 acres (2.7%) of the portions of the San Juan, Rio Arriba, McKinley, and Sandoval Counties that overlap the Mancos-Gallup Formation (4.8 million acres) have been previously disturbed by energy and mineral development as well as other land uses. Future planned actions are estimated to result in an additional 25,600 acres (0.53%) of disturbance within the counties that overlap the Mancos-Gallup Formation, for a combined total of 157,250 acres (3.3%) of surface disturbance. Table 3.1 presents a quantification of the relative contribution of the Proposed Action to the landscape disturbance associated with existing environmental trends and planned actions.

Table 3.1. Past, Present, and Reasonably Foreseeable Future Estimated Landscape Disturbance within the Analysis Area

Analysis Area		Acreage
FFO Planning Area		7,828,509
Mancos-Gallup Formation (portions of San Juan, Rio Arriba, McKinley, and Sandoval Counties)		4,800,000
Disturbance Trends within the Mancos-Gallup Formation Analysis Area	**Number of Wells**	**Acreage**
Other development and surface use (mining, grazing, roads, transmission lines, and urban expansion)		74,500*
FFO 2018 RFD past and present oil and gas development	37,300	56,500
RPFO 2019 RFD past and present oil and gas development	919	590
Total Past and Present Surface Use		**131,590**
Other development and surface use*		5,000
FFO 2018 reasonably foreseeable future oil and gas development (Crocker and Glover 2018)	3,200	18,500
RPFO 2019 reasonably foreseeable future oil and gas development (Crocker and Glover 2019)	200	2,160
Total Planned Actions	**3,400**	**25,660**
Estimated Total Landscape Disturbance	**41,619**	**157,250**
Contribution of Future Potential Development under the Proposed Action	**-**	**7.54**
Percentage Contribution of Future Potential Development under the Proposed Action	**-**	**0.006%**

* No study calculating existing disturbance for the analysis area was available at the time of writing. This value was estimated based on acreages of agricultural lands and coal mines reported in BLM (2015b). As such, this may be an underestimate of total non-oil and gas–related disturbance in the analysis area.

3.1.5 Land Restoration and Conservation Activities

A multifaceted network of federal and state agencies, as well as non-governmental organizations, have, and continue to, reclaim, restore, and conserve land and resources in the portions of the San Juan, Rio Arriba, McKinley, and Sandoval Counties that overlap the Mancos-Gallup Formation. The BLM New Mexico State Office has partnered with the State of New Mexico, ranchers, industry, and other local partners on a restoration initiative called Restore New Mexico. Since 2005, the initiative has restored over 3 million acres of grasslands, woodlands, and riparian areas across the state that had been degraded by invasive species and woodland encroachment in New Mexico (U.S. Geological Survey [USGS] 2019). This program has also resulted in the reclamation of some oil and gas legacy well pads, roads, and caliche pits within the FFO planning area. Restore New Mexico's rehabilitation efforts and continued work is considered an ongoing countervailing effect to present and future impacts to landscape level resources as legacy oil and gas development is reclaimed, and ecosystems are gradually restored.

Two BLM sensitive plant species occur within the FFO planning area: Clover's cactus and Aztec gilia (*Aliciella formosa*). Habitat for these two species is managed in accordance with Instruction Memorandum (IM) No. NMF01210-2017-003, which provides guidance for managing ground-disturbing projects on BLM-managed land. The IM prescribes proactive conservation measures to conserve habitat and maintain the viability of both species, such as requirements for pre-disturbance surveys and plans, moving projects outside of suitable habitat, and incorporating avoidance and minimization measures. All planned actions involving ground disturbance on BLM-managed land would be subject to the requirements of this IM.

The Crow Mesa Habitat Management Plan provides guidance in the management of approximately 43,000 acres of BLM-managed and New Mexico State Trust lands, which provide habitat for resident

mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and other wildlife species. The primary objective of this plan is to improve forage and other habitat features for wildlife species. Habitat improvement projects prescribed in the plan include prescribed burning, seeding, herbicide treatments, installation of water sources, fence modifications, and road removal.

The New Mexico Habitat Stamp Program (HSP), adopted by the New Mexico State Game Commission in 1991, was created to plan, develop, maintain, and coordinate conservation and rehabilitation programs that are designed to have a positive effect on wildlife and fish populations. Funding for projects implemented through the HSP comes from a $5 stamp purchased by hunters, anglers, and trappers recreating on federal BLM- or USFS-managed land. As such, all funding expended through the HSP is used to directly benefit land managed by the BLM and USFS (New Mexico Department of Game and Fish [NMDGF] 2022). Examples of the types of projects that could be performed with HSP funds include reclamation of roads that are no longer needed; removal of unnecessary infrastructure from the landscape; riparian and upland plantings and enclosures; seeding, thinning, and prescribed burning; development of wildlife watering facilities; and fence modifications to accommodate wildlife movement (NMDGF 2022).

In accordance with U.S. Department of the Interior Secretarial Order 3362, the BLM is working with the State of New Mexico to enhance and improve the quality of big-game winter range and migration corridor habitat on federal land. One of the primary obstacles in managing big game corridors in New Mexico is the lack of GPS collar data (NMDGF 2019). Wildlife corridors have been identified by local BLM biologists and supported by mule deer migration studies using telemetry collars in Rosa Mesa (BLM and BIA 2020). Habitat and mitigation projects that are identified as priorities for the San Juan basin landscape in the 2015 New Mexico State Action Plan for Secretarial Order 3362 (NMDGF 2019) include habitat enhancement within the mapped migration corridor and along exterior/fringe routes, limiting pinyon and juniper encroachment, improving browse availability and access within the corridors and on winter range, reseeding native forbs and grasses in disturbed areas, minimizing feral horse access and impacts to the seasonal range and migration corridors, modifying fences along the migration corridor to make them wildlife-friendly and facilitate movement, taking mitigation actions to reduce wildlife-vehicle collisions at high-risk areas, and limiting surface disturbance including restricting the timing of activities (NMDGF 2019).

Chemical and physical vegetation treatments have been implemented in the FFO planning area since the 1950s. The sagebrush community has undergone the majority of treatments, particularly with herbicide to thin sagebrush density, since the 1990s (BLM and BIA 2020). The FFO currently manages weed infestations through integrated weed management, including biological, chemical, mechanical, manual, and educational methods, primarily through weed control cooperative range improvement agreements (BLM and BIA 2020). A Fire Management Plan is currently being developed for the FFO, and vegetation management projects (e.g., prescribed burns) are planned at site-specific levels (BLM and BIA 2020).

It is anticipated that the BLM, as well as other agencies, would continue to treat lands within the FFO with prescribed fire, mechanical treatments, and herbicide according to the FFO RMP (BLM 2003a) and other management plans described above. New habitat conservation plans could be developed for listed species, or if additional species are listed as threatened or endangered in the future. Ongoing land restoration and conservation actions are expected to affect landscape-level conditions and could result in landscape modifications over time, including habitat improvements, changes in plant communities, and reclamation of disturbed land. The analyses presented in Sections 3.2 through 3.4 disclose the effects of these environmental trends and planned actions related to oil and gas and/or other mineral and energy development on resource issues analyzed in detail.

3.1.6 Cumulative Impacts for Air Quality

Cumulative impacts for air quality are the result of the incremental impacts from the Proposed Action when added to other past, present, and reasonably foreseeable future actions. The sections below describe trends in air quality and how they relate to past and present oil and gas activities, as well as projected emissions through modeling for the FFO RFD scenarios. More information regarding cumulative effects can be found in Chapters 8 and 11 of the Air Resources Technical Report (BLM 2021b).

Emission Trends

Nationally, ozone (O_3) concentrations at urban and rural sites have decreased 29% from 1980 to 2021. Since the late 1990s, concentrations of O_3-depleting substances have been declining due to the successful implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer (United Nations Environment Programme [UNEP] 1987). The long-term decrease is also likely driven by reductions in global emissions of substances that lead to the formation of O_3, such as O_3 precursors such as volatile organic compounds (VOCs) and nitrogen oxide(s) (NO_x). In correlation over the same period, emissions of VOCs and NO_x have decreased by 61% and 72%, respectively. (BLM 2021b).

In Farmington, New Mexico, O_3 concentrations decreased 15% from 2000 to 2021 (BLM 2021b). Design values in the FFO for O_3 emissions have shown a flat to slightly decreasing curve from 2018 to 2021 (U.S. Environmental Protection Agency [EPA] 2023a). Further reductions are anticipated as per the Statewide Natural Gas Capture Requirements (New Mexico Administrative Code [NMAC] 19.15.27.9), which regulate the oil and gas sector to reduce natural gas waste by a fixed amount each year to achieve a gas capture rate of 98% by December 31, 2026. Key provisions include prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to route the gas to pipeline or to use this gas for some other beneficial purpose (such as on-site fuel consumption). In all cases, operators must flare rather than vent natural gas except where this is technically infeasible or would pose a safety risk. These provisions will reduce VOC emissions due to stringent limitations on natural gas venting, which results in uncombusted VOC emissions. Additionally, the Statewide Natural Gas Capture Requirements propose that natural gas be recovered and reused rather than flared, which would result in reductions of VOC, NO_x, carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter emissions.

The New Mexico Environment Department (NMED) Ozone Attainment Initiative (20.2.50.1 NMAC) is estimated to reduce 260 million pounds of oxides of nitrogen and VOCs, along with a co-benefit of reducing methane (CH_4) emissions by over 851 million pounds annually (NMED 2021a).

Additionally, monitored CO concentrations have decreased nationally 87% from 1980 to 2021 due to improvements in motor vehicle emissions control and monitoring. CO concentrations in the analysis area have decreased 70% between 2000 and 2021. While outside the project area, the closest CO monitors are located in La Plata County, Colorado, and show the CO 8-hour emission design values at a declining to flat curve from 2016 to 2021 (EPA 2023a). Nationally, SO_2 concentrations have decreased 85% from 2000 to 2021, but substantial decreases (94% reduction) have occurred since 1980 due to implementation of federal rules requiring reduction in SO_2 emissions from power plants and other larger sources of SO_2. SO_2 concentrations in the analysis area have decreased 94% between 2000 and 2021 (BLM 2021b). Design values for SO_2 emissions in San Juan County have shown a decreasing curve from 2012 to 2016, then a flat curve from 2017 to 2021 (EPA 2023a).

Design values for nitrogen dioxide (NO_2) emissions in San Juan County have shown a slightly declining to flat curve from 2013 to 2021. Design values for particulate matter emissions in the analysis area show particulate matter equal to or less than 10 microns in diameter (PM_{10}) with a relatively flat curve from

2013 to 2021 and particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$) annual and 24-hour emissions at slightly declining to flat curves from 2012 to 2021 (EPA 2023a).

RFD

While there are other sources of emissions in the FFO, oil and gas development is one of the most prominent sources of emissions. There are approximately 22,207 active oil and gas wells in the New Mexico portion of the San Juan Basin. Of this total, roughly 14,302 wells are federal, with the remainder falling in other jurisdictions (BLM 2021b). Over the past 7 years, there have been a total of 267 federal well completions, all of which occurred within the FFO and RPFO (Table 3.2).

Table 3.2. Past and Present Federal Well Completions

Number of Federal Well Completions	2016	2017	2018	2019	2020	2021	2022
BLM FFO New Mexico portion of San Juan Basin	29	51	35	39	18	22	64
BLM RPFO New Mexico portion of San Juan Basin	2	1	5	0	0	0	1
Total*	31	52	40	39	18	22	65

Source: Petroleum Engineering Group, FFO

*The number of well completions within the FFO and RPFO.

As with past and present actions, continued oil and gas development is the most prominent reasonably foreseeable environmental trend and planned action affecting air quality in the analysis area. As stated in Section 3.1.1, the FFO Mancos-Gallup RFD (2018 RFD) estimates that there could be an additional 3,200 (federal and non-federal) wells drilled within the analysis area by 2037, of which 2,490 would be federal (Crocker and Glover 2018). In addition, the RPFO RFD (2019 RFD) estimates that an additional 200 wells will be built within the analysis area by 2039, of which 129 would be federal (Crocker and Glover 2019). With consideration of both RFDs, there would be an estimated 3,400 wells drilled within the New Mexico portion of the San Juan Basin by 2039, with an average of 170 wells per year (of which 131 would be federal). The RFD scenarios attempt to predict the development scenario without factoring in economics and demand; therefore, the predicted numbers may not represent actual development. As noted above, there have been far fewer than 170 total (131 federal) wells completed each year over the past 5 years.

Air Quality and Air Quality Related Values Modeling

The Comprehensive Air Quality Model with Extensions (CAMx) photochemical grid model (PGM) is used in the Colorado Air Resources Management Modeling Study (CARMMS) 2.0 to assess the air quality (AQ) and Air Quality Related Value (AQRV) impacts associated with BLM-authorized mineral development on federal lands within BLM Colorado and the New Mexico FFO planning areas. CARMMS 2.0 uses data from the modeling platform of Western Air Quality Study (WAQS) from the Intermountain West Data Warehouse (IWDW) for the 2011 base year and 2025 future year air quality modeling and has adopted a two-way nested 12/4 km horizontal resolution domain. Three 2025 future year oil and gas levels were developed for a range of potential outcomes: a high development scenario, a low development scenario, and a medium development scenario (which is a mitigated version of the high development scenario where additional emission controls were applied). Additional information on CARMMS 2.0 methodology can be found in the CARMMS 2.0 Report, incorporated by reference (BLM and Ramboll 2018). The estimated emissions, AQ, and AQRV impacts from oil and gas development from the Mancos Shale modeled in the CARMMS 2.0 (BLM and Ramboll 2018) are used to estimate impacts from development by the BLM FFO in the Air Impact Assessment for BLM Farmington Field

Office Oil and Gas Development report (BLM and Ramboll 2018), incorporated by reference. The Mancos Shale was treated as a separate source group in the CARMMS 2.0 modeling and AQ and AQRV impacts from the Mancos Shale separately quantified, enabling this analysis for the FFO. As stated above, with consideration of both RFDs, there would be an estimated 3,400 (federal and non-federal) wells drilled within the New Mexico portion of the San Juan Basin by 2039. In contrast, in CARMMS 2.0 it is estimated that by 2025 there will be 2,756 new oil and gas wells for the high scenario and 1,378 new oil and gas wells for the low scenario in the Mancos Shale in New Mexico. Compared to the Mancos-Gallup RFD, CARMMS 2.0 predicts that 749 more federal wells under the low scenario and 2,127 more federal wells under the high scenario would be developed by 2025 than predicted by the RFD. CARMMS 2.0 also predicts that 567 more total wells under the low scenario and 1,866 more wells under the high scenario would be developed in the planning area as a whole (federal and nonfederal development). Note that the additional 200 wells from the RPFO RFD added into the comparison to the CARMMS 2.0 modeling would still result in more wells developed by 2025 in the CARMMS 2.0 modeling than predicted by the RFD. The low and high scenarios of CARMMS 2.0 well development estimates are conservatively high relative to the RFD baseline scenario and current development (BLM and Ramboll 2018, Section 2.1.1.1). As a result, the low scenario can be used to represent a conservative estimate of federal and planning area-wide impacts through 2025.

The ozone National Ambient Air Quality Standards (NAAQS) are defined as the 3-year average of the fourth highest daily maximum 8-hour (DMAX8) ozone concentration. Since CARMMS 2.0 only uses one year of meteorology (2011), the 2025 fourth highest DMAX8 ozone concentration is used as a pseudo-NAAQS comparison metric. For the 2011 Base Case, there are vast regions where the modeled fourth high DMAX8 ozone exceeds the NAAQS (all source groups). In the 2025 High, Low, and Medium Development Scenarios, the areas of ozone exceedances decrease from the 2011 Base Case, with the 2025–2011 ozone differences showing decreases in almost all areas. The large contribution of natural emissions (natural wildfires) to the modeled fourth highest DMAX8 ozone concentrations was noted in the analysis. Maximum ozone contributions to the 2025 fourth highest DMAX8 ozone due to the New Mexico FFO are 1.7 parts per billion (ppb), 0.9 ppb, and 1.0 ppb for the 2025 High, Low, and Medium Development Scenarios, respectively. Maximum contributions of the New Mexico FFO ozone to the fourth highest DMAX8 ozone above the current ozone NAAQS (71.0 ppb and higher) for the 2025 High, Low, and Medium Development were 2.01%, 0.84%, and 0.90%, respectively (BLM and Ramboll 2017).

There are two $PM_{2.5}$ NAAQS, one for a 24-hour averaging time that is expressed as a 3-year average of the 98th percentile value in a year with a threshold of 35 micrograms per cubic meter ($\mu g/m^3$) and an annual average over three years with a threshold of 12 $\mu g/m^3$. With a complete year of modeling results, the 98th percentile corresponds to the eight highest daily $PM_{2.5}$ concentration in a year. The modeling of the differences between the 2025 Scenarios and 2011 Base Case (all sources) shows decreases of $PM_{2.5}$ concentrations in most of the domain, but also increases in a number of regions, including Denver, eastern Utah, and central and northwestern New Mexico. Maximum $PM_{2.5}$ contributions to the 8th highest daily $PM_{2.5}$ concentrations are 0.8, 0.4, and 0.4 $\mu g/m^3$ in the 2025 High, Low, and Medium Development Scenarios, respectively. Compared to 2011, 2025 annual $PM_{2.5}$ concentrations for all sources are reduced in most of the domain, but increase in a number of regions, including near Denver. Maximum contributions to the annual average $PM_{2.5}$ concentrations for the New Mexico FFO are 0.3, 0.1, and 0.1 $\mu g/m^3$ in the 2025 High, Low, and Medium Development Scenarios, respectively. Maximum contributions to the second highest daily average PM_{10} for the New Mexico FFO are 2.7, 1.3, and 1.1 $\mu g/m^3$ in the 2025 High, Low, and Medium Development Scenarios, respectively (BLM and Ramboll 2017).

The differences in 1-hour NO_2 concentrations between the 2011 and 2025 emission scenarios (all sources) indicate increases at various regions throughout the domain, including large increases in northern and eastern Arizona and New Mexico. Maximum contributions to the 1-hour NO_2 concentrations for the New

Mexico FFO are 5.8, 3.0, and 3.2 µg/m^3 in the 2025 High, Low, and Medium Development Scenarios, respectively. Maximum contributions to the annual average NO_2 concentrations for the New Mexico FFO are 1.5, 0.8, and 0.9 µg/m^3 in the 2025 High, Low, and Medium Development Scenarios, respectively (BLM and Ramboll 2017).

Contributions of the prevention of significant deterioration (PSD) pollutant concentrations across all PSD Class I and sensitive Class II areas due to emissions from the FFO for each development scenario were also developed. Contributions of New Mexico FFO emissions to PSD pollutant concentrations at Class I and Sensitive Class II areas for the 2025 High, Low, and Medium Development Scenarios can be found in the Air Impact Assessment for BLM Farmington Field Office Oil and Gas Development report (BLM and Ramboll 2017) and have been incorporated by reference. All New Mexico FFO contributions are below the PSD Class I and Sensitive Class II pollutant increments at the High, Low, and Medium Development Scenarios.

In summary, the CARMMS 2.0 low scenario, which represents a conservative estimate of federal impacts through 2025, does not exceed the indicator thresholds for any of the NAAQS, PSD Class I or Class II increment thresholds, the sulfur deposition threshold, the change in visibility threshold at any Class I area, or the thresholds for acid-neutralizing capacity at sensitive lakes. The low scenario would exceed the indicator threshold for change in visibility at one Class II area, the Aztec Ruins National Monument, and the nitrogen deposition threshold at Mesa Verde National Park, San Pedro Parks Wilderness, Weminuche Wilderness, Aztec Ruins National Monument, Chama River Canyon Wilderness, South San Juan Wilderness, and Cruces Basin Wilderness. The CARMMS 2.0 high scenario would not exceed any of the PSD Class I or Class II increment thresholds, the change in visibility threshold at Class I areas, the sulfur deposition threshold, or the thresholds for acid-neutralizing capacity at sensitive lakes. It would exceed the NAAQS indicator thresholds for ozone, annual average $PM_{2.5}$, and annual average NO_2; the change in visibility threshold at one Class II area, Aztec Ruins National Monument; and the nitrogen deposition threshold at Bandelier Wilderness, Mesa Verde National Park, San Pedro Parks Wilderness, Weminuche Wilderness, Aztec Ruins National Monument, Chama River Canyon Wilderness, Cruces Basin Wilderness, Dome Wilderness, Monte Vista National Wildlife Refuge, South San Juan Wilderness, and Sandia Mountain Wilderness.

Hazardous Air Pollutants Modeling

3.1.7 Cumulative Impacts for Greenhouse Gases and Climate Change

The *2021 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends from Coal, Oil, and Gas Exploration and Development on the Federal Mineral Estate* (BLM 2022b) (hereinafter referred to as the Annual Greenhouse Gas [GHG] Report) presents emissions estimates at two cumulative scales: geographic and temporal. The geographic cumulative scale is the federal onshore mineral estate managed by the BLM. The temporal cumulative scales include estimated emissions from total federal onshore mineral production projected for the next 12 months, the life-of-project emission estimates associated with the 12-month projections, and the long-term emissions from the portion of energy demand estimated to be met from the federal mineral estate out to year 2050 using data from the U.S. Energy Information Administration (EIA). The estimates provide a baseline to compare emissions from BLM-authorized development with those of the broader economy (national and global) and illustrate the degree to which federal fossil fuel mineral development contributes to projected GHG emissions and therefore to climate change.

The short-term projections for oil and gas emissions are based on analyses of three authorization scopes that exist for potential oil and gas production (the emissions that would result from what the BLM has

already authorized). Figure 3.1 shows an annualized timeline of the projected short-term life-of-project emissions for New Mexico. Over the next 12 months (Table 3.3), the life-cycle emissions from federal oil and gas extraction are estimated to be 413.46 megatonnes (Mt) per year of carbon dioxide equivalent (CO_2e) (Mt CO_2e/year) in New Mexico and 813.58 Mt CO_2e/year nationally. For all federal fossil fuel (oil, gas, and coal), lifecycle emissions are estimated to be 415.16 Mt CO_2e/year in New Mexico and 1,260.22 Mt CO_2e/year nationally. This table also provides estimated cumulative GHG emissions over the typical production life for existing and new development projected to occur over the next fiscal year. The projected cumulative short-term life-of-project emissions (oil and gas combined) are 1,939.52 Mt CO_2e for New Mexico and 4,614.81 Mt CO_2e nationally (BLM 2022b). The Proposed Action's direct and indirect emissions would be 0.25% of the estimated foreseeable federal life-cycle oil and gas emissions in New Mexico over the next 12 months (calculated utilizing year 1 emissions from the BLM Lease Sale Emissions Tool).

Table 3.3. Estimated GHG Emissions from Reasonably Foreseeable Projected Federal Fossil Fuel Production over the Next 12 Months

	Annual Federal Life-Cycle Emissions (Oil and Gas) – Mt CO_2e/year	Annual Federal Life-Cycle Emissions (Oil, Gas, and Coal) – Mt CO_2e/year	Cumulative Short-Term Life-of-Project Emissions (Oil and Gas Combined) – Mt CO_2e
New Mexico	413.46	415.16	1,939.52
U.S.	813.58	1,260.22	4,614.81

Source: BLM (2022b)

Long-term oil and gas production forecasts from the EIA's Annual Energy Outlook (AEO) are used to estimate GHG emissions out to 2050 that could occur from past, present, and future development of federal minerals. At the national level, these long-term projections estimate that there will be emissions of 13,541.25 Mt CO_2e from federal oil and gas combined, and 24,298.99 Mt CO_2e from all federal fossil fuel minerals (oil, gas, and coal). Together, the short-term and long-term projections provide a range of potential emissions until 2050. The short-term is the low estimate of what we know has already been authorized, while the long-term is the high estimate based on what may be authorized in the future to meet U.S. energy demands. Additional information on the short-term and long-term projections can be found in Chapters 4 and 5 of the Annual GHG Report (BLM 2022b) and has been incorporated by reference.

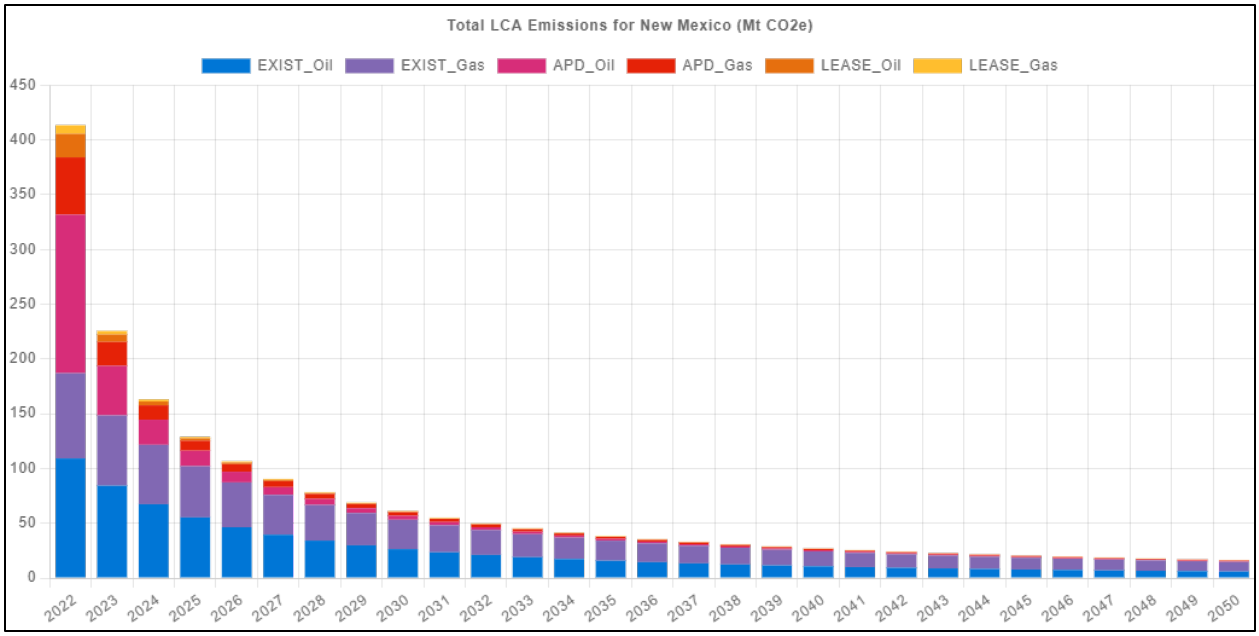

Figure 3.1. New Mexico oil and gas emissions timeline.

The U.S. has established an economy-wide target of reducing its net GHG emissions by 50% to 52% below 2005 levels in 2030 in its national determined contribution (NDC) under the Paris Agreement (United Nations Framework Convention on Climate Change [UNFCCC] 2021). This goal is also included in the 2021 U.S. Department of State and the U.S. Executive Office of the President, *The Long-Term Strategy of the United States, Pathways to Net-Zero Greenhouse Gas Emissions by 2050* (U.S. Department of State and the U.S. Executive Office of the President. 2021). Net GHG emissions include both anthropogenic and natural emissions of GHGs, as well as removals by sinks (e.g., carbon uptake by forests). To develop the NDC, the National Climate Task Force performed an analysis of potential and measured impacts of various policies and measures (both potential and existing) at all levels of government and in all relevant sectors. This analysis was conducted using input from all federal government agencies, as well as other stakeholders, such as scientists, activists, local and state governments, and various local institutions. For the industrial sector, the NDC outlines that the U.S. government will support research and implementation of very low- and zero-carbon industrial processes and products, including introducing these products to market. The U.S. government will also incentivize carbon capture and the use of new sources of hydrogen for powering industrial facilities. The net emissions (including sinks) in 2005 were 6,635 Mt CO_2e (UNFCCC 2021); therefore, the 2030 net emissions are estimated to be between approximately 3,185 and 3,318 Mt CO_2e. So far, the U.S. is anticipated to have met and surpassed the 2020 target of 17% reduction in net economy-wide emissions below 2005 levels and is broadly on track to meet the 2025 goal of 26% to 28% emissions reductions below 2005 levels (UNFCCC 2021).

Carbon neutrality, or net zero emissions, is maintaining a balance between emitting and absorbing GHGs from the atmosphere. On a global scale, carbon neutrality would result in atmospheric concentrations of GHGs reaching an equilibrium, which could stabilize climate change and limit global warming. Under the 2015 Paris Agreement, countries agreed to cut GHG emissions with the goal of holding the increase in the global average temperature to well below 2 degrees Celsius (°C) above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels in order to avoid some of the more dire consequences associated with climate change.

Annually, the UNEP publishes an emissions gap report, which provides an assessment of how actions and pledges of countries affect global GHG emissions trends and how these trends compare to emissions trajectories that are consistent with long-term goals for limiting global warming (UNEP 2022). Specifically, the emissions gap is the difference between GHG emissions levels consistent with limiting global warming to 1.5°C or 2.0°C and the emissions levels consistent with current reduction commitments by member nations. By 2030, the UNEP estimates that to limit warming to 2.0°C or 1.5°C, global annual emissions should be approximately 39 giga tonnes of carbon dioxide equivalent ($GtCO_2e$) and 25 $GtCO_2e$, respectively. Based on the most optimistic current emissions pledges, the global emissions gap in 2030 would be 11 $GtCO_2e$ above the 2.0°C warming goal and 25 $GtCO_2e$ above the 1.5°C warming goal. The UNEP gap report does not account for the recent passage of the Inflation Reduction Act. The Inflation Reduction Act formalizes an economy-wide policy, while continuing federal oil and gas leasing over the next 10 years, that puts the U.S. within reach of meeting the 2030 emissions target (Rhodium Group 2022). Additionally, the U.S. Department of Energy (DOE) stated that, "While [Federal] oil and natural gas leasing provisions may lead to some increase in GHG pollution in 2030, those possible increases are dwarfed around 35-to-1 by the net estimated pollution reduction associated with the two laws [Inflation Reduction Act and Bipartisan Infrastructure Law]" (DOE 2022). Note that while the Inflation Reduction Act specifically mentions oil and gas leasing, but not APDs, leasing is a commitment of resources and development is a foreseeable outcome of the lease.

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 as it is unclear what portion of the budget applies to emissions occurring in the United States. However, Table 3.4 provides an estimate of the potential emissions associated with BLM fossil fuel authorizations in relation to the Intergovernmental Panel on Climate Change (IPCC) carbon budgets. The projected annual emissions are added over the remaining time frame until the global emissions budget is estimated to be exhausted in order to show the portion of the budget that is consumed by federal emissions. The BLM-estimated emissions include direct emissions as well as transport and downstream combustion emissions. It is important to note that this comparison of BLM-estimated emissions from fossil fuel authorizations to global carbon budgets does not portray the full picture of carbon flux (amount emitted vs. amount stored/sequestered/offset) on public lands. Results of the carbon budget analysis are presented as the percent of the budget consumed by federal fossil fuel emissions and the difference in time it takes to consume the budget with and without federal fossil fuel emissions. The results in the table reflect only the emissions side of the equation and may overestimate actual consumption of global carbon budgets resulting from BLM leases and authorizations. The USGS estimated that sequestration on federal lands offset approximately 15% of CO_2 emissions resulting from the extraction and end-use combustion emissions of fossil fuels on federal lands (BLM 2022b). Based on the magnitude of emissions from this project, it would have a very small effect on the reduction in time to exhaust the budget occurring from federal emissions.

Table 3.4. Evaluation of Potential Federal Fossil Fuel GHG Emissions with Respect to Global Carbon Budgets

Minerals [a]	Metric	1.5°C			2.0°C		
		33%	50%	66%	33%	50%	66%
	Carbon Budget ($GtCO_2$)	650	500	400	1,700	1,350	1,150
	Time to Exhaust Budget (years) [b]	12.97	9.98	7.98	33.93	26.95	22.95

Minerals [a]	Metric	1.5°C			2.0°C		
		33%	50%	66%	33%	50%	66%
Federal Oil and Gas	Federal Emissions During Budget Time Frame ($GtCO_2$)	5.95	4.53	3.60	15.88	12.51	10.56
	Federal Consumption of Budget (%)	0.91%	0.91%	0.90%	0.93%	0.93%	0.92%
	Time to Exhaust Budget without Federal Emissions (years)	13.09	10.07	8.06	34.25	27.20	23.17
	Reduction in Time to Exhaust Budget from Federal Emissions (days)	-43.71	-33.32	-26.50	-116.75	-92.02	-77.66

[a] Based on Long-term Onshore Federal Mineral Emissions estimated from the EIA Annual Energy Outlook reference case energy projection scenario. Does not include sequestration by federal lands or other federal emissions offsets.

[b] Based on the global emissions estimates from the Rhodium Group, as cited in chapter 6.1 of the Annual GHG Report (BLM 2022b).

Climate change is fundamentally a cumulative phenomenon, global in scope, and all GHGs contribute incrementally to climate change regardless of scale or origin. The multitude of interwoven natural systems and feedback mechanisms that contribute to climate variability over the entirety of Earth further complicate analysis. Climate scientists provide analysis by modeling changes to these systems in response to a range of global emissions scenarios known as Representative Concentration Pathways (RCPs). The RCPs are not fully integrated scenarios of climate feedback, policy, emissions limits, thresholds, or socioeconomic projections, but rather a consistent set of cumulative emissions projections out to year 2100 of only the components of radiative forcing that are meant to serve as input for climate and atmospheric chemistry modeling. Climate models suggest that annual average temperatures in New Mexico may rise by 4°F to as much as 12°F above current levels by the end of the twenty-first century depending on the emissions scenario. More warming is projected to occur in the northern part of the state. While projections of annual precipitation are uncertain, more precipitation falling as rain is very likely to occur as temperatures increase. Spring precipitation, which is already light in the mountains of New Mexico, is projected to decrease across the state. A decrease in spring precipitation, coupled with higher temperatures, would have negative impacts on mountain snowpack. Even if snowpack accumulation remained similar to current levels, the projected higher temperatures will lead to an earlier start and end to the snowmelt season, potentially necessitating changes in water management (BLM 2022b). The climate change indicators, impacts, trends, and projections specific to states where the BLM conducts most of its fossil fuel authorizations are described in Chapters 8 and 9 of the Annual GHG Report (BLM 2022b), which is incorporated by reference.

3.2 Issue 1: How would emissions generated by equipment associated with the Proposed Action impact air quality?

3.2.1 Affected Environment

Air quality is determined by the quantity and chemistry of atmospheric pollutants in consideration of meteorological factors (e.g., weather patterns) and topography, both of which influence the dispersion and concentration of those pollutants. The presence of air pollutants is generally due to a number of different and widespread sources of emissions.

The analysis area for effects on air quality includes the FFO and a small portion of the RPFO, specifically San Juan, Sandoval, Rio Arriba, and McKinley Counties because they overlap the Mancos Shale formation and associated sandstones referred to as the Gallup zone, which includes the Gallup Sandstone, El Vado Member, and Tocito Sandstone Lentile and has the highest potential for oil and gas development near Nageezi and Counselor, New Mexico (Crocker and Glover 2018). 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. Much of the information referenced in this section is incorporated by reference from the BLM 2021 Air Resources Technical Report for Oil and Gas Development: New Mexico, Oklahoma, Texas and Kansas (herein referred to as the Air Resources Technical Report) (BLM 2021b).

3.2.1.1 NATIONAL AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS

The Clean Air Act (CAA) requires the EPA to set NAAQS for six criteria air pollutants considered harmful to public health and the environment: CO; NO_2; O_3; particulate matter (PM_{10} and $PM_{2.5}$); SO_2; and lead (Pb). NO_x and VOC emissions also contribute to secondarily formed pollutants of O_3 and $PM_{2.5}$ through a complex series of atmospheric chemical interactions. The CAA categorizes NAAQS as "primary" or "secondary." Primary standards provide public health protection, including the health of at-risk populations, with an adequate margin of safety (EPA 2019), and secondary standards provide for public welfare, including protection against degraded visibility and damage to animals, crops, vegetation, and buildings (EPA 2019). A detailed description of these pollutants, along with their health effects and their sources can be found in Chapter 2 of the Air Resources Technical Report (BLM 2021b) and has been incorporated by reference.

Compliance with the NAAQS is typically demonstrated through monitoring of ground-level concentrations of atmospheric air pollutants. Areas where pollutant concentrations are below the NAAQS are designated as attainment or unclassifiable. Locations where monitored pollutant concentrations are higher than the NAAQS are designated nonattainment, and air quality is considered unhealthy. All of the planning area is in attainment or unclassified for each of the NAAQS; however, air monitoring data show that 3-year average ozone concentrations in the planning area are within 95% of the 8-hour ozone NAAQS. Pursuant to New Mexico Statute 74-2-5.3, if the NMED determines that emissions from sources within its jurisdiction cause or contribute to ozone concentrations in excess of 95% of a national ambient air quality standard for ozone, it shall adopt a plan, including regulations, to control emissions of oxides of nitrogen and VOCs to provide for attainment and maintenance of the standard. The NMED has initiated an Ozone Attainment Initiative to address ozone levels in the area (NMED 2021a). The Four Corners Air Quality Task Force was convened in 2005 to address air quality issues in the Four Corners region in light of continued energy development and growth in the region and consider options for mitigating air pollution. This task force published a report in 2007 detailing a wide range of mitigation options and continues to meet annually since that time as the Four Corners Air Quality Group (BLM 2021b).

The EPA has delegated the responsibility of regulation and enforcement of the NAAQS to the NMED and has approved the New Mexico State Implementation Plan, which allows the State of New Mexico to enforce both the New Mexico Ambient Air Quality Standards (NMAAQS) and the NAAQS on all federal and private lands with the exception of tribal lands and lands within Bernalillo County (NMED 2021a, 2021b). Tribal lands under EPA jurisdiction follow the Federal Implementation Plan for the *Indian Country Minor New Source Review Program for the Oil and Gas Industry* (80 Federal Register 51991). Air pollutant concentrations are reported using design values. Design values are statistics that describe the air quality in any given area relative to the NAAQS levels. Design values are used to designate and classify nonattainment areas, as well as to assess progress towards meeting the NAAQS. The EPA's Air Quality Design Values webpage lists the Design Value Reports used for making NAAQS and NMAAQS compliance determinations (EPA 2023a). Design values that are representative for the impact analysis area are provided in Table 3.5. It is assumed that counties without reported design values have good air quality and pollutant concentrations are below the NAAQS. The main pollutants of concern are O_3 and $PM_{2.5}$ as these are the pollutants with reported design values nearest the NAAQS.

Table 3.5. Design Values Compared with NAAQS and NMAAQS for Counties within the Analysis Area

Pollutant	2021 Design Concentrations	Averaging Time	NAAQS	NMAAQS
CO	La Plata County, Colorado: 0.3 ppm	8-hour	9 ppm	–
O_3	Rio Arriba County: 0.064 ppm Sandoval County: 0.068 ppm San Juan County: 0.068 ppm: four stations; Bloomfield at 0.063 ppm, Navajo Dam at 0.068 ppm, Shiprock at 0.068 ppm, Chaco Culture National Historical Park at 0.068 ppm	8-hour [a]	0.070 ppm	–
NO_2	San Juan County: four stations; Bloomfield at 9 ppb, Navajo Dam at 6 ppb, Chaco Culture at 1 ppb, and Shiprock at 3 ppb	Annual [b]	53 ppb	50 ppb
NO_2	San Juan County: 32 ppb, four stations; Bloomfield at 32 ppb, Navajo Dam at 23 ppb, Chaco Culture invalid, Shiprock at 23 ppb	1-hour [c]	100 ppb	–
SO_2	San Juan County: 1 ppb	1-hour [d]	75 ppb	–
$PM_{2.5}$	Taos County: 5.6 µg/m^3	Annual [b, e]	12 µg/m^3	–
$PM_{2.5}$	Taos County: 16 µg/m^3	24-hour [c,e]	35 µg/m^3	
PM_{10}	San Juan County: 0.3 µg/m^3	24-hour [b,e]	150 µg/m^3	–

Source: EPA (2023a)

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[a] Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years.

[b] Not to be exceeded during the year.

[c] 98th percentile, averaged over 3 years.

[d] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

[e] Annual mean averaged over 3 years.

The PSD is a CAA permitting program for new or modified major sources of air pollution located in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (EPA 2023b). Under PSD regulations, the EPA classifies airsheds as Class I, Class II, or Class III. The CAA PSD requirements give more stringent air quality and visibility protection to national parks and wilderness areas that are designated as Class I areas, but a PSD designation does not prevent emission increases. Federal land managers are responsible for defining specific AQRVs, including visual air quality (haze), and acid (nitrogen and sulfur) deposition, for an area and for establishing the criteria to determine an adverse impact on the AQRVs. The nearest Class I areas are Mesa Verde National Park to the north, San Pedro Parks Wilderness Area and Bandelier Wilderness Area to the southeast, and Petrified National Park to the southwest. The analysis area

is in attainment for the NAAQS and the NMAAQS and is categorized as a Class II area (EPA 2023c; NMED 2021c). This project is not subject to PSD analysis or permitting.

Visibility extinction trends based on air monitoring data from the IMPROVE monitors in the BLM New Mexico State Office area of responsibility show that visibility trends have been flat or improving (Figures 8–10 of the Air Resources Technical Report [BLM 2021b]). Specifically, visibility trends shown for San Pedro Parks Wilderness, Mesa Verde National Park, and Weminuche Wilderness indicate that visibility on the best days has been flat to improving and visibility on worst days has shown little change over the period of record. Implementation of Best Available Retrofit Technology (BART) strategies as required under the federal Regional Haze Rule over the next few years should result in further improvements (BLM 2021b).

The National Park Service (NPS) monitors and evaluates deposition to determine which parks are most at risk from air pollution and where conditions are declining or improving. Nitrogen deposition conditions in NPS-managed areas near the project area are generally fair to good with no trend for improving or worsening conditions, while sulfur deposition conditions are fair to good and generally improving (where trend data is available) (Table 3.6) (NPS 2023).

Table 3.6. Nitrogen and Sulfur Deposition Conditions at NPS-Managed Areas in New Mexico

Class I Area	Nitrogen (Conditions / Trend)	Sulfur (Conditions / Trend)
Bandelier National Monument	Fair / Relatively unchanging trend	Good / Improving trend
El Morro National Monument	Fair / Trend not available	Good / Trend not available
Manhattan Project National Historical Park	Poor / Trend not available	Fair / Trend not available
Mesa Verde National Park	Fair / Relatively unchanging trend	Good / Improving trend
Petrified Forest National Park	Poor / Relatively unchanging trend	Good / Improving trend
Valles Caldera National Preserve	Fair / Trend not available	Good / Trend not available
Class II Sensitive Area		
Aztec Ruins National Monument	Good / Trend not available	Good / Trend not available
Canyon de Chelly National Monument	Fair / Trend not available	Good / Trend not available
Chaco Culture National Historic Park	Fair / Trend not available	Good / Trend not available
El Malpais National Monument	Fair / Trend not available	Good / Trend not available
Petroglyph National Monument	Good / Trend not available	Good / Trend not available

Source: NPS (2023) and BLM FFO RMP, Table 3-4 (BLM 2003b).
Only areas with air monitoring equipment have been reported in this table.

3.2.1.2 CRITERIA POLLUTANT EMISSIONS WITHIN THE ANALYSIS AREA

Along with criteria pollutant concentrations as measured by air monitors, the EPA provides data on criteria pollutant emissions, expressed in tons per year or total volume of pollutant released into the atmosphere. Emissions data point to which industries and/or practices are contributing the most to the general level of pollution (BLM 2021b). Emissions associated with industry and other anthropogenic practices within the FFO are primarily the result of electrical power generation, oil and gas development, vehicles (highway and off-highway traffic), and other industrial activities (EPA 2019).

The NMED compiles statewide emission inventories to assess the level of pollutants released into the air from various sources. The 2020 National Emissions Inventory (NEI) data for the state of New Mexico and San Juan, Sandoval, Rio Arriba, and McKinley Counties (four counties in the FFO) are listed in Table 3.7 (EPA 2023d). Sources of criteria air pollutants in the analysis area are two coal-fired electrical

generation units: the San Juan Generating Station 15 miles west of Farmington, New Mexico, and the Four Corners Power Plant on the Navajo Nation near Fruitland, New Mexico (BLM 2021b; EPA 2023d).

Table 3.7. 2020 NEI Air Pollutant Emissions for New Mexico and San Juan, Sandoval, Rio Arriba, and McKinley Counties

Source	Emissions (tons per year)						HAPs
	NO_X	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO	
2020 NEI – San Juan, Sandoval, Rio Arriba, and McKinley Counties *	53,708	141,794	24,218	6,042	2,301	108,755	15,278
2020 NEI – State of New Mexico	199,462	712,639	129,132	42,623	87,828	615,513	105,528

Source: EPA (2023d)

HAPs = hazardous air pollutants

Note: BLM now reports both biogenic and human-caused emissions in the table above. The table above shows emissions by county, including biogenic sources. Emissions of PM_{10}, $PM_{2.5}$, and SO_2 are estimated to be solely from human-caused sources. Human-caused emissions of NO_x, CO, and VOCs are reduced to 64,404 tons, 199,676 tons, and 109,510 tons, respectively.

* 2020 data include the point, nonpoint, onroad mobile, and nonroad mobile data. Values may not always sum correctly if queried on demand as the NEI database updates its emissions periodically with newer emission information.

The largest 2020 NEI anthropogenic sources of Criteria Air Pollutants (CAPs) in San Juan, Sandoval, Rio Arriba, and McKinley Counties are Oil and Gas Sources for CO and NO_x; Area Sources for Particulate Matter (PM_{10} and $PM_{2.5}$) and NH_3; Natural Sources (biogenic) for VOCs; and Point Sources for SO_x. (Table 3.8). The Area Sources category includes all area sources except biogenic (natural) sources, forest wildfires, and prescribed fires. From the period of 2008 to 2020, all source types showed a decrease in emissions except for Wildfires and Oil and Gas Sources. During this period, total emissions decreased from 676,988 tons (2008) to 342,828 tons (2020) (EPA 2008, 2023d).

Table 3.8. 2020 NEI San Juan, Sandoval, Rio Arriba, and McKinley Counties Air Pollutant Emissions Tons per Year by Source

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_x	VOC	NH_3
Area sources	2,064	322	20,805	2,989	34	4,571	5,605
Oil and gas sources	33,662	22,582	287	283	289	59,129	0
Non-road mobile	7,469	2,978	128	124	4	737	2
On-road mobile	25,162	6,826	362	193	14	1,763	146
Point sources	25,670	18,591	2,264	2,139	1,926	6,216	200
VOC refueling	-	-	-	-	-	924	-
Natural sources (biogenic)	11,304	2,336	-	-	-	67,639	-
Forest wildfires	3,039	64	330	279	30	723	51
Prescribed fires	385	9	42	35	4	92	6
San Juan, Sandoval, Rio Arriba, and McKinley Counties Total	108,755	53,708	24,218	6,042	2,301	141,794	6,010

While other emissions data exist (2014 Western States Air Resources Council-Western Regional Air Partnership, 2017 NEI data), the 2020 NEI contains the newest and best available emissions information. The 2020 NEI data includes emissions from the San Juan Generating Station (a four-unit coal-fired generator) and the Four Corners Power Plant (a five-unit coal-fired generator), which are PSD major sources subject to BART requirements to comply with the federal regional haze rule. The 2020 NEI data takes into account the shutdown of two electric generating units (EGUs) at the San Juan Generating Station in December of 2017 and new selective catalytic reduction technology installed on the remaining

two EGUs. The two remaining EGUs at the Four Corners Power Plant had selective catalytic reduction technology installed in 2018. The shutdown of two EGUs and the installation of selective catalytic reduction technology on the remaining EGUs is expected to result in significant emissions reductions in the project area (BLM 2021b). Additional information on the reductions can be found in Section 12.2 of the Air Resources Technical Report (BLM 2021b) and has been incorporated by reference.

3.2.1.3 HAZARDOUS AIR POLLUTANTS

Hazardous air pollutants (HAPs), which are a class of 187 toxic air pollutants, are known or suspected to cause cancer or other serious health effects, or adverse environmental effects. HAPs emitted by the oil and gas industry include benzene, toluene, ethyl benzene, mixed xylenes, formaldehyde, normal-hexane, acetaldehyde, and methanol. The Air Resources Technical Report discusses the relevance of HAPs to oil and gas development and the particular HAPs that are regulated in relation to these activities (BLM 2021b). The EPA Air Toxics Screening Assessment tool (AirToxScreen) is used to evaluate impacts from existing HAP emissions in New Mexico (EPA 2022a). The EPA tool is a cumulative HAP assessment based on total HAP emissions from all sources contained in the NEI. Per the AirToxScreen Technical Support Document, this national-scale assessment (AirToxSreen) is consistent with the EPA's definition of a cumulative risk assessment, as stated in the EPA's Framework for Cumulative Risk Assessment (EPA 2003, p.6), as "an analysis, characterization, and possible quantification of the combined risks to health or the environment from multiple agents or stressors." (EPA 2003, 2022b). Table 3.9 shows the cancer risk (per million) and noncancer risk (hazard index) for San Juan, Sandoval, Rio Arriba, and McKinley Counties from 2017 through 2019 (EPA 2022a). The EPA has determined that for the four counties in the FFO (San Juan, Sandoval, Rio Arriba, and McKinley), the total cancer risk is a maximum of 18.72 in 1 million. The maximum contribution of the oil and gas industry to the cancer risk in the FFO is 2.06 in 1 million. The total cancer risk is within the acceptable range of risk published by the EPA of 100 in 1 million as discussed in the National Contingency Plan, 40 CFR § 300.430.

The total risk for noncancer respiratory hazard index is estimated from a variety of factors from inhalation of air toxics nationwide, in both urban and rural areas. Background concentrations include pollutants that exist in the air that do not come from specific sources and may be derived from a natural source (biogenic) or from distance sources or pollutants that persist in the environment due to a long half-life. Background concentrations can explain pollutant concentrations found even without recent human-caused emissions. Total cancer risks showed variable conditions within the FFO from 2017 to 2019. San Juan and Sandoval Counties reported a slight increase from 2017 to 2019, while Rio Arriba and McKinley Counties showed a slight decline in total cancer risk. Oil and gas cancer risks are estimated from emissions from oil and gas operations such as emissions from individual well locations and production equipment such as pumps, dehydrators, tanks, and engines. Total cancer risk trends contributed to the oil and gas industry shows a slight increase for San Juan and Rio Arriba Counties from 2017 (although a slight decrease from 2018 to 2019) and a relatively flat trend for Sandoval and McKinley Counties.

The noncancer respiratory hazard index for the four counties in the FFO (San Juan, Sandoval, Rio Arriba, and McKinley) in New Mexico is between 0.12 and 0.28 during 2019. Hazard index values less than 1 mean it is unlikely that air toxics will cause adverse noncancer health effects over a lifetime of exposure. The hazard index trend shows a relatively flat to a slight decrease from 2017 to 2019. Oil and gas development and other foreseeable emission sources would contribute to HAP emissions and associated carcinogenic and noncancer risks.

Table 3.9. Cancer Risk and Noncancer Risk within Analysis Area (San Juan, Sandoval, Rio Arriba, and McKinley Counties)

County	Respiratory Hazard Index			Background Cancer Risk (per million)			Total Cancer Risk (per million)			Oil and Gas Cancer Risk (per million)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
San Juan	0.28	0.30	0.28	2.58	1.89	2.58	16.64	17.10	17.56	1.70	2.21	2.06
Sandoval	0.28	0.21	0.22	2.57	1.86	2.57	17.59	17.37	18.72	0.01	0.01	0.01
Rio Arriba	0.15	0.13	0.13	2.51	1.83	2.53	12.70	11.67	12.28	0.03	0.06	0.04
McKinley	0.13	0.12	0.12	2.48	1.82	2.48	11.62	10.50	11.12	0.01	0.01	0.01

Source: EPA Air Toxics Screening Assessment (EPA 2022a).

Potential health risks associated with HAPs released into the air from oil and gas operations have been evaluated by review of existing emissions data, air quality monitoring, and modeling studies assessed. For example, a 2019 health assessment study was completed, the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* (ICF and CSU 2019), for which scientists from Colorado State University (CSU) conducted on-site air monitoring for 47 VOCs (including HAPs) during various stages of well development and production at oil and gas extraction facilities in Colorado. The study used tracer gas controlled-release sampling to develop calculated emission rates during various stages of well development and production for well pads of various sizes and at various locations in Colorado. Acetylene was released at a controlled, constant rate while samples were collected in canisters downwind of the well pads. The samples collected were analyzed in a lab for acetylene and 47 other VOC species, including a number of HAPs such as acetaldehyde, benzene, hexane, toluene, and xylenes, to determine the concentration of each species. The ratio of the known acetylene release rate to the measured downwind sample concentration was then used to calculate emission rates of each VOC species for each sample. Dispersion modeling with the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) was then performed in which rings of receptors were established at various distances from 300 to 2,000 feet from the center of the well pads to estimate short- and long-term chemical air concentrations. (ICF and CSU 2019). The maximum results of the dispersion modeling for each distance were then used in EPA's Air Pollutants Exposure Model (APEX) to compare the calculated exposure levels from each scenario and each distance against acute, subchronic, and chronic exposure standards for each VOC species.

Results of the study indicate that acute (1-hour) exposures were below guideline levels (hazard index under 1 indicating short-term health impacts are unlikely to occur) for most chemicals. At the 500-foot distance, for a small number of chemicals (including benzene, toluene, and ethyltoluenes), the highest estimated acute exposures exceeded guideline levels at the most exposed (downwind) locations, in isolated cases by a factor of 10 or more, particularly during flowback activities at smaller well pads. Flowback is defined in the study as the period after the entire well is fracked and the plugs are drilled out to enable the flow of fracking fluid, water, oil, and natural gas to the surface (ICF and CSU 2019).

For a relatively small number of development scenarios, those highest predicted acute exposures decreased rapidly with distance, but remained above guideline levels out to 2,000 feet (ICF and CSU 2019). Flowback occurs during well completion when fracturing fluids, water, and reservoir gas come to the surface at high velocity and volume and contain a mixture of VOCs, CH_4, benzene, ethylbenzene, and n-hexane (BLM 2021b). As noted by the study, the identification of these estimated exceedances of acute health guidelines (hazard index above 1) is highly conservative and the highest exposures occur rarely (ICF and CSU 2019). Subchronic modeled hazard indexes were generally lower than acute modeled hazard indexes. Most subchronic (multi-day/lasting less than 1 year) exposures were below subchronic guideline levels (all exposures at the 500-foot distance and beyond) during development activities, although subchronic exposures slightly above guideline levels for combined exposures

to multiple chemicals were noted during fracking at distances out to 800 feet. As with acute exposure estimates, the study noted that the subchronic exposure estimates are also conservative (ICF and CSU 2019).

Chronic exposure was estimated for production operations, development and operations, and long flowback operations. Exposures at the 500-foot distance for the flowback periods were far below guideline levels for individual chemicals and only slightly above guideline levels for combined exposures to multiple chemicals (Executive Summary, pg. xxi, *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* [ISF and CSU 2019]). The chronic exposures during production operations were generally the lowest, relative to guideline levels, from all modeled scenarios. At the 500-foot distance from the facility, all chronic exposures during production activities were below guideline levels, and the average incremental lifetime cancer risk from chronic benzene exposure was 5 in 1 million or less (dropping below 1 in 1 million before the 2,000-foot distance). When estimates of chronic exposure include exposure to development activities occurring sequentially with exposure to production activities, exposures were only slightly higher than those estimated during the production activities alone. The hazard index for chronic health impacts was 1 or less, often by more than an order of magnitude, at receptors that are 2,000 feet from the modeled well pad scenarios (ICF and CSU 2019). Table 3.10 summarizes cancer risks over a lifetime of exposure during oil and gas production operations per the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* (ICF and CSU 2019).

Table 3.10. Cancer Risks Over a Lifetime of Exposure During Production Operations of Oil and Gas Activities

Distance (feet)	Average Incremental Lifetime Cancer Risk	Maximum Exposed Individuals Cancer Risk
300	10 in 1 million	-
400	-	10 in 1 million
500	4 in 1 million	7 in 1 million
1,400	1 in 1 million	-
2,000	-	1 in 1 million

Source: Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado (ICF and CSU 2019).

In summary, simulated cancer risks 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 CSU 2019).

3.2.2 Environmental Consequences

3.2.2.1 ENVIRONMENTAL EFFECTS

The Proposed Action would result in different emission sources associated with two project phases: well development and well production. Annual estimated emissions from the Proposed Action, summarized in Table 3.11, are estimated from the NMED Air Emissions Calculator Tool and the Emissions and Modeling Impacts Tool (EMIT). The wells would be drilled from a new well pad, including a new access road and pipeline to the project area. Emissions related to construction were averaged over all wells in the single well construction/development phase in Table 3.11. After the pad has been constructed and the wells are drilled, only operation emissions would occur on an annual basis. Operation annual emissions

were based upon the maximum emission year. Future-year operational annual emissions would be less based on production decline of the wells.

Table 3.11. Proposed Action Emissions (tons/year)

	Total Emissions (tons per year)						
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x	VOC	Total HAPs
Single well construction/development phase	2.98	8.13	0.49	0.48	0.01	0.70	0.13
Single well operation phase	16.47	11.63	0.36	0.29	0.01	14.43	1.86
Single well total	**19.45**	**19.76**	**0.85**	**0.77**	**0.02**	**15.14**	**1.99**
Six well construction/development phase	17.85	48.78	2.96	2.87	0.05	4.22	0.81
Six well operation phase	98.82	69.80	2.13	1.73	0.08	86.60	11.15
Six well project total	**116.68**	**118.58**	**5.09**	**4.60**	**0.13**	**90.82**	**11.96**
Current emissions (San Juan, Sandoval, Rio Arriba, and McKinley Counties)	108,755	53,708	24,218	6,042	2,301	141,794	15,278
Project percent increase compared to San Juan, Sandoval, Rio Arriba, and McKinley Counties	**0.11%**	**0.22%**	**0.02%**	**0.08%**	**0.01%**	**0.06%**	**0.08%**

Source: Enduring (2023c) and EPA (2023d).

Well development would include NO_x, SO_2, and CO tailpipe emissions from construction equipment, vehicle traffic, drilling, and completion activities. Fugitive dust concentrations would occur from vehicle traffic on unpaved roads, construction equipment, and wind erosion where soils are disturbed. Drill rig and fracturing engine operations would result mainly in NO_x and CO emissions, with lesser amounts of SO_2. VOC and HAP emissions during completions (flowback) would also occur. These emissions would be short-term, approximately 4–5 months for the construction of the well pad, development and completion of six wells, and development of associated infrastructure. During well production, NO_x, CO, VOC, and HAP emissions would originate from well pad separators, storage tank vents, compressor engines, generators, equipment tailpipes, and flares (if applicable). Fugitive road dust (PM_{10} and $PM_{2.5}$) would be produced by operational vehicles visiting and servicing the wells. HAP emissions would occur from storage tanks, pneumatic devices, and other production equipment. The wells associated with the Proposed Action are assumed to be included within the RFD. Emissions would be minimized through the application of air resource protection design features (detailed in Appendix H) such as limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads. Additionally, emissions would be minimized by following applicable NMED rules and regulations. Based on the current rate of development (below the projected RFD) and the RFD projections compared to the CARMMS 2.0 modeling (discussed in Section 3.1.6), the corresponding CARMMS 2.0 low modeling scenario, which represents a conservative estimate of federal impacts through 2025, indicates that the emissions from this project would not be expected to result in any exceedances of the NAAQS or NMAAQS for any criteria pollutants in the analysis area.

The project area is located in an oil/gas field approximately 0.5 mile (3,000 feet) from the nearest houses or residential buildings. There are approximately seven oil/gas wells within a 1-mile radius of the project area. The HAP impacts would be local and not affect nearby communities. The farthest distance from the extent of production activities to the modeled cancer risk of 1 in 1 million for the *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* was 2,000 feet (ICF and CSU 2019).

This is provided to give an estimate of the potential impact area and to show that this project may have a larger or smaller impact area based on differences in emissions and other HAPs sources in the area. As a result of this study, a mitigation measure of restricting well development 2,000 feet (609.6 meters) from the nearest residential building has been included in Section 3.2.2.2. HAP modeling for specific locations in New Mexico is ongoing, and this restrictive distance may change depending on the results of this modeling.

Emissions of criteria air pollutants would also occur outside the planning area from transport, processing, distribution, and end use. Generally, crude oil from the well fields in the San Juan Basin of northwestern New Mexico is transported to the crude oil refinery in Artesia, located in southeastern New Mexico. The refinery processes both heavy sour and light sweet crude oils and serves markets in the southwestern United States and northern Mexico. A small refinery in northwestern New Mexico, which processed local San Juan Basin crude oil, closed in 2020 (EIA 2023). Natural gas is produced from shales, low permeability sands, and coalbeds in the San Juan Basin in northwestern New Mexico. Interstate pipelines bring natural gas into New Mexico from Texas and Colorado and carry most of the natural gas that leaves the state to Arizona or back to Texas. Some of New Mexico's natural gas is placed in the state's two underground storage fields (EIA 2023). Since combustion of all petroleum products emit criteria and hazardous air pollutant emissions, local ambient concentrations of these pollutants could increase in areas where products from the San Juan Basin (oil and gas) are combusted. This could contribute to an area exceeding either national or local air quality standards. Air quality involves complex physical and chemical transformations at a local/regional level, so impacts would vary considerably depending on background concentrations, meteorology, and other local pollutant sources. If any pollutant concentration is near or above its standard in a particular area, the combustion of oil and gas products could contribute to or exacerbate nonattainment. Potential pollutant concentration change resulting from combustion is therefore often a key driver of public policy to mitigate air quality and public health impacts in such areas. Downstream combustion and end uses are regulated by the EPA or delegated to state agencies. This regulatory process is designed to avoid downstream impacts to regional and local air quality.

Under the No Action Alternative, the BLM would not authorize the APDs, and the new wells and associated infrastructure described in the Proposed Action would not be implemented. Potential impacts to air quality would not occur because the proposed wells would not be developed, and no new emissions of pollutants would occur. Although no new criteria pollutant emissions would occur under the No Action Alternative, federal production levels are expected to remain static or even increase in the short-term, and non-federal oil and gas supply would likely increase if the wells were not developed.

3.2.2.2 MITIGATION MEASURES AND RESIDUAL EFFECTS

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use. Magnesium chloride, organic-based compounds, and/or polymer compounds could also be used on dirt roads upon approval by the BLM.
- BMPs provided in The Gold Book would be implemented for proposed and existing roads (BLM and USFS 2007).
- Compressor engines 300 horsepower or less used during well production must be rated by the manufacturer as emitting NO_x at 2 grams per horsepower-hour or less to comply with the NMED Air Quality Bureau's guidance.
- Green completions would be used for all well completion activities where technically feasible, per the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa) or other regulations that replace or exceed OOOOa.

- The operator would obtain an air permit, if required by the regulatory agency, for equipment operating under this Proposed Action and would follow regulatory requirements.
- A set-back distance restricting well development 2,000 feet from the center of the well pad to the nearest residential building would be used (based on the study: *Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado* [ISF and CSU 2019]).[2]

Design features (detailed in Appendix H) have been established to minimize dust by limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads.

BMPs are designed to reduce emissions from field production and operations. These BMPs are applied to oil and natural gas drilling and production to help minimize impacts to air quality through reduction of emissions, surface disturbances, and dust from field production and operations. The BLM encourages oil and natural gas companies to adopt other proven, cost-effective technologies and practices that improve operational efficiency and reduce emissions. In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is administered by the EPA (EPA 2022c). 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 2006).

The BLM FFO created an Inspection and Enforcement Department in 2020 to perform inspections for potential fugitive emissions such as CH_4 leaks within the FFO planning area. The BLM currently has 17 certified inspectors and one noncertified inspector. At the beginning of each fiscal year, inspectors are assigned workloads consisting of production inspections for approximately 427 active wells per inspector, and at least 20 oil sales with 20-meter calibrations. Inspectors also witness all plug and abandonment procedures and high-priority drilling operations. Of the 17 inspectors, seven are infrared-certified inspectors who conduct infrared inspections throughout the FFO area. The inspections results are recorded and entered in the Automated Fluid Minerals Support System (AFMSS) database.

[2] HAP modeling for specific locations in New Mexico is ongoing, and this restrictive distance may change depending on the results of this modeling.

3.3 Issue 2: How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change?

The Proposed Action could lead to emissions of CO_2, CH_4, and nitrous oxide (N_2O), the three most common GHGs associated with oil and gas development. These GHGs would be emitted during well development and operations, and from the end-use consumption of any fluid minerals that may be produced. However, the BLM cannot reasonably determine before development the amount of fluid minerals that will be extracted. For the purposes of this analysis, the BLM has evaluated the potential effects of the Proposed Action on climate change by analyzing potential GHG emissions from the proposed development using estimates based on past oil and gas development and available information from existing development within the state.

Additional discussion of climate change science and predicted impacts as well as the reasonably foreseeable and cumulative GHG emissions associated with the BLM's oil and gas decisions are included in the 2021 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends from Coal, Oil, and Gas Exploration and Development on the Federal Mineral Estate (BLM 2022b) (hereinafter referred to as the Annual GHG Report). This report presents the estimated emissions of GHGs attributable to fossil fuels produced on lands and mineral estate managed by the BLM. The Annual GHG Report is incorporated by reference as an integral part of the analysis and is available at https://www.blm.gov/content/ghg/2021 (BLM 2022b).

3.3.1 Affected Environment

3.3.1.1 CLIMATE CHANGE

Climate change is a global process that is affected by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from a single proposed land management action cannot be accurately translated into its potential effect on global climate change or any localized effects in the area specific to the action. Currently, global climate models are unable to forecast local or regional effects on resources. 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. 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 allow 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 are put into context by comparing them to emissions from other state or federal, national, and global sources, and emissions reduction goals, and by expressing emissions in terms of equivalent sources and climate costs to understand their potential contribution to climate change impacts.

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 provided in Chapters 8 and 9 of the Annual GHG Report (BLM 2022b). 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.

The effects of climate change in New Mexico can be seen in the last decade (2011–2020) as it was the warmest on record for the state, and the three hottest years observed each occurred since 2012. Temperatures have increased the most in the central and southeastern portions of the state, while the

northeastern plains and Mogollon Rim have warmed by about half as much. Along with higher mean temperatures, much of the state has seen increases in the number of extremely hot days (maximum temperature at or above 100 degrees Fahrenheit [°F]), especially on the eastern plains. While 2020 was the second driest year on record and the most recent decade (2011–2020) was the driest since 1955–1964, there is no long-term trend in mean annual precipitation. Statewide annual precipitation has ranged from a high of 26.57 inches in 1941 to a low of 6.58 inches in 1956. Unlike many areas of the United States, there has been no increase in the frequency of extreme precipitation events (days with an inch or more of precipitation) in New Mexico. While the average number of such events between 2015 and 2018 was the highest on record, this is too short a period to constitute a trend (BLM 2022b).

Table 3.12 shows the total estimated GHG emissions from fossil fuels at the global, national, and state scales over the last 5 years. Emissions are shown in Mt CO_2e/year. Chapters 4, 5, and 6 of the Annual GHG Report (BLM 2022b), incorporated by reference, contains additional information on GHGs and an explanation of CO_2e, and contains the methodology and parameters for estimating emissions from cumulative BLM fossil fuel authorizations. State and national energy-related CO_2e emissions include emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed.

Table 3.12. Annual Global, U.S., and New Mexico GHG Emissions as Reported to the EPA from 2016 through 2020

Area	Annual GHG Emissions (Mt CO_2e/year)				
	2016	2017	2018	2019	2020
Global	36,465.59	36,935.59	37,716.18	37,911.37	35,962.87
U.S.	5,076.98	5,005.53	5,159.30	5,036.04	4,535.30
New Mexico	75.9	77.2	74.4	79.4	-

Source: Annual GHG Report (BLM 2022b), Chapter 6, Tables 6-1 and 6-3: Mt (megaton) = 1 million metric tons

Global and U.S. GHG emissions declined by approximately 4.4% and 9.94%, respectively, in 2020, primarily due to the economic effects of the COVID-19 pandemic (BLM 2022b). However, globally the use of all fossil fuels and the CO_2 emissions associated with the combustion of these fuels continues to rise. CO_2 emissions from global oil combustion have remained steady over the last decade while emissions from oil in the U.S. increased in recent years due primarily to the increase from new production in basins such as the Permian and Williston Basins and offshore regions. CO_2 emissions from natural gas have increased dramatically, both globally and in the U.S., due to increases in production and demand as a replacement fuel for coal (BLM 2022b).

Global energy-related CO_2 emissions are projected to increase by 0.6% per year from 2020 to 2050 from about 35 billion metric tons CO_2 to about 43 billion metric tons (BLM 2022b). Although aggregate CO_2 emissions from the energy sector are projected to continue to rise, the carbon intensity of future energy sources (i.e., the amount of CO_2 emissions produced per unit of energy used) is projected to decrease, indicating that sources of energy that do not produce CO_2 emissions (e.g., renewables) will comprise a larger portion of meeting future energy demands. U.S. energy-related CO_2 emissions from fossil fuel consumption are projected to slightly decrease over the next decade due primarily to significant decreases in coal consumption and a rise in the use of natural gas and renewable energy sources to meet demand. However, U.S. CO_2 emissions from energy consumption are expected to increase beyond 2035 due to increases in population and economic growth and the associated increases in oil and natural gas consumption (BLM 2022b).

3.3.2 Environmental Consequences

3.3.2.1 ENVIRONMENTAL EFFECTS

There are four general phases of development that would generate GHG emissions from the Proposed Action: 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. Emissions are presented for each of the four phases described above:

- Well development emissions occur over a short period and include emissions from heavy equipment and vehicle exhaust, drill rig engines, completion equipment, pipe venting, and well treatments, such as hydraulic fracturing, that may be used.
- 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.
- Production emissions may result from storage tank breathing and flashing, truck loading, pump engines, heaters and dehydrators, pneumatic instruments or controls, flaring, fugitives, and vehicle exhaust.
- Mid-stream emissions occur from the transport, refining, processing, storage, transmission, and distribution of produced oil and gas. Mid-stream emissions are estimated by multiplying the estimated ultimate recovery (EUR) of produced oil and gas with emissions factors from the DOE's National Energy Technology Laboratory life cycle analysis of U.S. oil and natural gas (National Energy Technology Laboratory 2009, 2019). Additional information on emission factors can be found in the Annual GHG report (Chapter 4, Tables 4-7 and 4-9, [BLM 2022b]). Actual mid-stream emissions may differ from the estimates made using these national-scale emissions factors.
- For this analysis, end-use emissions were calculated assuming all produced oil and gas would be combusted for energy use. End-use emissions are estimated by multiplying by the EUR of produced oil and gas with emissions factors for combustion established by the EPA (Tables C-1 and C-2 to Subpart C of 40 CFR § 98). Additional information on emission factors and EUR factors can be found in the Annual GHG Report (Chapter 4), [BLM 2022b]).

For purposes of estimating end-use emissions, wells are assumed to produce oil and gas in amounts similar to 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 that all produced oil or gas will be combusted (such as for domestic heating or energy production).

Table 3.13 lists the estimated direct (well development and production operations) and indirect (mid-stream and end-use) GHG emissions in metric tons (tonnes) for an estimated 20-year production life of the wells. Emissions are based on 100% of the well bore being federal minerals.

Table 3.13. Estimated Life of Wells Emissions from Well Development and Production Operations

Activity	Emissions (tonnes)				
	CO_2	CH_4	N_2O	CO_2e (100-year)	CO_2e (20-year)
Well development	7,461	0.18	0.006	7,468	7,477
Well production operations	232,366	981.60	0.0240	261,683	313,413

Activity	Emissions (tonnes)				
	CO_2	CH_4	N_2O	CO_2e (100-year)	CO_2e (20-year)
Mid-stream activities	249,457	1,200.23	4.019	286,321	349,572
End-use activities	1,794,967	64.49	12,.215	1,800,224	1,803,622
Total	**2,284,250**	**2,246.50**	**16.480**	**2,355,695**	**2,474,085**

Source: BLM Lease Sale Emissions Tool – modified to show emissions associated with the six APDs for a 20-year life.

IPCC Sixth Assessment Report Global Warming Potentials (GWP) - 100-year GWP: CO_2=1, CH_4=29.8, N_2O=273; 20-year GWP: CO_2=1, CH_4=82.5, N_2O=273 (IPCC 2021).

GHG emissions vary annually over the production life of a well due to declining production over time. Oil and gas wells typically produce high quantities of minerals initially, followed by a period of rapid decline that settles into a very shallow decline over the remainder of their economic life. This EA presents quantified estimates of direct and indirect GHG emissions released into the atmosphere from well construction, drilling, completion, production, and end use. However, GHG emission estimates involve significant uncertainty due to unknown factors including actual production and lifetime of the well. Figure 3.2 shows the estimated GHG emissions profile over the production life of typical well including well development, well production operations, end-use, and gross (total of well development, well production, and end-use) emissions.

Enduring estimates that each well will produce an average of 75.7 bbl of oil and 151.9 cubic feet (mcf) of natural gas per day; this will vary based on reservoir pressure, lateral length, etc. Assuming a 20-year well life, the lifetime production (EUR) is estimated to be 552,706 bbl of oil and 1,109,000 mcf of natural gas for one well or 3,316,236 bbl of oil and 6,654,000 mcf of natural gas for all six wells (Table 3.14).

Table 3.14. Estimated Ultimate Recovery for the Proposed Action

GLU 053 Production EUR	1 well / per day	1 well / 20-year life	6 wells / 20-year life
Produced oil (bbls)	75.7	552,706	3,316,236
Produced natural gas (mcf)	151.9	1,109,000	6,654,000

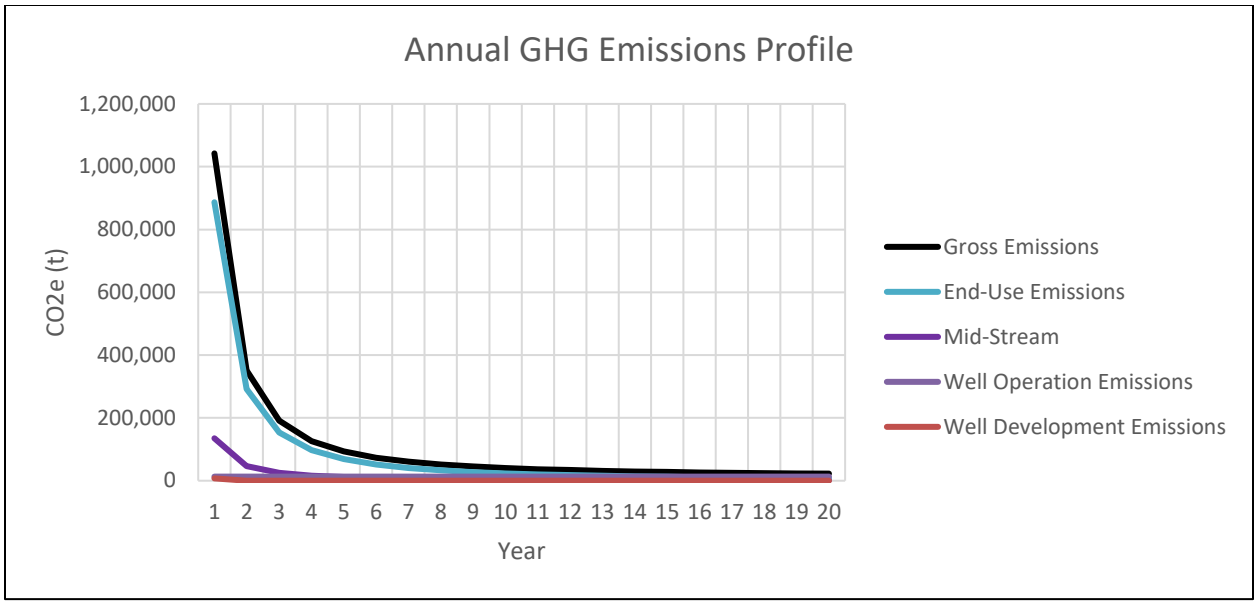

Figure 3.2. Estimated GHG emissions profile over the life of the Proposed Action.

Source: BLM Lease Sale Emissions Tool – modified to show emissions associated with the five APDs for a 20-year life.

Development of the Proposed Action can be compared with other common activities that generate GHG emissions and with emissions at the state and national levels. The EPA GHG equivalency calculator can be used to express the potential average-year GHG emissions on a scale relatable to everyday life (EPA 2022d). The average direct and indirect life of well emissions projected on an annual basis from this six-well Proposed Action is 117,785 tonnes CO_2e/yr. The projected average annual GHG emissions from expected development following the Proposed Action are equivalent to 25,385 gasoline-fueled passenger vehicles driven for 1 year, or the emissions that could be avoided by operating 32 wind turbines as an alternative energy source or offset by the carbon sequestration of 140,220 acres of forest land.

Table 3.15 compares the estimated Proposed Action emissions to existing federal fossil fuel (oil, gas, and coal) emissions and state and U.S. total GHG emissions from all sectors as reported in the EPA's *Inventory of U.S. GHG Emissions and Sinks: 1990-2020* (EPA 2022e). The federal portion is 20.6% of the U.S. total annual emissions, including offshore (BLM 2022b). The comparisons below show the Proposed Action's relationship to other past/present/foreseeable authorizations and how the Proposed Action fits as part of the BLM's oil, gas, and coal programs.

Table 3.15. Comparison of Proposed Action Annual Emissions with Other Source Emissions

Reference	MT CO_2e (per year)*	Average Year % of Reference
Proposed Action emissions (average year)	0.118	-
New Mexico Onshore Federal (Oil and Gas)†	245.71	0.048
U.S. Onshore Federal (Oil and Gas)†	465.63	0.025
U.S. Federal (Oil and Gas)†	844.27	0.014
U.S. Federal (Oil, Gas, and Coal)†	1,292.57	0.009
New Mexico Total (all sectors)‡	79.4	0.15
U.S. Total (all sectors)‡	5,981.40	0.002

* Estimates are based on 100-GWP values.

† Federal values come from the BLM Specialist Report on Annual Greenhouse Gas Emissions. Tables ES-1 and ES-2 (BLM 2022b).

‡ Values are from the EPA's *Inventory of U.S. GHG Emissions and Sinks: 1990-2020* (EPA 2022e) and use IPCC Fourth Assessment Report Global Warming Potentials.

Table 3.16 compares emissions estimates over the 20-year life of the wells with the 30-year projected federal emissions in the state and nation from existing wells, the development of approved APDs, and emissions related to reasonably foreseeable federal actions.

Table 3.16. Comparison of the Life of the Well Emissions to Other Federal Oil and Gas Emissions

Reference	Mt CO_2e (20-year)	Life of Well % of Reference
Life of well(s)	2.356	100
New Mexico reasonably foreseeable short-term federal (oil and gas)*	1,939.52	0.121
New Mexico EIA projected long-term federal (oil and gas)†	5,767.27	0.041
U.S. reasonably foreseeable short-term federal (oil and gas)*	4,614.81	0.051
U.S. EIA projected long-term federal (oil and gas)†	13,560.24	0.017

Source: U.S. and federal emissions from Annual GHG Report Figure 5-1 and Tables 5-17 and 5-18 (BLM 2022b).

* Short-term projections are based on existing production, approved permits, and potential new leases.

† Long-term projections are based on the projections from the U.S. EIA energy outlook.

Compared with emissions from other existing and foreseeable federal oil and gas development, the life of project emissions for the Proposed Action is between 0.041% and 0.121% of federal fossil fuel authorization emissions in the state and between 0.017% and 0.051% of federal fossil fuel authorization emissions in the nation (EPA 2022e). In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 2.356 Mt CO_2e over the life of the project.

3.3.2.2 MONETIZED IMPACTS FROM GHG 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.

On January 20, 2021, President Biden issued Executive Order 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis* (86 Federal Register 7037). Section 1 of this order directs agencies to, among other things, listen to the science; improve public health and protect our environment; ensure access to clean air and water; reduce GHG emissions; and bolster resilience to the impacts of climate change. Section 2 of the Executive Order calls for federal agencies to review existing regulations and policies issued between January 20, 2017, and January 20, 2021, for

consistency with the policy articulated in the Executive Order and to take appropriate action (86 Federal Register 7037).

Consistent with Executive Order 13990, the Council on Environmental Quality (CEQ) rescinded its 2019 "Draft National Environmental Policy Act Guidance on Considering Greenhouse Gas Emissions" and has begun to review for update its "Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews" issued on August 5, 2016 (2016 GHG Guidance). While the CEQ works on updated guidance, it has instructed agencies to consider and use all tools and resources available to them in assessing GHG emissions and climate change effects, including the 2016 GHG Guidance (CEQ 2016).

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

Section 5 of Executive Order 13990 emphasized how important it is for federal agencies to "capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account" and established an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG). In February 2021, the IWG published *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990* (Technical Support Document) (IWG 2021). This is an interim report that updated previous guidance from 2016; the final report is still pending (EPA 2022f).

In accordance with this direction, this subsection provides estimates of the monetary value of changes in GHG emissions that could result from selecting each alternative. 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. For example, the BLM's overall economic analysis for this development does not monetize most of the major costs or benefits and does not include all revenue streams from the Proposed Action. 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 SC-CO_2, SC-CH_4, and SC-N_2O developed by the IWG on the SC-GHG. Select estimates are published in the Technical Support Document (IWG 2021), and the complete set of annual estimates are available on the Office of Management and Budget's website.

The IWG's SC-GHG estimates are based on complex models describing how GHG emissions affect global temperatures, sea level rise, and other biophysical processes; how these changes affect society through, for example, agricultural, health, or other effects; and monetary estimates of the market and nonmarket values of these effects. One key parameter in the models is the discount rate, which is used to estimate the present value of the stream of future damages associated with emissions in a particular year. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (i.e., future benefits or costs are a less significant factor in present-day decisions). The current set of interim estimates of SC-GHG have been developed using three annual discount rates: 5%, 3%, and 2.5% (IWG 2021).

As expected with such a complex model, there are multiple sources of uncertainty inherent in the SC-GHG estimates. Some sources of uncertainty relate to physical effects of GHG emissions, human behavior, future population growth and economic changes, and potential adaptation (IWG 2021).

To better understand and communicate the quantifiable uncertainty, the IWG method generates several thousand estimates of the social cost for a specific gas, emitted in a specific year, with a specific discount rate. These estimates create a frequency distribution based on different values for key uncertain climate model parameters. The shape and characteristics of that frequency distribution demonstrate the magnitude of uncertainty relative to the average or expected outcome.

To further address uncertainty, the IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average damages from the multiple simulations at each of the three annual discount rates (5%, 3%, and 2.5%). The fourth value represents higher-than-expected economic impacts from climate change. Specifically, it represents the 95th percentile of damages estimated, applying a 3% annual discount rate for future economic effects. This is a low-probability but high-damage scenario that represents an upper bound of damages within the 3% discount rate model. The estimates below follow the IWG recommendations.

The SC-GHG values associated with estimated emissions from the proposed development are reported in Table 3.17. These estimates represent the present value of future market and nonmarket costs associated with CO_2, CH_4, and N_2O emissions from potential well development and operations, as well as potential end use, as described in Section 3.3.1. Estimates are calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and BLM's estimates of emissions in each year. They are rounded to the nearest $1,000. The estimates assume development will start in 2023 and end-use emissions will be complete in 2043, based on the projected production life of the Proposed Action.

Table 3.17. SC-GHG Associated with Development of the Proposed Action (2020$)

	SC-GHG (2020$)			
	SC-GHG Average Value, 5% discount rate	**SC-GHG Average Value, 3% discount rate**	**SC-GHG Average Value, 2.5% discount rate**	**SC-GHG 95th Percentile Value, 3% discount rate**
Development and Operations	$3,805,000	$1,549,000	$19,723,000	$39,702,000
End-Use	$32,208,000	$110,677,000	$164,049,000	$330,972,000
Total	**$36,013,000**	**$112,226,000**	**$183,772,000**	**$370,674,000**

Source: BLM SC-GHG Emissions Tool – modified to show emissions associated with the six APDs for a 20-year life.

Under the No Action Alternative, the BLM would not authorize the APDs, and the new wells and associated infrastructure described in the Proposed Action would not be implemented. Potential impacts to air quality would not occur because the proposed wells would not be developed, and no new emissions of pollutants would occur. Although no new criteria pollutant emissions would occur under the No Action Alternative, federal production levels are expected to remain static or even increase in the short term, and non-federal oil and gas supply would likely increase if the wells were not developed.

3.3.2.3 MITIGATION STRATEGIES

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 GHG Annual Report provides a more detailed discussion of GHG mitigation strategies (BLM 2022b).

The federal government has issued regulations that will reduce GHG emissions from any development related to the Proposed Action. These regulations include the New Source Performance Standard for Crude Oil and Natural Gas Facilities (49 CFR 60, subpart OOOOa), which imposes emissions limits, equipment design standards, and monitoring requirements on oil and gas facilities.

On May 25, 2021, in accordance with Governor Michelle Lujan Grisham's Executive Order 2019-003 (January 29, 2019), the New Mexico Energy, Minerals and Natural Resources Department announced the release of the New Mexico Oil Conservation Division (NMOCD) proposed Statewide Natural Gas Capture Requirements, NMAC 19.15.27.9, as part of New Mexico's statewide, enforceable regulatory framework to secure reductions in oil and gas sector emissions and to prevent natural gas waste from new and existing sources. Key provisions include prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to route the gas to pipeline or to use this gas for some other beneficial purpose (such as on-site fuel consumption). In all cases, operators must flare rather than vent natural gas except where this is technically infeasible or would pose a safety risk. These provisions will reduce VOC emissions due to stringent limitations on natural gas venting which results in uncombusted VOC emissions. Additionally, it proposes that natural gas be recovered and reused rather than flared, which would result in reductions of VOC, NO_X, CO, SO_2, and particulate matter emissions.

The Statewide Natural Gas Capture Requirements focus on natural gas loss reporting and collection of baseline gas capture data and natural gas waste targets and requires monthly reporting, monitoring, and recordkeeping. They also require operators to reduce their natural gas waste by a fixed amount each year to achieve a gas capture rate of 98% by December 31, 2026.

The BLM's regulatory authority is limited to those activities authorized under the terms of the APD that primarily occur in the "upstream" portions of natural gas and petroleum systems. This decision authority is applicable when development is proposed on public lands and BLM assesses its specific location, design, and proposed operation. In carrying out its responsibilities under NEPA, the BLM has developed BMPs designed to reduce emissions from field production and operations. BMPs may include limiting emissions on stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions occurring on a lease parcel. Typical BMPs include adherence to 43 CFR 3179 concerning the venting and flaring of gas on federal leases for natural gas emissions that cannot be economically recovered, flaring hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion, implementing 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, and provisions that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored.

In addition, the BLM encourages industry to participate in the Natural Gas STAR program that is 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 2006, 2022c).

Analysis and approval of future development may include application of BMPs within the BLM's authority, as Conditions of Approval, to reduce or mitigate GHG emissions. Additional measures may also be incorporated as applicant-committed measures by the project proponent or added to necessary air quality permits.

3.4 Issue 3: How would future drilling and completion operations associated with the Proposed Action impact water quality and quantity?

The following analysis summarizes information contained in the 2022 BLM New Mexico Water Support Document (BLM 2022a), hereafter referred to as the Water Support Document. The analysis area established to analyze effects on water quality and quantity is the New Mexico portion of the San Juan Basin, which encompasses portions of San Juan, McKinley, Rio Arriba, and Sandoval Counties. The Mancos Shale formation and the associated sandstones it contains such as the Gallup Sandstone, El Vado Member and Tocito Sandstone Lentil (collectively referred to as the Gallup zone), underlies a majority of the FFO management area and has the highest potential for oil and gas development near Nageezi and Counselor, New Mexico. See Section 3.1.1 for details of the RFD scenarios as they pertain to horizontal and vertical drilling in the analysis area.

3.4.1 Affected Environment

3.4.1.1 CURRENT TOTAL WATER USE IN THE ANALYSIS AREA

The 2015 USGS report, *Estimated Use of Water in the United States in 2015* (Dieter et al. 2018), lists total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power for the entire United States. Water use associated with oil and gas development is reported under the 'mining' category. The Water Support Document used information from Dieter et al. (2018) to estimate water use for the New Mexico portion of the San Juan Basin (BLM 2022a: Table 4-5). Within the New Mexico portion of the San Juan Basin, the total water use across all categories in 2015 was estimated at 486,660 acre-feet (AF), or about 15% of total statewide withdrawals (BLM 2022a: Table 4-5). About 10% of the New Mexico San Juan Basin total water use (50,008 AF) came from groundwater sources; the remainder was from surface water sources. The largest water-use categories in the analysis area are irrigation (79%) and public water supply (8%). Approximately 2% (11,658 AF) of total 2015 water use in the analysis area is attributable to mining, the category under which oil and gas operations are reported (Dieter et al. [2018] do not detail the amount of water used specifically for oil and gas development). Mining operations in the analysis area mostly used groundwater sources (8,934 AF, or about 77%), with some use from surface water sources (2,724 AF, or about 23%). Table 3.18 summarizes water use for the New Mexico portion of the San Juan Basin.

Table 3.18. 2015 Water Use for the New Mexico Portion of the San Juan Basin

Category	Surface Water (AF/year)			Groundwater (AF/year)			Total (AF/year)
	Fresh	Saline*	Total	Fresh	Saline*	Total	
Aquaculture	0	0	0	4,641	0	4,641	4,641
Domestic	0	-	0	8,979	-	8,979	8,979
Industrial	0	0	0	2,634	0	2,634	2,634
Irrigation	381,241	-	381,241	3,576	-	3,576	384,817
Livestock	437	-	437	986	-	986	1,424
Mining	2,724	0	2,724	3,677	5,257	8,934	11,658
Public Water Supply	21,613	0	21,613	17,958	0	17,958	39,571
Thermoelectric Power	30,637	0	30,637	2,298	0	2,298	32,935

Category	Surface Water (AF/year)			Groundwater (AF/year)			Total (AF/year)
	Fresh	Saline*	Total	Fresh	Saline*	Total	
Basin Totals	**436,652**	**0**	**436,652**	**44,750**	**5,257**	**50,008**	**486,660**

Source: 2022 BLM New Mexico Water Support Document (BLM 2022a).

Note: Values may not sum to total because of independent rounding (Dieter et al. 2018). Water use data are in AF/year.

* Saline water withdrawals are not reported for domestic, irrigation, or livestock water use (Dieter et al. 2018).

3.4.1.2 CURRENT WATER USE ASSOCIATED WITH OIL AND GAS DEVELOPMENT

As part of oil and gas development, water is used for (but is not limited to) activities such as drilling fluid preparation and make-up water for completion fluids, in-well stimulation (of which the most common method is hydraulic fracturing), and ancillary uses such as rig wash water, coolant for internal combustion engines, for dust suppression on roads or well/facility pads, and for equipment testing.

Water use associated with hydraulic fracturing (also called completion or stimulation) of wells, which comprises the majority of oil and gas water use volume, is dependent on many factors, including the target geologic formation and availability of resources. Hydraulic fracturing is an umbrella term for hydraulically fractured wells, but there are multiple different completion or fracturing technologies used to hydraulically fracture oil and gas wells. Within the FFO the two most prominent techniques utilized are nitrogen (which is a nitrogen-based fluid) and slick water (which is a water-based fluid). Historically, in the analysis area the water use associated with the hydraulic fracturing process in a vertical well is 0.537 AF/well; for a horizontal well, the average water use is 3.13 AF/well (Crocker and Glover 2018). According to interviews conducted with the largest operators currently operating within the San Juan Basin, approximately 95% of water used for well development is used to hydraulically fracture a well and 5% is used for all other activities listed above (BLM 2019a).

Oil and gas operators are required by the State of New Mexico to disclose water use to the FracFocus database (19.15.16 NMAC), a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission to provide objective information on hydraulic fracturing. The BLM examined FracFocus data reported for calendar years of 2014 to 2020 to determine actual water use in the analysis area (BLM 2022a; FracFocus 2023). Table 3.19 depicts how water was used in 2018 through 2021 according to FracFocus and the corresponding well files.

Table 3.19. 2018–2021 Water Use from Oil and Gas Activities, Reported to FracFocus

Year		Total Water Use All Categories	Water Use Recompletions	Total Water Use Nitrogen Completions	Total Water Use Slick Water Completions
2018	Average	4.6 AF	0.2 AF	4.6 AF	38.9 AF
	Total	658 AF	25 AF	88.3 AF	544.5 AF
2019	Average	1.74 AF	0.2 AF	5.6 AF	49.2 AF
	Total	161 AF	17.2 AF	94.4 AF	49.2 AF
2020	Average	5.7 AF	-	5.7 AF	-
	Total	51 AF	-	51 AF	-
2021	Average	14.9 AF	0.3 AF	5.2 AF	42.1 AF
	Total	671.1 AF	4.5 AF	78.2 AF	588.4 AF

Total water use from oil and gas activities within the four FFO counties has varied over the last 7 years. The total water use for all wells increased from 51 AF in 2020 to 671 AF in 2021. Average water use per well increased from 5.7 AF in 2020 to 14.9 AF in 2021 (see Table 3.19). Wells on federal land consumed 551 AF of water in 2021, 82% of the 2021 total water usage. The number of wells completed increased from nine in 2020 to 45 in 2021 (BLM 2022a). As reported in the Water Support Document (BLM 2022a) and with consideration of all types of well completions, the Water Support Document estimates 5.1 AF of water use per well based on historical water use and an analysis of all types of well completions over the next 20 years (BLM 2022a).

3.4.1.3 WATER USE ASSOCIATED WITH REASONABLY FORESEEABLE ENVIRONMENTAL TRENDS AND PLANNED ACTIONS

Reasonably Foreseeable Environmental Trends and Planned Actions

The FFO 2018 RFD projects the development of 3,200 (federal and non-federal) wells (2,300 horizontal wells and 900 vertical wells) drilled within the analysis area by 2037, of which 2,490 would be federal, or approximately 170 (131 federal) wells per year (see Section 3.1.1) (Crocker and Glover 2018). Future well development, such as the development expected under the Proposed Action, is already considered in this scenario. Based on vertical and horizontal water use estimates contained in the 2018 RFD and refined through a review of 2018 FracFocus water use data, consumptive water use required for hydraulic fracturing of the wells projected in the RFD is currently estimated at 11,615 AF, or about 580 AF in any given year. Development of the RFD would also require some water for drilling, dust control, and construction of reasonably foreseeable transmission lines and pipelines (BLM 2022a).

In 2019, the RPFO 2019 RFD (Crocker and Glover 2019) was published (see Section 3.1.1). This RFD includes a portion of Sandoval County that overlaps the RPFO portion of the Mancos-Gallup Formation area. Sandoval County is the only county addressed in the RFD because it is the only county in the RPFO with consistent oil and gas development. The 2019 RFD forecasted development of 200 (129 federal) oil and gas wells (160 vertical wells and 40 horizontal wells) over a 20-year period from 2020 to 2039 (BLM 2022a). Table 3.20 outlines the estimated total water used for hydraulic fracturing of the wells projected in the RFD. Development of the 2019 RFD would also require some water for drilling, dust control, and construction of reasonably foreseeable transmission lines and pipelines (BLM 2022a).

Table 3.20. 2019 RFD Water Use from Oil and Gas Activities in Sandoval County

2019 RFD Total Water Usage for Hydraulic Fracturing	Federal and Non-Federal Oil and Natural Gas Wells (200 total wells)	Vertical Well (160 wells)	Horizontal Well (40 wells)
Estimated Water Usage per Year	15.4 AF	0.32 AF	6.44 AF
Estimated Total Water Usage (2018–2039)	307.4 AF	6.40 AF	128.80 AF

Source: Crocker and Glover (2019)

Some water use would be required during construction and operations of reasonably foreseeable transmission lines and pipelines; these uses are addressed in the Water Support Document (BLM 2022a). No other planned actions with substantial use have been identified; however, predicted impacts from climate change for the analysis area include intensified droughts. A recent Bureau of Reclamation report (Bureau of Reclamation et al. 2013, as cited in BLM 2020) predicts decreases in overall water availability by one-quarter to one-third through the end of the twenty-first century for the Upper Rio Grande Basin (southern Colorado to central-southern New Mexico).

Beginning in 2015, the BLM FFO began receiving APDs that included new technologies that utilize greater quantities of water during the stimulation of the well under development, such as slick water stimulation. More than 20 wells have been drilled using long laterals with slick water stimulation within the BLM FFO area; the RPFO has also had wells drilled over the last 5 years using these technologies (BLM 2022a). Nitrogen stimulation is also common technique in the New Mexico portion of the San Juan Basin where gaseous nitrogen is used in place of water to fracture oil and gas formations. There are three predominant methods of nitrogen stimulation: nitrogen foam, energized nitrogen, and pure nitrogen stimulation. The three techniques vary in the amount of nitrogen and water used, as well as the partnering chemicals. The advantage to using nitrogen in place of water is the reduced quantity of water needed to achieve the same oil and gas yield (BLM 2022a).

Water Use Estimates

Depending on the completion technology chosen, horizontal well development may use between 4.6 AF and 54 AF of water; development of vertical well is assumed to require 0.537 AF in the FFO and 0.32 AF in the RPFO (BLM 2022a). The total number of expected wells in the analysis area, when combining the expected well development in the 2018 and 2019 RFDs, is 3,400 wells (940 horizontal wells and 2,460 vertical wells). Table 3.21 and following sections disclose water use associated with the 2018 and 2019 RFDs depending on completion technology.

Table 3.21. RFD Water Use by Completion Technology

	Nitrogen Stimulation Scenario Water Use (AF)	Revised RFD Scenario Water Use (AF)	Slick Water Stimulation Scenario Water Use (AF)
FFO RFD			
2,300 horizontal wells	10,580	11,132	124,200
900 vertical wells	483	483	483
Total FFO water use	11,063	11,615	124,683
RPFO RFD			
40 horizontal wells	152	258	1,012
160 vertical wells	51	51	51
Total RPFO water use	203	309	1,063
Total San Juan Basin Water Use	**11,266**	**11,924**	**125,746**

FFO water use factors: vertical well: 0.537 AF, horizontal well–nitrogen: 4.6 AF, horizontal well–RFD scenario: 4.84 AF, horizontal well–slick water: 54 AF. RPFO water use factors: vertical well: 0.32 AF, horizontal well–nitrogen: 3.8 AF, horizontal well–RFD scenario: 6.44 AF, horizontal well–slick water: 25.3 AF.

If conventional hydraulic fracturing techniques are used during well development, the total water use associated with the 2018 and 2019 RFD over the 20-year RFD time frames (i.e., 170 wells per year) would be approximately 11,924 AF or about 596 AF in any given year. This projection would comprise about 0.12% of the New Mexico portion of the San Juan Basin 2015 total water withdrawals (486,660 AF).

If the expected slick water trends are realized in both field offices and remain consistent over the 20-year RFD time frame, consumptive water use required for hydraulic fracturing of the wells projected in the 2018 and 2019 RFDs would be approximately 125,746 AF, or 6,287 AF in any given year. Annual water use would collectively represent about 1.3% of the New Mexico portion of the San Juan Basin 2015 total water withdrawals (486,660 AF).

If nitrogen stimulation were used for all of the projected wells, the total water used for hydraulic fracturing over the 20-year period would be approximately 11,266 AF, or about 563 AF in any given year. This would comprise about 0.05% of New Mexico portion of the San Juan Basin 2015 total water withdrawals (486,660 AF).

Development of the 2018 and 2019 RFDs would also require some water for drilling, dust control, and construction of reasonably foreseeable transmission lines and pipelines (BLM 2022a). Water use from the Proposed Action would comprise a small amount of this overall water use. Future water use for the other reported water use categories in the San Juan Basin is assumed to continue at current levels, and agricultural irrigation would continue to be the highest water use category in the San Juan Basin. See the Water Support Document (BLM 2022a) for more information about the 2018 RFD scenario and water use estimates.

3.4.1.4 WATER SOURCES AND WATER QUALITY

Surface Water Resources

The principal surface water drainages in the analysis area include the San Juan River (which is impounded at Navajo Dam), the Animas River, and the La Plata River. The major tributaries in the southern portion of the San Juan Basin are Canyon Largo, Gallegos Canyon, and Chaco Wash, all of which are ephemeral streams. Ephemeral flows in the New Mexico San Juan Basin are generally of poor-quality water due to the highly erosive and saline nature of the soils, sparse vegetation cover, and rapid runoff conditions that are characteristic of the area. Surface runoff generally contains 10,000 milligrams per liter (mg/L) of suspended sediment and greater than 1,000 mg/L of total dissolved solids (TDS) (BLM 2003a). In 2015, 2,724 AF of surface water were reported in San Juan County within the mining category (Dieter et al. 2018).

Groundwater Resources

There are 11 major confined aquifers that host groundwater in the San Juan Basin: the Morrison Formation, Ojo Alamo Sandstone, Pictured Cliffs Sandstone, Cliff House Sandstone, Menefee Formation, Kirtland Shale/Fruitland Coal Formation, Point Lookout Sandstone, Gallup Sandstone, Mancos Shale, Dakota Sandstone, and Entrada Sandstone. Water yield from San Juan Basin aquifers is highly variable, ranging from less than 20 gallons per minute (gpm) in most aquifers to 100 gpm in Cenozoic (younger) aquifers such as the San Jose, Nacimiento, and Ojo Alamo formations (BLM 2003b). Common historical sources of groundwater for hydraulic fracturing of oil and gas wells are the Nacimiento Formation and the Ojo Alamo Sandstone (Kelley et al. 2014).

The Water Support Document (BLM 2022a) indicates that sources of groundwater can be found in nearly every area of the FFO. There are four potential sources of groundwater in the analysis area: the Mesaverde aquifer, the Rio Grande aquifer, the Uinta-Animas aquifer, and the Entrada Sandstone aquifer (BLM 2022a). The main sources of recharge for the Mesaverde aquifer are upland areas, mainly in areas of the Zuni Uplift, Chuska Mountains, and northern Sandoval County. The main sources of recharge for the Rio Grande aquifer are precipitation and snowmelt from the mountains and valleys that surround the basin. The main sources of recharge for the Uinta-Animas aquifer are in higher elevations that encircle the San Juan Basin. The main source of recharge of the Entrada Sandstone aquifer is through surface exposures on the margins of the basin in the foothills of the Laramide uplifts (BLM 2022a). No additional information about recharge rates is available. In light of this uncertainty about water sources and recharge rates, the BLM therefore assumes that water use associated with oil and gas development is likely to be a long-term effect and the potential for aquifer recharge may be affected by drought conditions associated with climate change.

Groundwater quality in the New Mexico portion of the San Juan Basin is also highly variable (ranging from fresh to brackish) due to the complex stratigraphy and highly variable formation depths. Higher TDS concentrations typically make water less suitable for drinking or for agricultural irrigation.
In groundwater, TDS is influenced by the dissolution of natural materials such as rock, soil, and organic material. Anthropogenic activities also contribute to TDS concentrations in shallow unconfined aquifers. Brackish and saline water/non-potable (TDS >10,000 mg/L) is typically found at depths greater than 2,500 feet below the ground surface and toward the center of the basin, where the water-bearing formations such as the Point Lookout, Gallup, Morrison, and Entrada Formations are deepest (Kelley et al. 2014). Fresh water (TDS <1,000 mg/L) is typically found on the basin margins at depths less than 2,500 feet below the ground surface where water-bearing formations such as the Ojo Alamo, Nacimiento, and San Jose are shallower. However, exceptions to this generalization occur in deeper formations such as the Gallup Sandstone and Morrison, which have been reported to contain potable water with less than 10,000 TDS at depths of 3,500 to 7,000 feet (Kelley et al. 2014).

Potential Sources of Water for Oil and Gas Development

Any ground or surface waters that have TDS concentrations greater than 1,000 mg/L are defined as "non-potable" by the State of New Mexico (72-12-25 New Mexico Statutes Annotated 1978). Non-potable water is outside the New Mexico Office of the State Engineer's (NMOSE's) appropriative processes for the allocation of water resources and is mainly diverted for mineral exploration purpose. Water that is less than 1,000 mg/L TDS is "potable/fresh" and is generally within the appropriative process for the NMOSE. The BLM has identified anything less than 10,000 mg/L to be protected in the casing rule of the BLM's Onshore Order #2. Mining operations in the New Mexico San Juan Basin in 2015 used 5,258 AF of non-potable water, or 45% of mining water use, and 6,401 AF of potable/fresh water, or 55% of mining water use (Dieter et al. 2018).

Some San Juan Basin oil and gas operators use slick water fracturing fluid, which can use lower-quality water (higher TDS levels) than other fracturing fluids such as nitrogen foam or gels. The higher allowable TDS levels that are acceptable for slick water stimulation expand the possible water sources beyond those that have been historically used (e.g., potable surface or groundwater sources) into non-traditional sources of water (e.g., non-potable groundwater sources). Non-potable water sources in recent oil and gas projects include water source wells drilled specifically into the Entrada Formation, which lies stratigraphically below the Mancos shale and other producing intervals.

Flowback water is sourced from fluid that flows back through the wellhead directly after hydraulic fracturing activities and goes through a separation process to remove proppant and hydrocarbons. Produced water is naturally occurring geologic water trapped in hydrocarbon-bearing formations that is produced as a byproduct of oil and natural gas extraction. The Water Support Document (BLM 2022a) contains additional information regarding potential water sources that may be used in oil and gas development.

3.4.1.5 WATER DISPOSAL

Produced water is commonly disposed through underground injection wells. The NMOCD regulates and monitors underground injection wells in the state of New Mexico. NMOCD permits underground injection wells into formations that will allow water infiltration and has water with TDS concentrations greater than 10,000 mg/L. The majority of underground injection wells are permitted in the Entrada Formation; however, some older injection wells were permitted in the Mesaverde Group. Using data from the NMOCD, over 600 underground injection wells are currently located throughout the San Juan Basin with an average depth of 6,715 feet (NMOCD 2023). Underground injection wells are synonymous with saltwater disposal wells, disposal wells, and injection wells; the terms are used interchangeably.

3.4.2 Environmental Consequences

3.4.2.1 ENVIRONMENTAL EFFECTS

Water is used for multiple purposes to develop oil and natural gas wells, the largest use being well completion using hydraulic fracturing. Other water-use activities for well development include dust abatement of the well pad and road during construction activities, interim and final reclamation as well as rehabilitation, loosely packed soil during well construction, chemical flushes, spill cleanup (remediation activities), pressure tests, and potable water for personnel in trailers and living quarters. Well development would pose risks to groundwater, including potential contamination of freshwater aquifers from well integrity failures, spills, or surface spills during the drilling and completion processes. The regulatory program discussed in the Water Support Document (BLM 2022a) and standard terms and conditions would greatly reduce effects to groundwater from the future well development.

Under the Proposed Action, Enduring estimates total water usage (non-potable and potable groundwater) for the Proposed Action at 120.62 AF: 118.58 AF of non-potable groundwater for drilling and completion of six wells and 2.04 AF of potable groundwater for construction of the well pad, associated access road, pipelines, and dust control (Table 3.22).

The water uses described above would occur during the 4- to 5-month construction period and 30- to 60-day well completion period (such as hydraulic fracturing), as well as during the 20-year operation period (e.g., ongoing water use associated with dust control). While much 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 the Proposed Action (120.62 AF) would likely to be a long-term effect. Additionally, the ability for aquifer recharge may be affected by drought conditions associated with climate change.

Table 3.22. Detailed Non-Potable and Potable Groundwater Use from the Proposed Action

	Non-Potable Groundwater Use (AF) *	Potable Groundwater Use (AF) †
053H	19.21	0.26
054H	19.59	0.26
055H	20.88	0.26
056H	19.59	0.26
057H	18.43	0.26
One future well	20.88	0.26
Construction and dust control	-	0.45
Rig Wash	-	0.03
Total Proposed Action	**118.58**	**2.04**

* Enduring would be developing minerals from the Mancos Shale and Gallup Sandstone Formations; each well uses different water volumes for development and depends on the depth within the formation and length of the laterals of the well bores. (Enduring 2023d).

‡ Includes construction of the well pad, associated access road, and pipelines.

The development of the Proposed Action would increase the total water use (non-potable saline and potable/freshwater groundwater) in mining category water use by 1.03%. Dieter et al. (2018) reported 5,257 AF of non-potable saline groundwater used for mining purposes in 2015; non-potable groundwater use from the Proposed Action would increase saline water use within the San Juan Basin by 2.26%. Dieter et al. (2018) also reported 3,677 AF of potable groundwater used for mining purposes in 2015; potable groundwater use for construction of the well pad, associated access road, pipelines, and dust

control would increase freshwater use within the San Juan Basin by 0.06%. Table 3.23 discloses the contribution of the Proposed Action to groundwater use associated with the 2018 and 2019 RFDs for each of the potential water use scenarios identified in Section 3.4.1.3. As shown in the table, the Proposed Action would comprise between 0.09% and 1.07% of total groundwater use associated with the 2018 and 2019 RFDs and between 1.92% and 21.41% of annual groundwater use associated with the RFDs.

Table 3.23. Contribution of the Proposed Action to RFD Water Use

	Proposed Action	RFDs-Nitrogen Scenario	RFDs-Revised RFD Scenario	RFDs-Slick Water Scenario
Total water use for drilling and completing six wells	120.62 AF	11,266 AF	11,924 AF	125,746 AF
Percent Proposed Action to total RFD water use	-	1.07%	1.01%	0.09%
Percent Proposed Action to annual RFD water use	-	21.41%	20.23%	1.92%

Water used for the Proposed Action would be purchased legally from those who hold water rights in or around the San Juan Basin. All non-potable saline groundwater used for well drilling and completion would be taken from a non-potable water-bearing formation (Mancos Shale and Gallup Sandstone Formations). Enduring may also utilize produced water gathered from their existing wells within the Mancos Gallup area (refer to Appendix E, Map E.3.). Produced water may be gathered via existing underground pipeline infrastructure and temporary surface line infrastructure and trucked. Produced water gathered at Shiprock San Juan, LLC's 4-1 CDP may also be trucked and used during completion operations. Flowback water from completion operations would be recycled for reuse. These non-potable sources would be gathered, stored, treated, and recycled at the Enduring Resources NEU 2207-16B, WLU 2309-24N, KWU 2390-19K, or SEU 2206-20O water recycling facilities. All potable groundwater used for the well pad, access road, pipeline construction, and dust abatement would be taken from one or more existing private water wells or private water hole, such as the Blanco Wash Trading Post (point of division number SJ 2105). The Proposed Action would not use any surface water and would not increase the surface water use in the mining category according to the 2015 Dieter et al. (2018) report of 2,724 AF.

Development of the Proposed Action is not expected to affect water quality. BLM's Onshore Oil and Gas Order No. 2 outlines the casing and cementing requirements for wells to ensure that groundwater reservoirs containing water with less than 10,000 TDS are isolated from the well bore. Cementing and casing of the well bore before any hydraulic fracturing activities ensures that communication of fracturing fluids and production fluids does not occur. Under the authority of the Mineral Leasing Act of 1920, as amended, the BLM implements existing safeguards and regulations for the prevention of harm to the environment and health and human safety, specifically surface and groundwater resources. Protection of ground and surface water is enforced in concert with the State of New Mexico and any other applicable entities with jurisdiction (e.g., Tribal entities, U.S. Army Corps of Engineers, EPA). The mitigation of any water-contaminating event would occur in addition to the enforcement of applicable regulations.

Lists of equipment are included in Sections 2.1.1 through 2.1.5. The natural gas and liquids produced by the wells would be piped to existing infrastructure. If any storage of the oil and liquids occurs at the proposed project area, it would increase potential for oil or produced water spills that could affect groundwater quality. As noted in Section 2.1 and Appendix H, design features and BMPs include containment areas surrounding all tanks. Containment areas would be capable of containing 110% of the fluids in the largest tank in the containment area and would also include sufficient freeboard for precipitation. Should a spill occur, the BLM, NMOCD, and operator would work together with any other

necessary agency to immediately remediate spills in accordance with federal and state standards, including 43 CFR 3162.5-1 and 19.15.29.11 NMAC.

Under the No Action Alternative, the BLM would not authorize the APDs, and the new wells and associated infrastructure described in the Proposed Action would not be implemented. Potential impacts to water quality and quantity would not occur because the proposed wells would not be developed. Although no new wells would be developed under the No Action Alternative, federal production levels are expected to remain static or even increase in the short term, and non-federal oil and gas supply would likely increase if the wells were not developed.

3.4.2.1 MITIGATION MEASURES AND RESIDUAL EFFECTS

The BLM encourages the use of recycled water in hydraulic fracturing techniques, and in 2019, the State of New Mexico passed the Produced Water Act, which encourages oil and gas producers to reuse produced water, when possible, rather than relying on freshwater sources for oil and gas extraction. Additionally, the State of New Mexico has promulgated new rules on produced water stemming from passage of the 2019 Produced Water Act (NMED 2019). The rules were developed to encourage the recycling, reuse, or disposition of produced water while also affording reasonable protection against contamination of fresh water and establish procedures by which persons may transport and dispose of produced water, drilling fluids, and other liquid oil field waste. Such rules do not change the requirement that development of a federal lease must comply with all applicable federal and state laws and regulations. The NMED also recently signed a memorandum of understanding with New Mexico State University to develop new technologies for treating produced water to inform future policies for produced water reuse.

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4 Consultation and Coordination

4.1 Endangered Species Act Consultation

BLM FFO biologists have reviewed the Proposed Action and determined that it would comply with threatened and endangered species management guidelines outlined in the biological assessment associated with the PRMP/FEIS (see Table 1.4 and the NEPA IDT checklist [Appendix G]).

In 2014, the yellow-billed cuckoo (*Coccyzus americanus*) was listed as threatened with proposed critical habitat. There is no nesting habitat for this species within or adjacent to the Proposed Action. The nearest designated critical habitat for this species is approximately 95 miles to the east. Therefore, the Proposed Action would not impact this species.

The New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) was listed as endangered in 2014 with critical habitat designated. There is no riparian habitat within or adjacent to the Proposed Action. The nearest designated critical habitat for this species is approximately 57 miles to the southeast. Therefore, the Proposed Action would not impact this species.

4.2 Tribal Consultation

Tribal consultation for the Proposed Action was initiated on a government-to-government basis by the BLM FFO with various Pueblos and Tribes of New Mexico and southern Colorado. A letter and map describing the proposed project and inviting consultation with the BLM FFO was sent via certified mail to each of the various Pueblos and Tribes listed in Table 4.1 on November 14, 2022 with a request for response within 30 days of receipt.

Table 4.1. Pueblos and Tribes Who Received Consultation Requests from the BLM FFO

Tribe	Name
All Pueblos Council of Governors	Governors
Counselor Chapter House	President Damien Augustine
Eight Northern Indian Pueblos Council	Governors
Five Sandoval Indian Pueblos	Governors
Jicarilla Apache Tribal Council	President Edward Velarde
Kewa Pueblo (Pueblo of Santo Domingo)	Governor Sidelio Tenorio, Sr.
Nageezi Chapter House	President Ervin Chavez
Navajo Nation	President Jonathan Nez
Ohkay Owingeh	Governor Patrick Aguino
Pueblo of Acoma	Governor Randall Vicente
Pueblo of Cochiti	Governor Phillip Quintana
Pueblo of Isleta	Governor Abeita
Pueblo of Isleta, Tribal Historic Preservation Office	Dr. Henry Walt
Pueblo of Jemez	Governor Raymond Loretto
Pueblo of Laguna	Governor Martin Kowemy, Jr.
Pueblo of Nambe	Governor Nathaniel Porter
Pueblo of Picuris	Governor Craig Quanchello

Tribe	Name
Pueblo of Pojoaque	Governor Jenelle Roybal
Pueblo of San Felipe	Governor Anthony Ortiz
Pueblo of San Felipe Department of Natural Resources	Pinu'u Stout, Director
Pueblo of San Ildefonso	Governor Christopher Moquino
Pueblo of Sandia	Governor Stuart Paisano
Pueblo of Santa Ana	Governor Joseph Sanchez
Pueblo of Santa Ana Tribal Historic Preservation Office	Director Murrell
Pueblo of Santa Clara	Governor J. Michael Chavarria
Pueblo of Taos	Governor Clyde Romero, Sr.
Pueblo of Tesuque	Governor Robert Mora, Sr.
Pueblo of Zia	Governor Gabriel Galvan
Pueblo of Zuni	Governor Val R. Panteah, Sr.
Southern Ute Indian Tribe	Manuel Heart, Chairman
Ten Southern Pueblo Governor's Council	Ten Southern Pueblos Council
The Hopi Tribe	Chairman Timothy L. Nuvangyaoma
Ute Mountain Ute Tribe	Chairman Manuel Heart

4.3 New Mexico State Historic Preservation Office Consultation

Section 106 of the National Historic Preservation Act of 1966 and its implementing regulations require federal agencies to consider what impact their licensing, permitting, funding, or otherwise authorizing an undertaking, such as an APD, Sundry Notice, or ROW, may have on properties listed in or eligible for listing in the National Register of Historic Places. Specific definitions for key cultural resources management concepts (such as undertakings, impacts, and areas of potential effects) are provided in 36 CFR 800.16.

The New Mexico BLM has a two-party agreement with the New Mexico State Historic Preservation Office (SHPO) (hereafter referred to as the Protocol) that implements an authorized alternative to 36 CFR 800 for most undertakings (BLM and SHPO 2014). The Protocol offers a streamlined process for reporting and review that expedites consultation with the SHPO.

The entire area of potential effects associated with the Proposed Action was archaeologically surveyed at a BLM Class III level (100%), and a report was prepared and submitted to the BLM and Navajo Nation Heritage and Historic Preservation Department (NNHHPD). Below is a summary of the findings.

- **Enduring's Proposed GLU 053H Project:** A Class III Archaeological Survey ([NNHHPD] No. HPD-22-660) was conducted in the proposed project area. No cultural sites were discovered. Two isolated occurrences were recorded, and neither are eligible for the National Register of Historic Places. The BLM and NNHHPD determined that the proposed project will have no effect to historic properties (see Appendix G).

5 List of Appendices

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Appendix A: List of Preparers

This EA has been prepared on behalf of the BLM by a contractor (SWCA) to comply with the requirements and guidelines prescribed by the BLM FFO. Portions of this document may be altered or written by the BLM FFO, as the BLM has the ultimate responsibility for the content of the EA. The table below contains a list of individuals that contributed to or reviewed this EA.

List of EA Preparers

Individual	Area of Expertise	Organization
Whitney Thomas	Physical Scientist/NEPA Planning and Environmental Coordinator	BLM FFO
Kimberly Adams	Archaeologist	BLM FFO
Chris Wenman	Geologist	BLM FFO
Stanley Allison	Outdoor Recreation Planner	BLM FFO
Ryan Joyner	NEPA Planner	BLM FFO
Monica Tilden	Realty	BLM FFO
J. Quintana	Fuels/Fire Management	BLM FFO
Barbara Witmore	Biologist	BLM FFO
R. Culp	Range Specialist	BLM FFO
Casandra Gould	Range Specialist	BLM FFO
Abiodun Adeloye	Natural Resource Specialist	BLM FFO
John Kendall	Threatened and Endangered Species Biologist	BLM FFO
Ryan McBee	Wildlife Biologist	BLM FFO
Theresa Ancell	Project Manager	SWCA
Janet Guinn	Senior NEPA QA/QC	SWCA
Kelly Haun	NEPA QA/QC	SWCA
Lili Perreault	Project Ecologist	SWCA

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Approval Date: 06/27/2023

Appendix B: Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
µg/m^3	microgram per cubic meter
AEO	Annual Energy Outlook
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AF	acre-feet
APD	Application for Permit to Drill
AQ	air quality
AQI	Air Quality Index
AQRV	Air Quality Related Value
ARPA	Archaeological Resources Protection Act
BART	Best Available Retrofit Technology
bbl	barrel(s)
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
CAA	Clean Air Act
CAMx	Comprehensive Air Quality Model with Extensions
CARMMS	Colorado Air Resources Management Modeling Study
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSU	Colorado State University
CWA	Clean Water Act
dBA	A-weighted decibel
DMX8	daily maximum 8-hour
DOE	U.S. Department of Energy
EA	environmental assessment
EGU	electric generating unit

EIA	U.S. Energy Information Administration
EJ	environmental justice
Enduring	Enduring Operating, LLC
EPA	U.S. Environmental Protection Agency
EUR	estimated ultimate recovery
FFO	Farmington Field Office
FIMO	Federal Indian Minerals Office
GLU	Greater Lybrook Unit
$GtCO_2e$	giga tonnes of carbon dioxide equivalent
GWP	global warming potential
HAP	hazardous air pollutant
HSP	Habitat Stamp Program
IDT	Interdisciplinary Team
IM	Instruction Memorandum
IPCC	Intergovernmental Panel on Climate Change
IWDW	Intermountain West Data Warehouse
IWG	Interagency Working Group on the Social Cost of Greenhouse Gases
MBTA	Migratory Bird Treaty Act of 1918
mcf	cubic feet
mg/L	milligrams per liter
Mt CO_2e/year	metric tons of CO_2 equivalent per year
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NDC	national determined contribution
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act of 1969
NESL	Navajo Nation Endangered Species List
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMOCD	New Mexico Oil Conservation Division

NMOSE	New Mexico Office of the State Engineer
NMSO	New Mexico State Office
NNDFW	Navajo Nation Department of Fish and Wildlife
NNHHPD	Navajo Nation Heritage and Historic Preservation Department
NO_2	nitrogen dioxide
NO_x	nitrogen oxide(s)
NPS	National Park Service
O_3	ozone
Pb	lead
$PM_{2.5}$	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
ppb	parts per billion
PRMP/FEIS	Proposed Resource Management Plan and Final Environmental Impact Statement
Proposed Action	Greater Lybrook Unit 053 Nos. 053H, 054H, 055H, 056H, 057H, and One Future Well Oil and Natural Gas Wells Project
PSD	prevention of significant deterioration
PUP	pesticide use proposal
RFD	reasonably foreseeable development
RMP	Resource Management Plan
ROW	right-of-way
RPFO	Rio Puerco Field Office
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon dioxide
SC-GHG	social cost of greenhouse gases
SC-N_2O	social cost of nitrous oxide
SDA	Special Designation Area
SHL	surface hole location
SHPO	New Mexico State Historic Preservation Office
SO_2	sulfur dioxide
SUPO	Surface Use Plan of Operations
SWCA	SWCA Environmental Consultants
SWReGAP	Southwest Regional Gap Analysis Project
TDS	total dissolved solids

TUPA	temporary use permit area
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound

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Approval Date: 06/27/2023

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Appendix D: Figures

Figure D.1. View of sagebrush shrublands vegetation community in proposed project area, facing north.

Figure D.2. View of sagebrush shrublands vegetation community in proposed project area, facing east.

Figure D.3. View of sagebrush shrublands vegetation community in proposed project area, facing south.

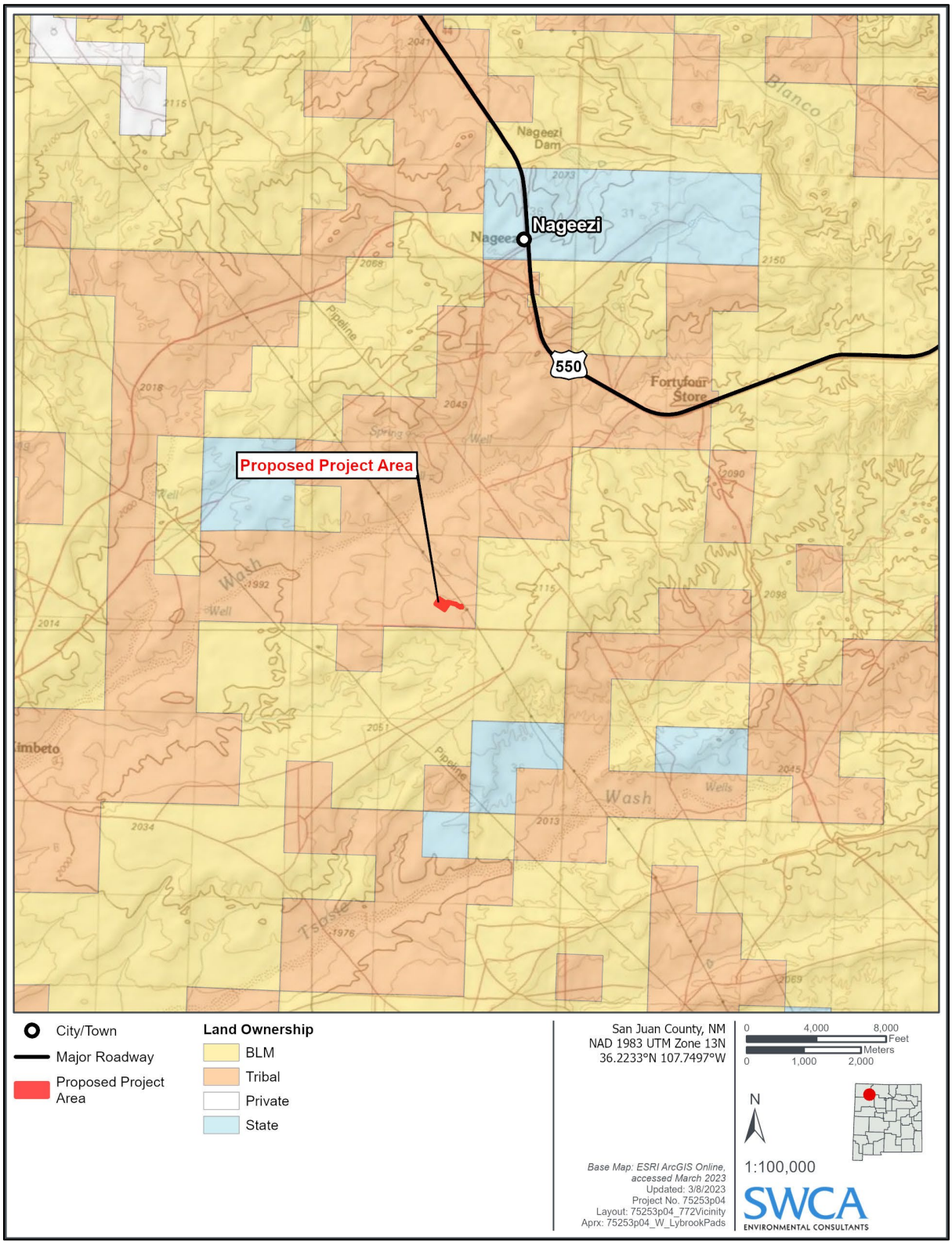
Figure D.4. View of sagebrush shrublands vegetation community in proposed project area, facing west.

Figure D.5. View of sagebrush shrublands vegetation community in proposed project area, facing north.

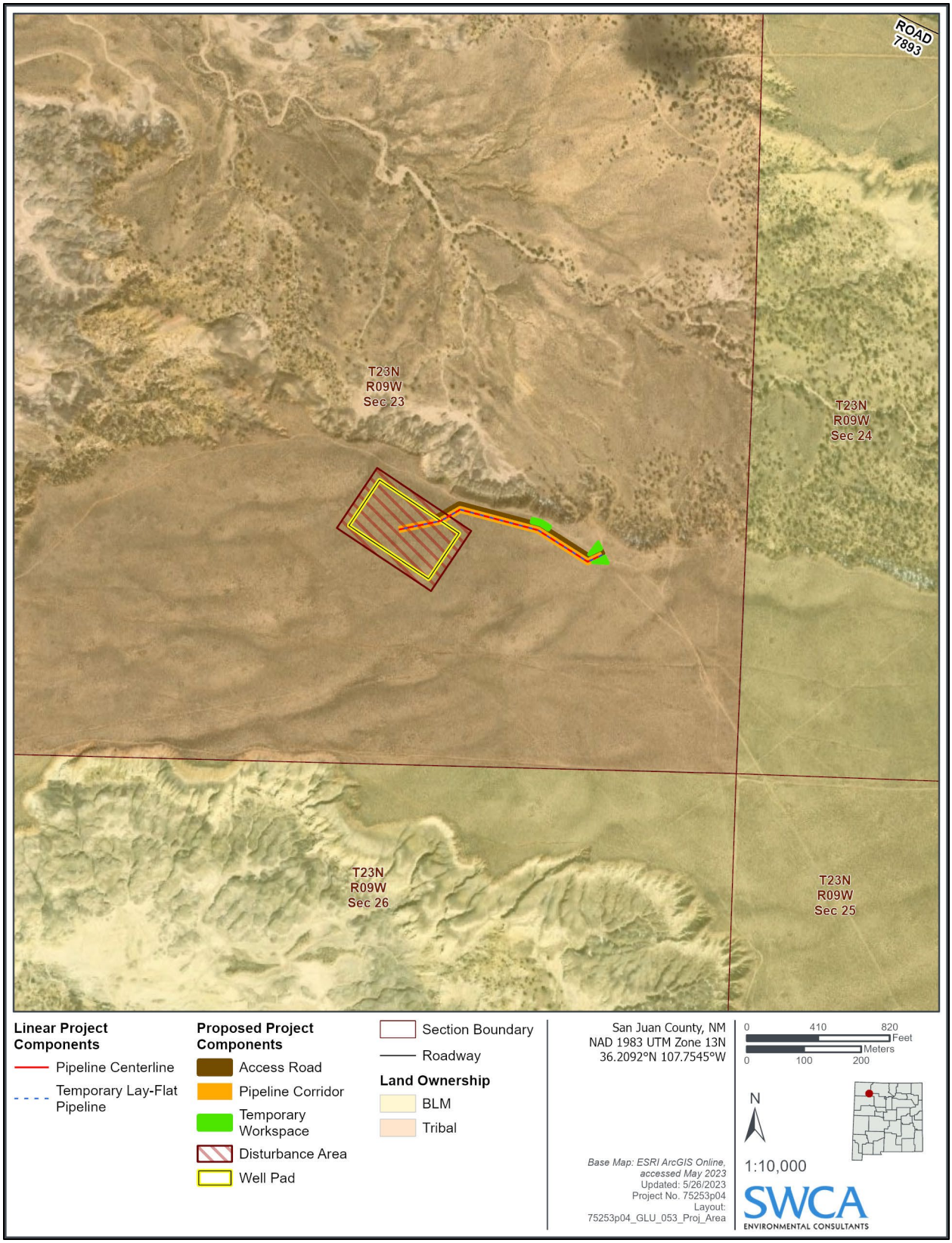
Figure D.6. View of sagebrush shrublands vegetation community in proposed project area, facing east.

Figure D.7. View of noxious weed, saltlover (*Halogeton glomeratus*), in proposed project area.

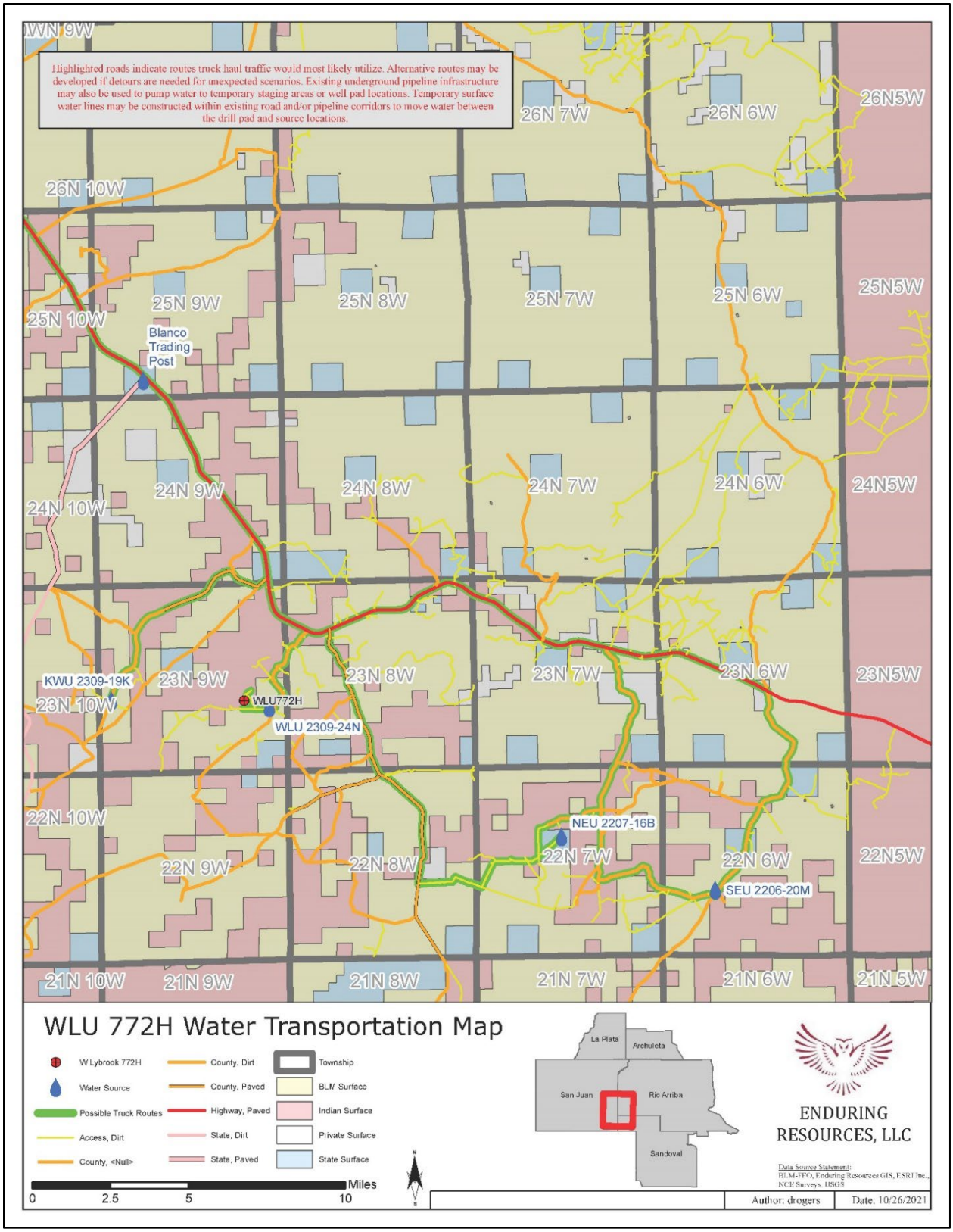
Appendix E: Maps



Map E.1. Project vicinity map.



Map E.2. Proposed project area map.



Map E.3. Water transportation map.

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Appendix F: Tables

Table 1.1. Permits, Regulations, and Approvals Relevant to the Proposed Action

Permit/Regulation/Approval	Issuing Agency	Status
Federal Permit, Approval, or Clearance		
APD	BLM	The applications are currently under review by the BLM and are the subject of this EA.
Executive Order 12898	BLM	Impacts to minority and low-income populations are described in Table 1.4.
Section 7 of the Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)	The Proposed Action is in conformance with the biological assessment conducted for the 2003 FFO RMP (BLM 2002). No endangered or threatened species listed under the Endangered Species Act or designated critical habitat were observed during the general biological survey conducted on September 14, 2022 (SWCA Environmental Consultants [SWCA] 2022). No new water depletions would occur from groundwater systems that have the potential to be source water for vegetation, and subsequently for species, within or adjacent to the proposed project area. All groundwater used for pads, road construction, and well drilling and completion would be taken from one or more permitted private wells or private water holes. Water used for drilling and completion activities would be hauled via truck from Enduring's Blanco Trading Post Well point of diversion No. SJ-4348. No further consultation with the USFWS is required.
BLM 6840 Manual	BLM	Manual 6840 directs the BLM to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the Endangered Species Act.
Federal Noxious Weed Act (Public Law 93-629; 7 USC 2801 et seq. 88 Statute 2148)	BLM	Prior to construction activities, the proponent would adhere to the BLM's standard noxious weed procedures. Enduring will follow all guidance outlined in its Pesticide Use Proposal approved by the BLM FFO.
Clean Water Act (CWA) Section 402 General Construction (Stormwater) Permit	U.S. Environmental Protection Agency and New Mexico Environment Department (NMED)	The Proposed Action is exempt based on the 1987 Water Quality Act and Section 323 of the Energy Policy Act of 2005.
Migratory Bird Treaty Act of 1918 (MBTA) (16 USC 703–712)	USFWS – Migratory Bird Permit Office R2	The BLM would comply with MBTA preconstruction nesting survey requirements as the proposed project would impact more than 4 acres of vegetation; therefore, a preconstruction survey would be required during the nesting season (May 15–July 31). See Appendix G for more details.
Paleontological Resources Preservation Act of 2009 (Sections 6301–6312 of the Omnibus Public Lands Act of 2009, 16 USC 470aaa)	BLM	The BLM FFO geologist/paleontologist reviewed the proposed project and determined that there were no paleontological resources that would be impacted from development of the proposed project. Table 1.4 describes potential impacts to paleontological resources. With consideration of project design features and best management practices (detailed in Appendix H), the Proposed Action would be in compliance with the Act.

Permit/Regulation/Approval	Issuing Agency	Status
CWA Section 404 Permitting Discharges of Dredge or Fill Material into Waters of the U.S. (including wetlands)	U.S. Army Corps of Engineers	Section 3.4 describes impacts to water resources. The Proposed Action does not intersect potentially jurisdictional waters of the U.S. that could be impacted by development activities. The proponent will be responsible for adhering to Section 404 (dredge and fill) of the CWA, including any required permitting actions with the U.S. Army Corps of Engineers for any impacts within any surface water features prior to construction.
CWA Section 401 Permitting Water Quality Certification	NMED Surface Water Quality Bureau	Section 3.4 describes impacts to water resources. There are no potentially jurisdictional waters of the U.S. that intersect the Proposed Action. The Proponent will be responsible for adhering to Section 401 (water quality certification) of the CWA, including any required permitting actions with the NMED Surface Water Quality Bureau for any impacts within surface water features prior to construction.
Section 106 of the National Historic Preservation Act of 1966	BLM*	Table 1.4 describes potential impacts to cultural resources. Any required further consultation with the State Historic Preservation Office would be conducted by the BLM.
State Permit, Approval, or Clearance		
New Mexico Executive Order 00-22 (regarding noxious weeds)	New Mexico Department of Agriculture	Prior to construction activities, the proponent would adhere to the BLM's standard noxious weed procedures. Enduring will follow all guidance outlined in its Pesticide Use Proposal approved by the BLM FFO.
Clean Air Act New Mexico Air Quality Control Act	NMED	Impacts to air quality are described in Sections 3.2 and 3.3. The Proposed Action would be approved under separate APDs and would be considered a minor source unit and may be permitted with a General Construction Permit per 20.2.72 New Mexico Administrative Code. Prior to construction activities, a notice of intent for the proposed project would need to be filed with the NMED.
Local Permit, Approval, or Clearance		
Executive Order 11988 Floodplain Management	County Floodplain Commission	Section 3.4 describes impacts to water resources. There are no Federal Emergency Management Agency floodplains within the project area.

*The BLM is the agency that oversees compliance.

Table 1.2. Individuals and Groups Invited to the On-Site Meeting

Name	Group
Charlie Barrett, Kendra Pinto	Earthworks
Thomas Singer, Erik Schlenker-Goodrich, Kyle Tisdale	Western Environmental Law Center
Mike Eisenfeld	San Juan Citizens Alliance
Jeremy Nichols, Rebecca Sobel	WildEarth Guardians
Anson Wright	Chaco Alliance
Lori Goodman	Diné Care
Don Schrieber	Devil Springs Ranch
Joe Trudeau	Center for Biological Diversity
Miya King-Flaherty	Sierra Club
Tweetie Blancett	Interested Public

Name	Group
Henry Wait	Pueblo of Isleta
Pinu'u Stout	Pueblo of San Felipe
Sonia Grant	Interested Public
Daniel Tso	Interested Public
Teran Villa	All Pueblo Council of Governors
Michael Casaus	New Mexico Wilderness Society
Samuel Sage	Counselor Chapter

Table 1.3. Issues Identified for Detailed Analysis

Issue Number	Issue Statement	Impact Indicator
Issue 1	How would emissions generated by equipment associated with the Proposed Action impact air quality?	Emissions
Issue 2	How would the future potential development of the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change?	Emissions
Issue 3	How would future drilling and completion operations associated with the Proposed Action impact water quality and quantity?	Water volumes Use of wells

Table 1.4. Issues Identified but Eliminated from Detailed Analysis

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would ground-disturbing construction, operation, and maintenance activities from the Proposed Action impact cultural resources?	Impacts to cultural resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. There are no Chaco Culture Archaeological Protection Sites or United Nations Educational, Scientific and Cultural Organization World Heritage Sites within or near the proposed project area. A Class III Archaeological Survey (Navajo Nation Heritage and Historic Preservation Department [NNHHPD] No. HPD-22-660) was conducted in the proposed project area. No cultural sites were discovered. Two isolated occurrences were recorded, and none are eligible for the National Register of Historic Places. The BLM and NNHHPD determined that the proposed project will have no effect to historic properties (see Appendix G). In the event of a cultural resource's discovery during construction, construction activities would immediately cease in the immediate vicinity of the discovery, and Enduring would immediately notify the archaeological monitor, if present, or the BLM. The BLM would then ensure the site is evaluated. Should a discovery be evaluated as significant (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act of 1990, Archaeological Resources Protection Act), it would be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM. Details of the cultural resources survey of the Proposed Action, as well as results of Section 106 consultation and government-to-government consultation, are detailed in Chapter 4. With consideration of the above requirements, other design features, and best management practices (BMPs) provided in Appendix H, such as educating/informing all employees, contractors, and subcontractors that cultural sites are to be avoided and that it is illegal to collect, damage, or disturb cultural resources and may be punishable by law under the provision of the Archaeological Resources Protection Act (16 USC 470aa–mm), would mitigate impacts to cultural resources to the point that detailed analysis is not warranted. The Proposed Action would be in compliance with Section 106 of the National Historic Preservation Act.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would ground-disturbing construction, operation, and maintenance activities from the Proposed Action impact paleontological resources?	Impacts to paleontological resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The Proposed Action is not located within a BLM-designated area for paleontology; however, the proposed project is within an area known for high potential for paleontological resources within the Nacimiento Formation (Potential Fossil Yield Classification 5). The BLM FFO geologist/paleontologist reviewed the project area and determined that there are no mapped localities nearby, the project would avoid outcrops where fossils are commonly found, and potential for encountering paleo resources is low; therefore, paleontological clearance has been obtained (see Appendix G). Project design features and BMPs (detailed in Appendix H) would mitigate impacts to paleontological resources to the point that detailed analysis is not warranted. The Proposed Action would be in compliance with the Paleontological Resources Preservation Act of 2009.
How would the construction and operation phases of the Proposed Action impact Special Designation Areas (SDAs)?	Impacts to SDAs from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area is not located within a BLM-designated SDA. Additionally, there are no Special Recreation Management Areas within a 10-mile radius of the Proposed Action. No impacts to SDAs are anticipated to occur; therefore, detailed analysis is not warranted.
How would the proposed project activities and surface disturbance impact BLM FFO designated fragile soils?	Topography generally dictates development within this region to occur in soils not designated as fragile. The BLM FFO has identified six soil types as fragile depending on percent of slope: Badland, Gypsiorthids-Badlands-Stumble Complex, Rock Outcrop-Travessilla-Weska Complex, Rock Outcrop-Vessilla-Menefee Complex, Pinavetes-Florita Complex, and Sparand-San Mateo Silt Loam. There is one soil type mapped within the project area: Dakota-Sheppard Shiprock association, rolling, which is well drained and non-hydric (Natural Resources Conservation Service 2023). Surface disturbance associated with the Proposed Action would avoid BLM FFO–designated fragile soils. The BLM's authority under 43 CFR 3100 would result in the application of measures to mitigate impacts to the physical and biological integrity of soils during future development.
How would the Proposed Action including surface disturbance and/or presence of facilities impact the viewshed in the region?	Impacts to visual resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. BLM does not assign Visual Resource Management classification to non-BLM lands. However, the BLM determined that visual contrast on this project can be reduced by utilizing best management practices such as painting aboveground infrastructure the Juniper Green BLM Environmental Color to blend in with the predominantly sagebrush environment (see Appendix G). The nearest residences are located approximately 3,000 feet to the north and could potentially see development of the proposed project. There is an existing oil and gas facility that lies between the residences and the proposed project that may lessen visual impacts from construction activities; visual impacts from construction would be temporary for a duration of approximately 3 to 5 months. Project design features and BMPs (detailed in Appendix H) such as any lighting installed would be downward-facing or shielded where possible and limited to those needed for safety during construction and operations would mitigate potential impacts to visual resources to the degree that detailed analysis is not warranted.
How would lighting associated with construction activities from the Proposed Action impact dark skies within the surrounding area?	The proposed project area is approximately 15 miles northeast of Chaco Culture National Historical Park. The BLM FFO does not have established dark skies management areas in the FFO management area; however, it is assumed that visual impacts from the development of the Proposed Action would not be visible to the naked eye or within line of sight from Chaco Cultural National Historic Park due to the distance and topographical constraints (BLM 2021a); thus, the Proposed Action would not impact stargazing from that area. Lighting associated with the construction phases of the proposed project would be temporary and/or limited to that needed for safety during construction and operations. Any permanent lighting associated with the aboveground appurtenances would be downward-facing or shielded where possible as described above. Project design features and the BMPs outlined in Appendix H would mitigate impacts to dark skies to a degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would traffic, public safety, and noise issues associated with the development of the Proposed Action impact local residences or communities?	To mobilize construction equipment to the proposed project area, it is assumed that Enduring would travel south from Bloomfield, New Mexico, along U.S. Highway 550 and turn onto County Road 7890 for approximately 3.9 miles to an existing resource for 0.3 mile to the proposed access road. Construction equipment would consist of heavy and light vehicles, including 22 to 140 round trips per day during construction, drilling, and/or completions, two to four round trips during reclamation, and a maximum of three vehicle round trips per day during the first year of operations and maintenance and decreasing to one round trip per day after Year 3 of production (Enduring 2023a). There are 24 residences along County Road 7890 that may temporarily experience increased traffic during the construction phase (4–5 months), which would decrease during the operations and maintenance phase as described above. The BLM determined that project-specific design features (detailed in Appendix H), have been established to minimize potential vehicle collisions due to increased traffic. These design features include posting signage and instructing construction personnel on safe driving practices, thus reducing the construction impact to local residences and the Nageezi community. The closest residences from the proposed project area are located approximately 3,000 feet (0.5 mile) north of the proposed well pad; these residences could be impacted by increased noise from the development of the Proposed Action. Current noise levels in residential areas are assumed to be a mean value of 40 A-weighted decibel (dBA) average noise level (U.S. Environmental Protection Agency 1974, 1978). Construction noise levels would increase from 40 dBA to 50 dBA at 3,000 feet (La Plata County 2002). Noise levels from the well pad during the operations phase would dissipate to ambient noise levels at 1,000 feet; therefore, the residences located at 3,000 feet of the Proposed Action would not be impacted. The BLM determined that the Proposed Action adheres to Notice to Lessees (NTL) 04-2-FFO, Management of Sound Generated by Oil and Gas Production and Transportation, which states that noise levels are not to exceed 48.6 dBA over a continuous 24-hour period; the Notice to Lessees does not apply to transient operations such as construction activities (BLM 2004). Project design features and BMPs, provided in Appendix H, would mitigate potential impacts to traffic, public safety, and noise to the degree that detailed analysis is not warranted.
How would the Proposed Action impact environmental justice communities?	The Proposed Action is located within Census Tract No. 9432.01 in San Juan County. Data from the 2020 Census indicates the total population is 5,229, of which 4,711 (90%) are minority and 518 (10%) are white non-Hispanics (U.S. Census Bureau 2020). The nearest community center to the Proposed Action is the Nageezi community, which is located approximately 3.5 miles north of the proposed project area. The percentage of the population below the poverty line is 34% for all people within Tract No. 9432.01 (U.S. Census Bureau 2020). Based on these data and the BLM's experience with the residents and communities surrounding the Proposed Action, there are low-income, minority, and Native American populations of concern (or "Environmental Justice Populations and/or EJ communities"), as defined under Executive Order 12898, that may be disproportionately and adversely impacted by activities resulting from the Proposed Action. For additional information on the identification of analyses Environmental Justice Populations and/or Environmental Justice communities see Appendix K, Environmental Justice Analyses. Based on the above analysis, and the analysis in the previous issue statement, there would be short-term impacts during construction such as fugitive dust and increased traffic that may be felt more by the residents in close proximity to future potential development. The BLM recognizes that its assessment of environmental justice impacts may not reflect the perspective of the environmental justice populations and/or environmental justice communities themselves and thus encourages operators to implement an outreach program with surrounding communities. Design features (detailed in Appendix H) include measures to reduce dust, noise, and light pollution, and to limit surface disturbance to protect natural and cultural resources, as well as the type of lighting (limited to downcast lighting with covers for safety purposes only). The BLM would ensure that all laws, regulations, and policies are adhered to for the life of the Proposed Action. Project design features (detailed in Appendix H) would further mitigate impacts to any nearby residents to a degree that detailed analysis is not warranted. The proposed project would be in compliance with Executive Order 12898.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would the Proposed Action impact range improvements and livestock mobility associated with the existing allotments within the Proposed Action?	Impacts to rangeland resources, including grazing allotments, from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The Proposed Action is located within the 103,305-acre Kimbeto Community Allotment (No. 6013). The Proposed Action would disturb approximately 7.54 acres, which is less than 0.01% of the total allotment's acreage. The Proposed Action would not directly impact any existing range improvements or long-term trend plots. Long-term trend plots are monitoring plots the BLM uses to conduct land health evaluations to assess present and potential rangeland resources, provide data to identify and support needed management actions, and establish baselines for monitoring and evaluation (BLM 2009). With consideration of the design features in Appendix H, impacts to range improvements and livestock would be mitigated to the point that detailed analysis is not warranted.
What is the potential for the spread of noxious weeds and invasive plants as a result of the Proposed Action?	The spread of weeds associated with BLM FFO–wide oil and natural gas development was analyzed in the PRMP/FEIS (BLM 2003b), as amended. SWCA Environmental Consultants (SWCA) biologists conducted noxious weed surveys for the Proposed Action on September 14, 2022. During the survey, two New Mexico Department of Agriculture (NMDA)–listed species were observed near the beginning of the GLU 053 proposed access road: saltlover (*Halogeton glomeratus*) and cheatgrass (*Bromus tectorum*) (SWCA 2022). Saltlover is an NMDA-listed Class B noxious weed species, and cheatgrass is an NMDA-listed Class C noxious weed species and was sparsely present. Additionally, prickly Russian thistle (*Salsola tragus*) was also observed during the biological survey near the beginning of the proposed access road. While this species is not a designated noxious weed, it has been noted within the BLM FFO management area as a species that may cause economic or environmental harm or harm to human health or safety. Enduring would follow all guidance outlined in its Pesticide Use Proposal (PUP) approved by the BLM FFO. The Surface Use Plan of Operations (SUPO) developed for this project details that a weed management plan and PUP will be provided for noxious and invasive weed control on location. Enduring will be responsible for weed control on location and actions that are associated with the proposed project. With consideration of the above and other project-specific design features detailed in Appendix H, the potential spread of noxious weeds would be mitigated to the degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the Federal Noxious Weed Act and New Mexico Executive Order 00-22.
What vegetation impacts would occur as a result of proposed ground-disturbing activities?	Impacts to upland vegetation from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area consists of three land cover types as described and mapped by the Southwest Regional Gap Analysis Project (SWReGAP); Colorado Plateau Pinyon-Juniper Woodland (0.5 acre [6.2%]), Inter-Mountain Basins Big Sagebrush Shrubland (0.2 acre [2.5%]), and Inter-Mountain Basins Semi-Desert Shrub Steppe (6.9 acres [91.3%]) (SWReGAP 2004). These vegetation types are the predominant vegetative communities within the BLM FFO region (SWReGAP 2004). The dominant vegetation community consists of sagebrush shrublands, with foliar cover of approximately 35%; the remaining area was 65% bare ground, 5% grass, less than 1% forbs, and less than 1% tree cover (SWCA 2022). Vegetation clearing associated with the Proposed Action would impact <0.01% of these vegetation communities within the BLM FFO. With consideration of the design features provided in Appendix H, impacts to vegetation would be mitigated to the degree that detailed analysis is not warranted.
How would vegetation removal during construction activities from the Proposed Action impact suitable foraging for wildlife and nesting habitat for migratory birds?	Impacts to wildlife (including migratory birds) from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. Vegetation clearing associated with the Proposed Action would impact <0.01% of present vegetation communities within the BLM FFO (see above). Migratory bird nest surveys would be performed if construction activities are scheduled to occur during the migratory bird nesting season (March 1–August 31 [Navajo Nation Department of Fish and Wildlife]; May 15–July 31 [BLM FFO]). With consideration of the above requirements and other design features in Appendix H, impacts to foraging for wildlife and migratory birds would be mitigated to a degree that detailed analysis is not warranted. The Proposed Action would be in compliance with the Migratory Bird Treaty Act (MBTA).

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would vegetation removal and increased noise during construction activities from the Proposed Action impact federally listed threatened, endangered, and candidate species?	Impacts to federally listed species from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation database (USFWS 2022) lists four endangered species (Mancos milkvetch [*Astragalus humillimus*], Colorado pikeminnow [*Ptychocheilus Lucius*], Razorback sucker [*Xyrauchen texanus*], southwestern willow flycatcher [*Empidonax traillii extimus*]); two threatened species (Mesa Verde cactus [*Sclerocactus mesae-verdae*], yellow-billed cuckoo [*Coccyzus americanus*]); and one candidate species (monarch butterfly [*Danaus plexippus*]) that could potentially occur in San Juan County. SWCA performed a biological survey of the proposed project on September 14, 2022, and no suitable or potential habitat for these species was observed (SWCA 2022). The proposed project area does not include critical habitat for any federally listed species (USFWS 2015). However, the monarch butterfly, a candidate species, could potentially forage within the proposed project area; no monarch butterfly individuals were observed during the general biological survey in September 2022. Although monarch butterflies could use the proposed project area for foraging, no milkweed species (*Asclepias* spp.), which are required for egg laying, were observed. Therefore, it is unlikely that breeding efforts of the species would be impacted by the Proposed Action. Removal of vegetation within the proposed project area could reduce the availability of flowering plants and thus possibly impact the species' food sources. However, seed mixtures used for reseeding often contain nectar-producing species that could provide food sources for adult butterflies during interim reclamation. The Proposed Action is not likely to contribute to a trend toward federal listing or cause a loss of viability to the population or species because, although the project would impact approximately 7.54 acres initially, approximately 5.34 acres of which would undergo interim reclamation, including reseeding, resulting in permanent impacts to only 2.2 acres. Additionally, the Proposed Action would not use any surface water that could affect federally listed threatened, endangered, or candidate species; all groundwater used for pipeline construction and/or dust abatement would be taken from one or more existing private water wells or private water holes, such as the Blanco Trading Post Water Well (point of diversion number SJ-4348), which is accessed from the Uinta-Animas aquifer at depths of less than 2,500 feet and is deemed potable (<1,000 milligrams/liter total dissolved solids) and suitable for vegetation (U.S. Geological Survey 2023). There would be no new water depletions associated with the Proposed Action. Further detailed analysis is not warranted. The Proposed Action would be in compliance with the Endangered Species Act and with the PRMP/FEIS and associated biological assessment (BLM 2002). No further consultation with the USFWS is required.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
How would vegetation removal and increased noise during proposed construction activities from the Proposed Action impact plant and animal species listed under the Navajo Nation Endangered Species List (NESL)?	The Navajo Nation Department of Fish and Wildlife (NNDFW) Data Response (DR) lists nine NESL species as having the potential to occur in the proposed project area: Aztec gilia (*Aliciella formosa*), Clover's cactus (*Sclerocactus cloverae*), San Juan milkweed (*Asclepias sanjuanensis*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), Kit fox (*Vulpes macrotis*), mountain plover (*Charadrius montanus*), southwestern willow flycatcher, and western burrowing owl (*Athene cunicularia*). The proposed project area is located within one NNDFW Biological Resource Land Use Clearance Policies and Procedures (RCP) area (Area 3: Less Sensitive Area), which has the fewest restrictions on development (NNDFW 2022). Based on current distribution, habitat requirements, and the results of the general biological surveys conducted by SWCA, eight of the nine NNDFW DR-listed species were found unlikely to occur in the proposed project area. However, the remaining NNDFW DR-listed species (golden eagle) was found to occur or have the potential to occur in the proposed project area. See the biological evaluation on file with the BLM FFO for additional details; below is a summary of the results (SWCA 2022). **Golden eagle**: The golden eagle is listed as an NESL Group 3 species. This species is also protected under the Bald and Golden Eagle Protection Act and MBTA. This eagle breeds from Alaska to central Mexico. Golden eagles are year-round residents in New Mexico, with known breeding locations occurring throughout the state (New Mexico Avian Conservation Partners 2017). During the breeding or nesting season (January 15 to July 15), golden eagles occur in areas of mountain cliffs or canyons adjacent to open desert or grassland vegetation communities that provide habitat for their primary prey of cottontails (*Sylvilagus* sp) and jackrabbits (*Lepus* sp.). Nests are typically on cliffs greater than 30 meters high, although shorter cliffs of 10 meters high are also infrequently used (NNDFW and Navajo Natural Heritage Program 2020). During the winter, golden eagles forage in open or shrubland habitats. Agricultural areas are often avoided by these eagles (New Mexico Avian Conservation Partners 2017). No golden eagles were observed during the general biological survey. SWCA biologists also did not observe any appropriate nesting sites in the immediate vicinity of the proposed project area; however, this species has the potential to forage in the proposed project area year-round. Per BLM habitat maps and biologist review of satellite imagery, the nearest mapped golden eagle nest is located approximately 14 miles northeast of the proposed project area (BLM 2018). There are no steep-walled canyons or cliffs within the vicinity of the proposed project area. Due to the mobility of adult birds, it is unlikely that golden eagles would be directly harmed by the proposed project. Noise and visual disturbances associated with project construction could temporarily deter this species from utilizing the proposed project area and immediately adjacent land. Once construction has been completed, the temporary disturbance would abate. The Proposed Action would be constructed adjacent to existing roads and oil and natural gas infrastructure, reducing impacts to these species. If ground- or vegetation-disturbing activities are scheduled to occur within the migratory bird nesting season (March 1–August 31 [NNDFW]; May 15–July 31 [BLM FFO]), preconstruction migratory bird nest surveys of the proposed project area would be performed. See also the biological survey report on file with the BLM FFO and NNDFW for additional details (SWCA 2022). Project design features (detailed in Appendix H) would mitigate potential impacts to NESL species to the degree that detailed analysis is not warranted.
How would storage of hydrocarbon liquids from the Proposed Action impact drinking water sources or surface waters?	The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. The total depth of the proposed well bores would be between approximately 6,000 and 11,000 feet below the ground surface. The producing zone targeted by the Proposed Action is well below any economically viable underground sources of drinking water (typically shallower than 2,000 feet). All chemicals stored on-site would be properly contained. On-site containment structures such as containment dikes, containment walls, and drip pans would be impervious and would be maintained to prevent a discharge to waters of the U.S. BMPs would ensure that no materials are discharged into downstream jurisdictional water features. Project design features (detailed in the project's SUPO on file with the BLM FFO) would mitigate impacts to drinking water and surface waters to the degree that detailed analysis is not warranted.

Issue Statement	Rationale for Not Further Discussing in Detail in the EA
What is the potential for impacts to oil and gas/energy production from the Proposed Action?	Impacts to oil and natural gas resources from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The commitment of these resources is also analyzed at the lease level. The Proposed Action would contribute to future mineral development within the BLM FFO management planning area. Further detailed analysis is not warranted.
What are potential impacts from waste (hazardous materials) associated with ground-disturbing activities from the Proposed Action?	Project design features (detailed in Appendix H), as well as the adherence to Onshore Oil and Gas Operations regulations (43 CFR 3160) would mitigate impacts associated with waste to the degree that detailed analysis is not warranted.
How would the construction and operation phases of the Proposed Action impact recreation and access to BLM land (for uses such as hunting, fishing, shooting, etc.)?	Impacts to recreation from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. The proposed project area is not located within a designated recreation SDA. Dispersed recreation opportunities similar to those found within the proposed project area are readily available across a wide area near the Proposed Action. The Proposed Action would not restrict recreation opportunities; therefore, detailed analysis is not warranted.
How would construction activities associated with the Proposed Action impact public access to BLM land?	Impacts to public access to BLM land from BLM FFO–wide oil and natural gas development were analyzed in the PRMP/FEIS (BLM 2003b), as amended. While public access roads and ROWs are present in the immediate area and would be used by personnel during all phases of the proposed project, access to the public would not be restricted (other than the usage of potential, temporary flaggers, or other safety features). The presence of the proposed project components would likewise not impact public use in the area. Additionally, the use of mitigation measures would minimize the impacts and protect the existing ROWs. With standard design features and stipulations, no further analysis is needed.

Table 2.1. Proposed Action Surface Disturbance

Project Feature	Landowner/Land Manager	Dimensions of Project Features	New Surface Disturbance (acres)	Interim Reclamation (acres)	Final Reclamation (acres)
Well pad	Navajo Allotted	650 feet × 415 feet	6.2	4.8	1.4
Access road and road pullout	Navajo Allotted	1,041 feet	0.8	-	0.8
Buried pipelines	Navajo Allotted	1,267 feet	1.2	1.2	-
TUPA	Navajo Allotted	40 feet × 75 feet	0.1	0.1	-
Lay-flat pipeline	Navajo Allotted	1,267 feet	-	-	-
Deduction for overlapping components			0.7	0.7	-
Total* [†]	-	-	***7.54***	***5.34***	***2.2***

* Total includes reduction in surface disturbance from overlapping project components.

† Totals may vary due to rounding discrepancies.

Table 3.1. Past, Present, and Reasonably Foreseeable Future Estimated Landscape Disturbance within the Analysis Area

Analysis Area		Acreage
FFO Planning Area		7,828,509
Mancos-Gallup Formation (portions of San Juan, Rio Arriba, McKinley, and Sandoval Counties)		4,800,000
Disturbance Trends within the Mancos-Gallup Formation Analysis Area	**Number of Wells**	**Acreage**
Other development and surface use (mining, grazing, roads, transmission lines, and urban expansion)		74,500*

Analysis Area		Acreage
FFO 2018 RFD past and present oil and gas development	37,300	56,500
RPFO 2019 RFD past and present oil and gas development	919	590
Total Past and Present Surface Use		**131,590**
Other development and surface use*		5,000
FFO 2018 reasonably foreseeable future oil and gas development (Crocker and Glover 2018)	3,200	18,500
RPFO 2019 reasonably foreseeable future oil and gas development (Crocker and Glover 2019)	200	2,160
Total Planned Actions	**3,400**	**25,660**
Estimated Total Landscape Disturbance	**41,619**	**157,250**
Contribution of Future Potential Development under the Proposed Action	**-**	**7.54**
Percentage Contribution of Future Potential Development under the Proposed Action	**-**	**0.006%**

* No study calculating existing disturbance for the analysis area was available at the time of writing. This value was estimated based on acreages of agricultural lands and coal mines reported in BLM (2015b). As such, this may be an underestimate of total non-oil and gas–related disturbance in the analysis area.

Table 3.2. Past and Present Federal Well Completions

Number of Federal Well Completions	2016	2017	2018	2019	2020	2021	2022
BLM FFO New Mexico portion of San Juan Basin	29	51	35	39	18	22	64
BLM RPFO New Mexico portion of San Juan Basin	2	1	5	0	0	0	1
Total*	31	52	40	39	18	22	65

Source: Petroleum Engineering Group, FFO

*The number of well completions within the FFO and RPFO.

Table 3.3. Estimated GHG Emissions from Reasonably Foreseeable Projected Federal Fossil Fuel Production over the Next 12 Months

	Annual Federal Life-Cycle Emissions (Oil and Gas) – Mt CO_2e/year	Annual Federal Life-Cycle Emissions (Oil, Gas, and Coal) – Mt CO_2e/year	Cumulative Short-Term Life-of-Project Emissions (Oil and Gas Combined) – Mt CO_2e
New Mexico	413.46	415.16	1,939.52
U.S.	813.58	1,260.22	4,614.81

Source: BLM (2022b)

Table 3.4. Evaluation of Potential Federal Fossil Fuel GHG Emissions with Respect to Global Carbon Budgets

Minerals [a]	Metric	1.5°C			2.0°C		
		33%	50%	66%	33%	50%	66%
	Carbon Budget ($GtCO_2$)	650	500	400	1,700	1,350	1,150
	Time to Exhaust Budget (years) [b]	12.97	9.98	7.98	33.93	26.95	22.95

Minerals [a]	Metric	1.5°C			2.0°C		
		33%	50%	66%	33%	50%	66%
Federal Oil and Gas	Federal Emissions During Budget Time Frame ($GtCO_2$)	5.95	4.53	3.60	15.88	12.51	10.56
	Federal Consumption of Budget (%)	0.91%	0.91%	0.90%	0.93%	0.93%	0.92%
	Time to Exhaust Budget without Federal Emissions (years)	13.09	10.07	8.06	34.25	27.20	23.17
	Reduction in Time to Exhaust Budget from Federal Emissions (days)	-43.71	-33.32	-26.50	-116.75	-92.02	-77.66

[a] Based on Long-term Onshore Federal Mineral Emissions estimated from the EIA Annual Energy Outlook reference case energy projection scenario. Does not include sequestration by federal lands or other federal emissions offsets.

[b] Based on the global emissions estimates from the Rhodium Group, as cited in chapter 6.1 of the Annual GHG Report (BLM 2022b).

Table 3.5. Design Values Compared with NAAQS and NMAAQS for Counties within the Analysis Area

Pollutant	2021 Design Concentrations	Averaging Time	NAAQS	NMAAQS
CO	La Plata County, Colorado: 0.3 ppm	8-hour	9 ppm	–
O_3	Rio Arriba County: 0.064 ppm Sandoval County: 0.068 ppm San Juan County: 0.068 ppm: four stations; Bloomfield at 0.063 ppm, Navajo Dam at 0.068 ppm, Shiprock at 0.068 ppm, Chaco Culture National Historical Park at 0.068 ppm	8-hour [a]	0.070 ppm	–
NO_2	San Juan County: four stations; Bloomfield at 9 ppb, Navajo Dam at 6 ppb, Chaco Culture at 1 ppb, and Shiprock at 3 ppb	Annual [b]	53 ppb	50 ppb
NO_2	San Juan County: 32 ppb, four stations; Bloomfield at 32 ppb, Navajo Dam at 23 ppb, Chaco Culture invalid, Shiprock at 23 ppb	1-hour [c]	100 ppb	–
SO_2	San Juan County: 1 ppb	1-hour [d]	75 ppb	–
$PM_{2.5}$	Taos County: 5.6 µg/m^3	Annual [b, e]	12 µg/m^3	–
$PM_{2.5}$	Taos County: 16 µg/m^3	24-hour [c,e]	35 µg/m^3	
PM_{10}	San Juan County: 0.3 µg/m^3	24-hour [b,e]	150 µg/m^3	–

Source: EPA (2023a)

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[a] Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years.

[b] Not to be exceeded during the year.

[c] 98th percentile, averaged over 3 years.

[d] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

[e] Annual mean averaged over 3 years.

Table 3.6. Nitrogen and Sulfur Deposition Conditions at NPS-Managed Areas in New Mexico

Class I Area	Nitrogen (Conditions / Trend)	Sulfur (Conditions / Trend)
Bandelier National Monument	Fair / Relatively unchanging trend	Good / Improving trend
El Morro National Monument	Fair / Trend not available	Good / Trend not available
Manhattan Project National Historical Park	Poor / Trend not available	Fair / Trend not available
Mesa Verde National Park	Fair / Relatively unchanging trend	Good / Improving trend
Petrified Forest National Park	Poor / Relatively unchanging trend	Good / Improving trend
Valles Caldera National Preserve	Fair / Trend not available	Good / Trend not available

Class II Sensitive Area		
Aztec Ruins National Monument	Good / Trend not available	Good / Trend not available
Canyon de Chelly National Monument	Fair / Trend not available	Good / Trend not available
Chaco Culture National Historic Park	Fair / Trend not available	Good / Trend not available
El Malpais National Monument	Fair / Trend not available	Good / Trend not available
Petroglyph National Monument	Good / Trend not available	Good / Trend not available

Source: NPS (2023) and BLM FFO RMP, Table 3-4 (BLM 2003b).

Only areas with air monitoring equipment have been reported in this table.

Table 3.7. 2020 NEI Air Pollutant Emissions for New Mexico and San Juan, Sandoval, Rio Arriba, and McKinley Counties

Source	Emissions (tons per year)						HAPs
	NO_X	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO	
2020 NEI – San Juan, Sandoval, Rio Arriba, and McKinley Counties *	53,708	141,794	24,218	6,042	2,301	108,755	15,278
2020 NEI – State of New Mexico	199,462	712,639	129,132	42,623	87,828	615,513	105,528

Source: EPA (2023d)

HAPs = hazardous air pollutants

Note: BLM now reports both biogenic and human-caused emissions in the table above. The table above shows emissions by county, including biogenic sources. Emissions of PM_{10}, $PM_{2.5}$, and SO_2 are estimated to be solely from human-caused sources. Human-caused emissions of NO_x, CO, and VOCs are reduced to 64,404 tons, 199,676 tons, and 109,510 tons, respectively.

* 2020 data include the point, nonpoint, onroad mobile, and nonroad mobile data. Values may not always sum correctly if queried on demand as the NEI database updates its emissions periodically with newer emission information.

Table 3.8. 2020 NEI San Juan, Sandoval, Rio Arriba, and McKinley Counties Air Pollutant Emissions Tons per Year by Source

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_x	VOC	NH_3
Area sources	2,064	322	20,805	2,989	34	4,571	5,605
Oil and gas sources	33,662	22,582	287	283	289	59,129	0
Non-road mobile	7,469	2,978	128	124	4	737	2
On-road mobile	25,162	6,826	362	193	14	1,763	146
Point sources	25,670	18,591	2,264	2,139	1,926	6,216	200
VOC refueling	-	-	-	-	-	924	-
Natural sources (biogenic)	11,304	2,336	-	-	-	67,639	-
Forest wildfires	3,039	64	330	279	30	723	51
Prescribed fires	385	9	42	35	4	92	6
San Juan, Sandoval, Rio Arriba, and McKinley Counties Total	108,755	53,708	24,218	6,042	2,301	141,794	6,010

Table 3.9. Cancer Risk and Noncancer Risk within Analysis Area (San Juan, Sandoval, Rio Arriba, and McKinley Counties)

County	Respiratory Hazard Index			Background Cancer Risk (per million)			Total Cancer Risk (per million)			Oil and Gas Cancer Risk (per million)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
San Juan	0.28	0.30	0.28	2.58	1.89	2.58	16.64	17.10	17.56	1.70	2.21	2.06
Sandoval	0.28	0.21	0.22	2.57	1.86	2.57	17.59	17.37	18.72	0.01	0.01	0.01
Rio Arriba	0.15	0.13	0.13	2.51	1.83	2.53	12.70	11.67	12.28	0.03	0.06	0.04
McKinley	0.13	0.12	0.12	2.48	1.82	2.48	11.62	10.50	11.12	0.01	0.01	0.01

Source: EPA Air Toxics Screening Assessment (EPA 2022a).

Table 3.10. Cancer Risks Over a Lifetime of Exposure During Production Operations of Oil and Gas Activities

Distance (feet)	Average Incremental Lifetime Cancer Risk	Maximum Exposed Individuals Cancer Risk
300	10 in 1 million	-
400	-	10 in 1 million
500	4 in 1 million	7 in 1 million
1,400	1 in 1 million	-
2,000	-	1 in 1 million

Source: Final Report: Human Health Risk Assessment for Oil and Gas Operations in Colorado (ICF and CSU 2019).

Table 3.11. Proposed Action Emissions (tons/year)

	Total Emissions (tons per year)						
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x	VOC	Total HAPs
Single well construction/development phase	2.98	8.13	0.49	0.48	0.01	0.70	0.13
Single well operation phase	16.47	11.63	0.36	0.29	0.01	14.43	1.86
Single well total	**19.45**	**19.76**	**0.85**	**0.77**	**0.02**	**15.14**	**1.99**
Six well construction/development phase	17.85	48.78	2.96	2.87	0.05	4.22	0.81
Six well operation phase	98.82	69.80	2.13	1.73	0.08	86.60	11.15
Six well project total	**116.68**	**118.58**	**5.09**	**4.60**	**0.13**	**90.82**	**11.96**
Current emissions (San Juan, Sandoval, Rio Arriba, and McKinley Counties)	108,755	53,708	24,218	6,042	2,301	141,794	15,278
Project percent increase compared to San Juan, Sandoval, Rio Arriba, and McKinley Counties	**0.11%**	**0.22%**	**0.02%**	**0.08%**	**0.01%**	**0.06%**	**0.08%**

Source: Enduring (2023c) and EPA (2023d).

Table 3.12. Annual Global, U.S., and New Mexico GHG Emissions as Reported to the EPA from 2016 through 2020

Area	Annual GHG Emissions (Mt CO_2e/year)				
	2016	2017	2018	2019	2020
Global	36,465.59	36,935.59	37,716.18	37,911.37	35,962.87
U.S.	5,076.98	5,005.53	5,159.30	5,036.04	4,535.30
New Mexico	75.9	77.2	74.4	79.4	-

Source: Annual GHG Report (BLM 2022b), Chapter 6, Tables 6-1 and 6-3: Mt (megaton) = 1 million metric tons

Table 3.13. Estimated Life of Wells Emissions from Well Development and Production Operations

Activity	Emissions (tonnes)				
	CO_2	CH_4	N_2O	CO_2e (100-year)	CO_2e (20-year)
Well development	7,461	0.18	0.006	7,468	7,477
Well production operations	161,950	212.40	0.0240	168,345	179,538
Mid-stream activities	249,457	1,200.23	4.019	286,321	349,572
End-use activities	1,794,967	64.49	12,.215	1,800,224	1,803,622
Total	**2,213,834**	**1,477.30**	**16.480**	**2,262,357**	**2,340,210**

Source: BLM Lease Sale Emissions Tool – modified to show emissions associated with the six APDs for a 20-year life.

IPCC Sixth Assessment Report Global Warming Potentials (GWP) - 100-year GWP: CO_2=1, CH_4=29.8, N_2O=273; 20-year GWP: CO_2=1, CH_4=82.5, N_2O=273 (IPCC 2021).

Table 3.14. Estimated Ultimate Recovery for the Proposed Action

GLU 053 Production EUR	1 well / per day	1 well / 20-year life	6 wells / 20-year life
Produced oil (bbls)	75.7	552,706	3,316,236
Produced natural gas (mcf)	151.9	1,109,000	6,654,000

Table 3.15. Comparison of Proposed Action Annual Emissions with Other Source Emissions

Reference	MT CO_2e (per year)*	Average Year % of Reference
Proposed Action emissions (average year)	0.113	-
New Mexico Onshore Federal (Oil and Gas)†	245.71	0.046
U.S. Onshore Federal (Oil and Gas)†	465.63	0.024
U.S. Federal (Oil and Gas)†	844.27	0.013
U.S. Federal (Oil, Gas, and Coal)†	1,292.57	0.009
New Mexico Total (all sectors)‡	79.4	0.14
U.S. Total (all sectors)‡	5,981.40	0.002

* Estimates are based on 100-GWP values.

† Federal values come from the BLM Specialist Report on Annual Greenhouse Gas Emissions. Tables ES-1 and ES-2 (BLM 2022b).

‡ Values are from the EPA's *Inventory of U.S. GHG Emissions and Sinks: 1990-2020* (EPA 2022e) and use IPCC Fourth Assessment Report Global Warming Potentials.

Table 3.16. Comparison of the Life of the Well Emissions to Other Federal Oil and Gas Emissions

Reference	Mt CO_2e (20-year)	Life of Well % of Reference
Life of well(s)	2.262	100
New Mexico reasonably foreseeable short-term federal (oil and gas)*	1,939.52	0.117
New Mexico EIA projected long-term federal (oil and gas)†	5,767.27	0.039
U.S. reasonably foreseeable short-term federal (oil and gas)*	4,614.81	0.049
U.S. EIA projected long-term federal (oil and gas)†	13,560.24	0.017

Source: U.S. and federal emissions from Annual GHG Report Figure 5-1 and Tables 5-17 and 5-18 (BLM 2022b).

* Short-term projections are based on existing production, approved permits, and potential new leases.

† Long-term projections are based on the projections from the U.S. EIA energy outlook.

Table 3.17. SC-GHG Associated with Development of the Proposed Action (2020$)

	SC-GHG (2020$)			
	SC-GHG Average Value, 5% discount rate	SC-GHG Average Value, 3% discount rate	SC-GHG Average Value, 2.5% discount rate	SC-GHG 95th Percentile Value, 3% discount rate
Percent value (in base year) of estimated SC-CO_2 for all CO_2 emissions, 2020$)	$33,452,100	$11,626,228	$173,396,668	$ 349,912,358
Percent value (in base year) of estimated SC-CH_4 for all CH_4 emissions, 2020$)	$1,039,309	$2,371,944	$3,122,979	$6,284,006
Percent value (in base year) of estimated SC-N_2O for all N_2O emissions, 2020$)	$101,045	$318,873	$468,051	$840,712
Project Totals	**$34,592,454**	**$14,317,045**	**$176,987,698**	**$357,037,076**

Source: BLM SC-GHG Emissions Tool – modified to show emissions associated with the six APDs for a 20-year life.

Table 3.18. 2015 Water Use for the New Mexico Portion of the San Juan Basin

Category	Surface Water (AF/year)			Groundwater (AF/year)			Total (AF/year)
	Fresh	Saline*	Total	Fresh	Saline*	Total	
Aquaculture	0	0	0	4,641	0	4,641	4,641
Domestic	0	-	0	8,979	-	8,979	8,979
Industrial	0	0	0	2,634	0	2,634	2,634
Irrigation	381,241	-	381,241	3,576	-	3,576	384,817
Livestock	437	-	437	986	-	986	1,424
Mining	2,724	0	2,724	3,677	5,257	8,934	11,658
Public Water Supply	21,613	0	21,613	17,958	0	17,958	39,571
Thermoelectric Power	30,637	0	30,637	2,298	0	2,298	32,935
Basin Totals	**436,652**	**0**	**436,652**	**44,750**	**5,257**	**50,008**	**486,660**

Source: 2022 BLM New Mexico Water Support Document (BLM 2022a).

Note: Values may not sum to total because of independent rounding (Dieter et al. 2018). Water use data are in AF/year.

* Saline water withdrawals are not reported for domestic, irrigation, or livestock water use (Dieter et al. 2018).

Table 3.19. 2018–2021 Water Use from Oil and Gas Activities, Reported to FracFocus

Year		Total Water Use All Categories	Water Use Recompletions	Total Water Use Nitrogen Completions	Total Water Use Slick Water Completions
2018	Average	4.6 AF	0.2 AF	4.6 AF	38.9 AF
	Total	658 AF	25 AF	88.3 AF	544.5 AF
2019	Average	1.74 AF	0.2 AF	5.6 AF	49.2 AF
	Total	161 AF	17.2 AF	94.4 AF	49.2 AF
2020	Average	5.7 AF	-	5.7 AF	-
	Total	51 AF	-	51 AF	-
2021	Average	14.9 AF	0.3 AF	5.2 AF	42.1 AF
	Total	671.1 AF	4.5 AF	78.2 AF	588.4 AF

Source: Crocker and Glover (2019)

Table 3.20. 2019 RFD Water Use from Oil and Gas Activities in Sandoval County

2019 RFD Total Water Usage for Hydraulic Fracturing	Federal and Non-Federal Oil and Natural Gas Wells (200 total wells)	Vertical Well (160 wells)	Horizontal Well (40 wells)
Estimated Water Usage per Year	15.4 AF	0.32 AF	6.44 AF
Estimated Total Water Usage (2018–2039)	307.4 AF	6.40 AF	128.80 AF

Table 3.21. RFD Water Use by Completion Technology

	Nitrogen Stimulation Scenario Water Use (AF)	Revised RFD Scenario Water Use (AF)	Slick Water Stimulation Scenario Water Use (AF)
FFO RFD			
2,300 horizontal wells	10,580	11,132	124,200
900 vertical wells	483	483	483
Total FFO water use	11,063	11,615	124,683
RPFO RFD			
40 horizontal wells	152	258	1,012
160 vertical wells	51	51	51
Total RPFO water use	203	309	1,063
Total San Juan Basin Water Use	**11,266**	**11,924**	**125,746**

FFO water use factors: vertical well: 0.537 AF, horizontal well–nitrogen: 4.6 AF, horizontal well–RFD scenario: 4.84 AF, horizontal well–slick water: 54 AF. RPFO water use factors: vertical well: 0.32 AF, horizontal well–nitrogen: 3.8 AF, horizontal well–RFD scenario: 6.44 AF, horizontal well–slick water: 25.3 AF.

Table 3.22. Detailed Non-Potable and Potable Groundwater Use from the Proposed Action

	Non-Potable Groundwater Use (AF) *	Potable Groundwater Use (AF) †
053H	19.21	0.26
054H	19.59	0.26
055H	20.88	0.26
056H	19.59	0.26

	Non-Potable Groundwater Use (AF) *	Potable Groundwater Use (AF)†
057H	18.43	0.26
One future well	20.88	0.26
Construction and dust control	-	0.45
Rig Wash	-	0.03
Total Proposed Action	**118.58**	**2.04**

* Enduring would be developing minerals from the Mancos Shale and Gallup Sandstone Formations; each well uses different water volumes for development and depends on the depth within the formation and length of the laterals of the well bores. (Enduring 2023d).

‡ Includes construction of the well pad, associated access road, and pipelines.

Table 3.23. Contribution of the Proposed Action to RFD Water Use

	Proposed Action	RFDs-Nitrogen Scenario	RFDs-Revised RFD Scenario	RFDs-Slick Water Scenario
Total water use for drilling and completing six wells	120.62 AF	11,266 AF	11,924 AF	125,746 AF
Percent Proposed Action to total RFD water use	-	1.07%	1.01%	0.09%
Percent Proposed Action to annual RFD water use	-	21.41%	20.23%	1.92%

Table 4.1. Pueblos and Tribes Who Received Consultation Requests from the BLM FFO

Tribe	Name
All Pueblos Council of Governors	Governors
Counselor Chapter House	President Damien Augustine
Eight Northern Indian Pueblos Council	Governors
Five Sandoval Indian Pueblos	Governors
Jicarilla Apache Tribal Council	President Edward Velarde
Kewa Pueblo (Pueblo of Santo Domingo)	Governor Sidelio Tenorio, Sr.
Nageezi Chapter House	President Ervin Chavez
Navajo Nation	President Jonathan Nez
Ohkay Owingeh	Governor Patrick Aguino
Pueblo of Acoma	Governor Randall Vicente
Pueblo of Cochiti	Governor Phillip Quintana
Pueblo of Isleta	Governor Abeita
Pueblo of Isleta, Tribal Historic Preservation Office	Dr. Henry Walt
Pueblo of Jemez	Governor Raymond Loretto
Pueblo of Laguna	Governor Martin Kowemy, Jr.
Pueblo of Nambe	Governor Nathaniel Porter
Pueblo of Nambe, Tribal Historic Preservation Office	Lt. Governor Arnold J. Garcia
Pueblo of Picuris	Governor Craig Quanchello
Pueblo of Pojoaque	Governor Jenelle Roybal
Pueblo of San Felipe	Governor Carl Valencia
Pueblo of San Felipe Department of Natural Resources	Pinu'u Stout, Director

Tribe	Name
Pueblo of San Ildefonso	Governor Christopher Moquino
Pueblo of Sandia	Governor Stuart Paisano
Pueblo of Santa Ana	Governor Joseph Sanchez
Pueblo of Santa Ana Tribal Historic Preservation Office	Director Murrell
Pueblo of Santa Clara	Governor J. Michael Chavarria
Pueblo of Taos	Governor Clyde Romero, Sr.
Pueblo of Tesuque	Governor Robert Mora, Sr.
Pueblo of Zia	Governor Gabriel Galvan
Pueblo of Zuni	Governor Val R. Panteah, Sr.
Southern Ute Indian Tribe	Melvin J. Baker
Ten Southern Pueblo Governor's Council	Ten Southern Pueblos Council
The Hopi Tribe	Chairman Timothy L. Nuvangyaoma
Ute Mountain Ute Tribe	Chairman Manuel Heart

Approval Date: 06/27/2023

Appendix G: National Environmental Policy Act Interdisciplinary Team Checklist

Approval Date: 06/27/2023

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

(EAs & DNAs) - The purpose of this checklist is to document which resource issues need analysis in the NEPA document and to identify the ID team for the NEPA document. Responsible staff will make an initial determination and provide rationale for that determination, which is subject to manager review and concurrence. If warranted, issues or determinations may be changed during the NEPA process (e.g., after external scoping, during review, etc.), but changes must be documented and have Authorized Officer concurrence. All elements need a determination, assigned specialist, rationale, initials, and date. The ID team will include all specialists with a "PI" in the table below, and resources with a "PI" will be addressed in Ch. 3 of the EA.

(CXs) - The purpose of this checklist is to identify the ID team for the categorical exclusion (CX). The ID team will help the project lead develop mitigation measures and determine if extraordinary circumstances apply. DO NOT enter a determination, initials, or date for CX projects. Specialists may provide mitigation measures or extraordinary circumstances in the "Rationale for Determination" column, but it is not necessary at this time.

Project Title: Greater Lybrook Unit 057H, 056H, 055H, 054H & 053H Oil and Natural Gas Wells Project

NEPA Number: DOI-BLM-NM-F010-2023-0040-EA

File/Serial Number: NOG 1312-1857, NMNM135316A 7018631318

Project Leader: Abiodun Adeloye (Emmanuel)

DETERMINATION OF STAFF: ***(Choose one of the following abbreviated options for the left column)***

PI = Present with potential for relevant impacts that need to be analyzed in Ch. 3 in the EA.
NP = Not present in the area impacted by the proposed or alternative actions
NI = Present, but not impacted to a degree that analysis is required in Ch. 3 in the EA.
NC = (DNAs only) Actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section D of the DNA form. The Rationale column may include NI and NP discussions.

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
RESOURCES AND ISSUES CONSIDERED (INCLUDES SUPPLEMENTAL AUTHORITIES APPENDIX 1 H-1790-1)					
PI	Air Quality/	(x) W. Thomas ( ) J. Tafoya	How would air quality (particularly with respect to the National Ambient Air Quality Standards [NAAQS]) and volatile organic compounds (VOCs) in the BLM FFO be affected by emissions generated as a result of development associated with the Proposed Action?	WT	3/29/2023
PI	Greenhouse Gas Emissions	(x) W. Thomas ( ) J. Tafoya	How would the future potential development of the proposed action contribute to Greenhouse gas (GHG) emissions?	WT	3/29/2023
NP	Cultural Resources	(x) K. Adams ( ) E. Simpson ( ) G. Haymes	A Class III Archaeological Survey (NNHHPD No. HPD-22-660) was conducted in the proposed project area and during this survey no cultural sites were discovered. As such, no specific site protection stipulations will be attached to this project, and the proposed project will have no effect to Historic Properties.	KA	9/23/2022
NP	Native American Religious and other Concerns	(x) K. Adams ( ) E. Simpson ( ) G. Haymes	No known TCPs or sensitive cultural areas are present in the proposed project area.	KA	9/23/2022
NI	Paleontology	( ) S. Landon (x) C. Wenman	The proposed project is in an area mapped as PFYC 5, meaning paleo resource occurrence potential is high based on the surface geology. However, there are no mapped localities nearby and the project avoids outcrops where fossils are commonly found in-situ, so potential for encountering paleo resources is low. Include the following as a COA: "Any paleontological resource discovered by the Operator, or any person working on his behalf, on public or Federal land shall be immediately reported to the Authorized Officer. Holder shall suspend all operations in the immediate area of such	CW	8/8/2022

Page 1 of 4

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
			discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant scientific values. The Holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the Holder."		
NI	Areas of Critical Environmental Concern	( ) S. Allison ( ) D. McKim ( ) Project Lead (x) R Joyner	No ACEC is present within the project area.	WT	8/11/2022
NP	Lands with Wilderness Characteristics	(x) S. Allison ( ) D. McKim	Proposed project is not in proximity to any lands determined to be eligible for LWC during the 2016 LWC Inventory.	SA	08/04/2022
NP	Wilderness	(x) S. Allison ( ) D. McKim	Proposed project is not in proximity to either the Bisti/De-Na-Zin or Ah-shi-sle-pah Wilderness.	SA	08/04/2022
NI	Visual Resources	(x) S. Allison ( ) D. McKim	BLM does not assign VRM Classification to non-BLM Lands. Visual contrast on this project can be reduced by utilizing best management practices such as painting above ground infrastructure the Covert Green BLM Environmental Color to blend in with the predominantly sagebrush environment.	SA	08/04/2022
NP	Recreation	(x) D. McKim ( ) S. Allison	No impact to dispersed recreation.	DM	07/11/2022
NP	Fuels/Fire Management	( ) J. Tafoya (x) J. Quintana	No impact to fire and fuels management.	JQ	7/25/2022
NP	Geology	(x) C. Wenman	No geologic resources are present in the proposed project area.	CW	8/8/2022
NP	Solid Mineral Resources	(x) C. Wenman	No solid mineral resources exist within the proposed project area.	CW	8/8/2022
NI	Oil and Gas / Energy Production	( ) S. Scott ( ) R. Joyner (x) C. Wenman	The proposed project would allow Enduring to produce oil and gas from their Greater Lybrook Unit.	CW	8/8/2022
NP	Lands/Access	( ) B. Virginia (X) M. Tilden ( ) T. Faust	There are no existing ROWs within the project area.	MT	10/21/2022
NI	Wastes (hazardous or solid)	(x) W. Thomas ( ) A. Gallegos ( ) C. Wenman	Wastes will be mitigated via waste management plan.	WT	8/11/2022
NI	Livestock Grazing	( ) B. Witmore (x) C. Gould ( ) N. Craun ( ) J. Tafoya	The proposed action is not expected to impact livestock grazing within the PPA.	CG	7/15/2022
NI	Public Land Health Standards	( ) B. Witmore (x) C. Gould ( ) N. Craun ( ) J. Tafoya	The proposed action is not expected to impact PLHS within the PPA.	CG	7/15/2022
NI	Invasive Species/ Noxious Weeds	(x) H. Perry	Endurings updated SUPO reviewed on 8/15/22 provides that a weed management plan and PUP will be provided for noxious and invasive weed control on location. Enduring will be responsible for control on their location and actions that are associated with this proposal. For sections that occur on State managed land, Enduring will need to contact the State Lands	HP	8/15/2022

Project Title: Greater Lybrook Unit 057H, 056H, 055H, 054H & 053H Oil and Natural Gas Wells Project

Page 2 of 4

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

Determ-ination	Resource	Assigned Specialist (X)	Rationale for Determination[1]	Initials[2]	Date[3]
			office to obtain instructions on how to manage weeds on their surface.		
NI	Vegetation Excluding USFWS Designated Species	(x) B. Witmore ( ) C. Gould ( ) N. Craun ( ) J. Tafoya	The proposed action is not expected to impact Vegetation excluding USFWS Designated Species within the PPA.	CG	7/15/2022
NP	Special Status Plant Species and Animal Species	(X) J. Kendall	Proposed project area on IA lands. Will defer to BIA. Low indirect impacts to BLM sensitive species on BLM managed lands	JK	7/25/22
NP	Threatened, Endangered or Candidate Plant and Animal Species	(X) J. Kendall	The proposed project area is not located on BLM lands within suitable or potential habitat, as defined by USFWS; within conformance of 2002 Biological Assessment (and associated 2003 RMP)	JK	7/25/22
NP	Migratory Birds	(X) J. Kendall	Proposed project area on IA lands. Will defer to BIA. Low indirect impacts to migratory birds on BLM managed lands	JK	7/25/22
NI	Wildlife	(X) R. McBee	Proposed project area on IA lands. Will defer to BIA. Low impacts to small and big game species.	RM	8/8/22
NP	Wildlife-aquatic	(X) R. McBee	No aquatic wildlife present.	RM	8/8/22
NP	Wetlands/Riparian Zones	(X) J. Kendall	No designated riparian on BLM within PPA	JK	7/25/22
PI	Water Resources/Quality (drinking/surface/ ground)	(X) W. Thomas	How would future drilling and completion operations associated with the Proposed Action impact groundwater quality and quantity?	WT	3/29/2023
NI	Soils	(X) W. Thomas	There are no Fragile Soils located within the proposed project area.	WT	8/11/2022
NP	Wild Horses and Burros	( ) J. Tafoya ( ) B. Witmore ( ) C. Gould ( ) N. Craun (x) R. Culp	No congressionally designated wild horse or burro herd within the project area.	RC	7/11/2022
NI	Socio-Economics	(X) W. Thomas	Socio economics will not be impacted by the project	WT	8/11/2022
NI	Environmental Justice	(X) W. Thomas	EJ communities will not be impacted by the project	WT	8/11/2022

[1] Rationale for Determination is required for all "NIs" and "NPs." Write brief issue statements for "PIs."

[2] The appropriate resource specialist or Authorized Officer or NEPA Coordinator entering the determination should enter their initials. Typically, the assigned specialist should enter initials. If a senior specialist or the Authorized Officer assigns a resource specialist to the NEPA project, the senior specialist or Authorized Officer shall enter their initials in this column after making a determination. If the assigned specialist is making the determination from an off-site location (i.e., state office), the project lead may enter their own initials as long as the determination is documented (i.e., email, conversation record, etc.). DO NOT enter someone else's initials.

[3] The date entered should be the date the determination was made by the assigned specialist, senior specialist, or Authorized Officer.

PROJECT-ASSIGNED SPECIALISTS REVIEW:

Reviewer Title	Initials[4]	Date	Comments

Project Title: Greater Lybrook Unit 057H, 056H, 055H, 054H & 053H Oil and Natural Gas Wells Project

INTERDISCIPLINARY (ID) TEAM CHECKLIST

Farmington Field Office

NEPA Coordinator or Supervisor	WT	8/11/20222	Insure FIMO reviews the project due to being located on Indian Allotted lands.

[4] Initials in this column indicates that the NEPA Coordinator has reviewed the assigned specialists column and agrees that the specialists that have been assigned or that have entered PIs (for EAs) will be included in the ID Team for the project. This section is typically initialed at the initial project presentation meeting.

INITIAL DETERMINATION REVIEW (*EA or DNA only*):

Reviewer Title	Initials[5]	Date	Comments
NEPA Coordinator or Supervisor			

[5] Initials in this column indicates that the Authorized Officer or NEPA Coordinator has reviewed the completed checklist after the ID Team entered initial determinations, and the project lead may continue the NEPA process. Initials will not be made here for categorical exclusions (CXs).

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Appendix H: Design Features

– Design Features –

Enduring would adhere to any conditions required by the BLM FFO. Additional project-specific design features would be included as determined during the BLM on-site meeting. Enduring has also committed to the following design features and BMPs to lessen impacts to resources. Where applicable, additional details related to the design features may be found in the APDs on file at the BLM FFO.

Air Resources

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use (magnesium chloride, organic-based compounds, and/or polymer compounds could also be used on dirt roads upon approval of the BLM).
- BMPs provided in The Gold Book would be implemented for proposed and existing roads (BLM and U.S. Forest Service 2007).
- Where applicable, compressor engines 300 horsepower or less used during well production must be rated by the manufacturer as emitting NO_x at 2 grams per horsepower hour or less to comply with the NMED, Air Quality Bureau's guidance.

Water Resources

- To prevent erosion, certain areas surrounding the proposed site would be recontoured during interim reclamation.
- Culverts and silt traps would be installed as appropriate, and locations would be determined during the BLM on-site and/or facility on-site visits.

Wildlife, Migratory Birds, and Special-Status Species

- Any wildlife encountered within the proposed project area would be avoided and allowed to move out of the proposed project area. No wildlife would be intentionally harmed or harassed.
- Wildlife hazards, such as storage tanks, associated with the proposed project would be fenced or covered, as necessary.
- Because the proposed project would disturb more than 4.0 acres of vegetation, migratory breeding bird nesting surveys would be required if construction activities are scheduled to occur during the migratory bird nesting season (May 15–July 31). If an active nest is encountered, it would be avoided (avoidance buffer to be determined by BLM FFO) and left undisturbed until the nest has failed, or nestlings have fledged. If present, an inactive nest could be cleared by a BLM FFO–approved wildlife biologist.
- Enduring would notify the BLM and U.S. Fish and Wildlife Service (USFWS) upon discovery of a dead or injured migratory bird, bald eagle (*Haliaeetus leucocephalus*), or golden eagle (*Aquila chrysaetos*) within or adjacent to the proposed project area. If the BLM becomes aware of such mortality or injury, the BLM will inform Enduring. If Enduring fails to notify the USFWS of the mortality or injury, the BLM would notify the USFWS. The BLM and the

USFWS would then attempt to determine the cause of mortality and identify appropriate mitigation measures to avoid future occurrences.

- Should other special-status species be observed within the proposed project area prior to or during the proposed project, construction would cease, and the BLM FFO would be immediately contacted. The BLM FFO would then evaluate the resource. Should a discovery be evaluated as significant (protected under the Endangered Species Act, etc.), it would be protected in place until mitigation could be developed and implemented according to guidelines set by the BLM FFO.
- Per BLM FFO Instruction Memorandum No. NM-200-2008-001 (BLM 2008b), an updated pre-construction biological survey could be required for the proposed project if vegetation removal would occur more than 1 year following the previous biological survey.

Soil, Upland Vegetation, and Noxious Weeds and Invasive Species

- No construction or routine maintenance activities would be performed during periods when the soil is too wet to adequately support construction equipment. If equipment creates ruts deeper than six inches, the soil would be deemed too wet for construction or maintenance.
- Reclamation would follow the guidance provided in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013). These procedures are referenced in Enduring's Surface Reclamation Plan.
- During the pre-disturbance on-site meeting with BLM, a suitable vegetation community from the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013) would be selected by the BLM. Plant species would be chosen from the BLM FFO's seed pick list for the selected community.
- A noxious weed inventory utilizing the New Mexico Noxious Weed List (New Mexico Department of Agriculture 2020) and the U.S. Department of Agriculture's (USDA's) Federal Noxious Weed List (USDA 2010) will be conducted during the pre-disturbance on-site meeting.
- Identified noxious weeds would be treated prior to new surface disturbance, as determined by the BLM FFO Noxious Weed Specialist (505-564-7600). A pesticide use proposal (PUP) would be submitted to and approved by the BLM FFO Noxious Weed Specialist prior to application of any pesticide.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.
- See the above water resources section for erosion-control features.

Cultural Resources

- All cultural resources stipulations would be followed as indicated in the BLM Cultural Resource Records of Review and the conditions of approvals. These stipulations may include, but are not limited to, temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, project area reduction and/or specific construction avoidance zones, and employee education.
- All employees, contractors, and subcontractors would be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment; that it is illegal to collect, damage, or disturb cultural resources; and that such activities on federal and tribal lands are punishable by criminal and or administrative penalties under the provisions of the Archaeological Resources Protection Act (16 USC 470aa–mm).
- In the event of a cultural resource's discovery during construction, construction activities would immediately cease in the immediate vicinity of the discovery, and Enduring would immediately notify the archaeological monitor, if present, or the BLM. The BLM would then ensure the site is evaluated. Should a discovery be evaluated as significant (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act of 1990, Archaeological Resources Protection Act), it would be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.
- Known sites and sites identified during the pre-construction cultural resources inventory surveys would be avoided.

Paleontological Resources

If any paleontological resources are discovered during activities associated with the proposed project:

- Enduring would immediately inform the BLM Authorized Officer.
- Activities in the vicinity of the discovery would be immediately suspended until written authorization to proceed is issued by the BLM Authorized Officer.
- The discovery would be protected from damage or looting.
- The Authorized Officer would ensure evaluation of the discovery as soon as possible.
- Appropriate measures to mitigate adverse effects to significant paleontological resources would be determined by the Authorized Officer after consulting with the operator.

Visual Resources and Dark Skies

- Equipment not subject to safety requirements would be painted a BLM Standard Environmental Color (Juniper Green) to minimize contrast with the surrounding landscape.
- If applicable, during reclamation, stockpiled rocks, if available, would be placed within the reclaimed area for erosion control and/or to discourage off-highway vehicle traffic (if requested by the BLM FFO). Rocks would be placed in a manner that visually blends with the adjacent, undisturbed landscape.
- Lights would be limited to those needed for safety during construction and operations.
- Lighting would be downward-facing or shielded where possible.

Livestock Grazing and Rangeland Health Standards

- Livestock grazing operators in the vicinity of the proposed project area would be contacted prior to construction.
- Safety meetings would be conducted prior to construction to increase awareness of livestock, such as the presence of open range and driving speed to avoid livestock collisions.
- To the extent feasible, construction activities would not be conducted when livestock are present within the proposed project area.
- If livestock are present during construction, barriers would be placed to ensure that livestock do not come in contact with potential hazards. Barrier examples could include fencing of exposed ditch-type holes, covering of holes when personnel are not present on-site, and containment of contaminants, fluid leaks, or hazards that could cause injury to livestock.

Public Health and Safety

- The hauling of equipment and materials on public roads would comply with New Mexico Department of Transportation regulations. Any accidents involving persons or property would be reported to the BLM FFO. Enduring would notify the public of potential hazards by posting signage, having flaggers, or using lighted signs, as necessary.
- Worker safety incidents would be reported to the BLM FFO as required under NTL–3A (BLM 2019b). Enduring would adhere to company safety policies and Occupational Safety and Health Administration regulations.
- Vehicles would be restricted to proposed and existing disturbance areas.
- The proposed site would have an informational sign, delineating operator, legal description, etc.
- Oil and gas industry traffic is expected to adhere to all posted speed limits and signs. Drivers would be appropriately licensed and inspected.

Lay-Flat Pipeline BMPs

- Time construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g., buried pipelines, culverts) to avoid high-flow conditions. When construction disturbs a flowing stream, utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.
- Design and construct surface pipelines at drainage crossings at an adequate height above possible flood levels. Bore/bury pipeline crossings below the surface deep enough to remain undisturbed by scour and fill processes typically associated with peak flows. Complete a hydraulic analysis during the pipeline design phase to avoid repeated maintenance of such a crossing and eliminate costly repairs and potential environmental degradation associated with pipeline breaks at stream crossings. Utilize horizontal directional boring techniques below perennial water bodies and/or wetland complexes when environmental circumstances allow.
- X-ray pipeline welds within 100 feet of a perennial stream to prevent leakage into the stream. Where pipelines cross streams that support Federal or State-listed threatened or endangered species or BLM-listed sensitive species, utilize additional safeguards (such as double-walled pipe, and remotely actuated block or check valves) on both sides of the stream.

- Avoid water courses when locating pipelines and flowlines; utilize road corridors wherever possible to minimize surface disturbance and provide better leak detection and access for installation and repair activities.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an un-reclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut and-fill slopes or along linear features.

Weeds

Farmington Field Office Standard Noxious/Invasive Weeds Design Features and Best Management Practices

Noxious/Invasive Weeds: Enduring will inventory the proposed site for the presence of noxious and invasive weeds. Noxious weeds are those listed on the New Mexico Noxious Weed List and USDA's Federal Noxious Weed List. The New Mexico Noxious Weed List or USDA's Noxious Weed List can be updated at any time and should be regularly checked for any changes. Invasive species may or may not be listed as noxious weeds but have been identified to likely cause economic or environmental harm or harm to human health. The following noxious weeds have been identified as occurring on land within the boundaries of the FFO. Numerous invasive species occur in the BLM FFO area, such as Russian thistle (*Salsola* spp.) and field bindweed (*Convolvulus arvensis*).

African rue (*Peganum harmala*)	Leafy spurge (*Euphorbia esula*)
Bull thistle (*Cirsium vulgare*)	Musk thistle (*Carduus nutans*)
Camelthorn (*Alhagi pseudalhagi*)	Perennial pepperweed (*Lepidium latifolium*)
Canada thistle (*Cirsium arvense*)	Russian knapweed (*Centaurea repens*)
Dalmation toadflax (*Linaria genistifolia*)	Saltcedar (*Tamarix* spp.)
Diffuse knapweed (*Centaurea diffusa*)	Scotch thistle (*Onopordum acanthium)*
Halogeton (*Halogeton glomeratus*)	Spotted knapweed (*Centaurea maculosa*)
Hoary cress (*Cardaria draba*)	Yellow toadflax (*Linaria vulgaris*)

a. Any identified weeds will be treated prior to new surface disturbance if determined by the FFO Noxious Weed Specialist. If a Weed Management Plan is not on file, a Weed Management Plan will be created. A PUP will be submitted to and approved by the FFO Noxious Weed Specialist prior to application of pesticide. The FFO Noxious Weed Specialist (505-564-7600) can provide assistance in the development of the PUP.

b. Vehicles and equipment should be inspected and cleaned prior to coming onto the site. This is especially important for vehicles from out of state or if coming from a weed-infested site.

c. Fill dirt or gravel may be needed for excavation, road construction/repair, or as a surfacing material. If fill dirt or gravel will be required, the source shall be noxious weed free and approved by the FFO Noxious Weed Specialist.

d. The site shall be monitored for the life of the project for the presence of noxious weeds (includes maintenance and construction activities). If weeds are found, the FFO Noxious Weed Specialist shall be notified at (505) 564-7600 and provided with a Weed Management Plan and, if necessary, a PUP. The FFO Noxious Weed Specialist can provide assistance developing the Weed Management Plan and/or the PUP.

e. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. Enduring's weed-control contractor would contact the BLM FFO prior to using these chemicals.

Noxious/invasive weed treatments must be reported to the FFO Noxious Weed Specialist. A pesticide use report (PUR) is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate and/or control noxious or invasive species. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Specialist.

Bare ground vegetation trim-out:

Enduring Resources, LLC

BARE GROUND VEGETATION TRIM-OUT DESIGN

ATTACHED TO

SURFACE USE PLAN OF OPERATIONS

Facility/ Structure	Required Trim-Out Buffer Distance	Pesticide Use for Vegetation Control	Pesticide Use Plan On file with BLM
Well Head	10’	Yes	Yes
Tanks/Containment	10’	Yes	Yes
Pumps	10’	Yes	Yes
Other Equipment	10’	Yes	Yes

a. Pesticide use for trim-out will require a PUP submitted for approval by the FFO Noxious Weed Specialist. A PUP is required prior to any treatment. Only pesticides authorized for use on BLM land would be used and applied by a licensed pesticide applicator. The use of pesticides would comply with federal and state laws and used only in accordance with their registered use and limitations. Enduring’s weed-control contractor would contact the BLM FFO Noxious Weed Specialist prior to using these chemicals and provide PURs post treatment.

A PUR is required to report any mechanical, chemical, biological, or cultural treatments used to eradicate, or control vegetation on site. Reporting will be required quarterly and annually or per request from the FFO Noxious Weed Specialist.

Approval Date: 06/27/2023

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Appendix I: Preliminary Draft Emissions Summary Table

Approval Date: 06/27/2023

Company Name: Enduring Resources IV, LLC
Field Name: San Juan Basin
Facility Name: Greater Lybrook Unit 772 Expansion (GLU 053)

Potential to Emit Calculations[1]

		NO_x		CO		VOC		SO_x		$PM_{2.5}$		PM_{10}		TSP		Total HAPs	
Emission Unit	Description	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
ENG 1 - 3 GEN 1 - 4	(3) Compressor Engines[2] (4) Generator Engines	8.31	36.39	8.78	38.48	5.5	24.08	0.0	0.04	0.23	1	0.23	1	0.23	1	1.85	8.1
TK 1 - 7	(7) 500 bbl Oil Storage Tanks[3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PWTK 1	(1) 500 bbl Produced Water Tanks[3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HT 1 - 8	(8) Process Heaters	1.14	5.0	0.96	4.19	0.06	0.27	0.0	0.0	0.08	0.36	0.08	0.36	0.08	0.36	0.0	0.0
GB 1	(1) 750 bbl Gunbarrel Separator Tank	Not Present at Site															
OIL LOADOUT 1	(1) Oil Loadout	0.0	0.0	0.0	0.0	14.99	5.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PW LOADOUT 1	(1) Produced Water Loadout	0.0	0.0	0.0	0.0	0.15	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ECD 1 - 2	(2) Enclosed Combustion Device	0.24	1.05	0.54	2.37	1.12	4.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROAD 1	(1) Unpaved Haul Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.05	0.43	0.46	1.7	1.82	0.0	0.0
FUG 1	(1) Fugitive Emissions	0.0	0.0	0.0	0.0	5.35	23.43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14	0.64
SSM	(1) Startup, Shutdown & Malfunction	0.0	0.0	0.0	0.0	45.86	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.09	0.23
Total	Facility Wide Total Emissions	9.7	42.4	10.3	45.0	73.0	67.9	0.0	0.0	0.4	1.4	0.7	1.8	2.0	3.2	3.1	9.0

[1]Emissions determined using NMED Air Emission Calculation Tool (AECT)

[2]Composite engine emissions represent worst case scenario emissions

[3]All storage tanks are post-flash

Approval Date: 06/27/2023

Company Name: Enduring Resources IV, LLC
Field Name: San Juan Basin
Facility Name: Greater Lybrook Unit 772 Expansion (GLU 053)

Potential to Emit Calculations[1]

		GHG[4]			
		CO_2	CH_4	N_2O	CO_2e
Emission Unit	Description	mtpy	mtpy	mtpy	mtpy
ENG 1 - 3, GEN 1 - 4	(3) Compressor Engines[2] (4) Generator Engines	3,035.89	0.06	0.01	3,039.02
TK 1 - 7	(7) 500 bbl Oil Storage Tanks[3]	0.00	0.00	0.00	0.00
PWTK 1	(1) 500 bbl Produced Water Tank[3]	0.00	0.00	0.00	0.00
HT 1 - 8	(8) Process Heaters	3,155.89	0.06	0.01	3,159.15
GB 1	(1) 750 bbl Gunbarrel Separator Tank	Not present at site			
OIL LOADOUT 1	(1) Oil Loadout	0.00	0.00	0.00	0.03
PW LOADOUT 1	(1) Produced Water Loadout	0.02	0.10	0.00	2.54
ECD 1 - 2	(2) Enclosed Combustion Device[5]	1,905.37	0.74	0.00	1,924.42
ROAD 1	(1) Unpaved Haul Roads	0.00	0.00	0.00	0.00
FUG 1	(1) Fugitive Emissions	0.13	3.98	0.00	99.51
SSM	(1) Startup, Shutdown & Malfunction	0.18	5.70	0.00	142.67
Total	Facility Wide Total Emissions	8,097.48	10.64	0.01	8,367.35

[1]Emissions determined using NMED Air Emission Calculation Tool (AECT)
[2]Composite engine emissions represent worst case scenario emissions
[3]All storage tanks are post-flash
[4]All GHG emissions are in metric tons per year
[5]In EPA GHG reporting, these emissions would be attributed to the sources the ECDs control

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Appendix J: Phases of Oil and Gas Development

Construction Activities

Clearing of the proposed well pad and access road would be limited to the smallest area possible to provide safe and efficient work areas for all phases of construction. First, all new construction areas need to be cleared of all vegetation. All clearing activities are typically 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, at a minimum, the pad. Other features, as needed for development, 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. If a reserve pit is authorized, it would be lined using an impermeable liner or other lining mechanism (i.e., bentonite or clay) to prevent fluids from leeching 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 surfaces are typically dressed with a layer of crushed rock or soil cemented. Construction materials come from a variety of sources. Areas not needed for long-term development (i.e., portions of the pipeline or road ROW) are reclaimed by recontouring the surface and establishing vegetation.

If a pipeline is needed, the ROW would be cleared of all vegetation. The pipeline would be laid out within the cleared section. A backhoe, or similar piece of equipment, would dig a trench at least 36 inches below the surface. After the trench is dug, the pipes would be assembled by welding pieces of pipe together and bending them slightly, if necessary, to fit the contour of the pipeline's path. Once inspected, the pipe can be lowered into the trench and covered with stockpiled subsoil that was originally removed from the hole. Each pipeline undergoes hydrostatic testing prior to natural gas being pumped through the pipeline. This ensures the pipeline is strong enough and absent of any leaks.

Drilling Operations

When the pad is complete, the drilling rig and associated equipment would be moved on-site and erected. A conventional rotary drill rig with capability matched to the depth requirements of the proposed well(s) would be used. The well could be drilled as a horizontal well to target the desired formation. The depth of the well is entirely dependent on the target formation depth.

When a conventional reserve pit system is proposed, 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 mud emerges from the hole, it enters into the reserve pit, where it would remain until all fluids are evaporated and the solids can be buried.

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

In either situation the mud is maintained at a specific weight and viscosity to cool the bit, seal off any porous zones (thereby protecting aquifers or 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 and is entirely dependent on the site-specific conditions.

Completion Operations

Once a well has been drilled, completion operations would begin once crews and equipment are available. 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.

Hydraulic Fracturing

Hydraulic fracturing is one technological key to economic recovery of oil and gas that might have been left by conventional oil and gas drilling and pumping technology. It is a formation stimulation practice used to create additional permeability in a producing formation, thus allowing gas to flow more readily toward 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 2009). The process is not new and has been a method for additional oil and gas recovery since the early 1900s; however, with the advancement of technology it is more commonly used.

Hydraulic fracturing is a process that 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 development, fracture fluids are primarily water-based fluids mixed with additives that help the water to carry proppants into the fractures, which may be made up of sand, walnut hulls, or other small particles of materials. The proppant is 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 the opened fracture in the formation.

Hydraulic fracturing of horizontal shale gas wells is 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 uphole as each stage of the treatment is completed until the entire lateral well has been stimulated.

This process 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 (see Table J.1 below).

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.

Chemicals serve many functions in hydraulic fracturing, from limiting the growth of bacteria to preventing corrosion of the well casing. Chemicals are needed to ensure the hydraulic fracturing job is effective and efficient. The fracturing fluids used for shale stimulations consist primarily of water but also include a variety of additives. The number of chemical additives used in a typical fracture treatment

varies depending on the conditions of the specific well being fractured. A typical fracture treatment will use 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. The predominant fluids currently being use for fracture treatments in the shale gas plays are water-based fracturing fluids mixed with friction-reducing additives, also known as slickwater (Groundwater Protection Council 2009).

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 2009).

Typically, the fracturing fluids consist of about 99% water and sand and about 1% chemical additives. The chemical additives are essential to the process of releasing gas trapped in shale rock and other deep underground formations.

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.

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, casing, 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.

To ensure that hydraulic fracturing is conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance on federal public land. Operators must submit Applications for Permit to Drill (APDs) to the agency. Prior to approving an APD, a BLM Field Office geologist identifies all potential subsurface formations that would be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures.

Once the geologic analysis is completed, the BLM reviews the company’s proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist and all known or anticipated zones with potential risks.

During drilling, the BLM is on location during the casing and cementing of the groundwater protective surface casing and 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 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” fracture 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.

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 pump jack 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 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.

Anticipated use or produced hazardous materials during the development may come from drilling materials; cementing and plugging materials; hydraulic fracturing materials; production products (natural gas, condensates, produced water); fuels and lubricants; pipeline materials; combustion emissions; and miscellaneous materials. Table J.1 includes some of the common wastes (hazardous and nonhazardous) that are produced during oil and gas development.

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

Phase	Waste	
Construction	Domestic wastes (e.g., food scraps, paper, etc.)	
	Excess construction materials	Woody debris
	Used lubricating oils	Paints
	Solvents	Sewage
	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 [PAHs], 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	Rigwash
	Production testing wastes	Excess drilling chemicals
	Excess construction materials	Processed water
	Scrap metal	Contaminated soil
	Sewage	Domestic wastes
Hydraulic Fracturing	See below	

Phase	Waste
Production	Power unit and transport maintenance wastes (i.e., batteries, used filters, lubricants, filters, tires, hoses, coolants, antifreeze, paints, solvents, used parts)
	Discharged produced water
	Production chemicals
	Workover wastes (e.g., brines)
Abandonment / Reclamation	Construction materials
	Decommissioned equipment
	Contaminated soil

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Appendix K: GLU 053H Project Environmental Assessment (DOI-BLM-NM-F010-2023-0040-EA): Environmental Justice Analysis

Prepared by:

Hebin Lin, Ph.D.
Sun-Zone Socioeconomic Specialist
hlin@blm.gov

Regulations and Policies

The Executive Order 12898 (1994) entitled Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands."

For implementation of Executive Order 12898, the Council on Environmental Quality (CEQ), part of the Executive Office of the President, issued Environmental Justice Guidance under the National Environmental Policy Act (NEPA) (1997) which provides the following statements:

- "Each Federal agency should analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA."
- Minority populations are "individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic,"
- "Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis."
- "Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty."
- "The Executive Order recognizes the importance of research, data collection, and analysis, particularly with respect to multiple and cumulative exposures to environmental hazards for low-income populations, minority populations, and Indian tribes. Thus, data on these exposure issues should be incorporated into NEPA analyses as appropriate."

In September 2022, the BLM published an Instruction Memorandum on Environmental Justice Implementation (https://www.blm.gov/policy/im2022-059) which reflects the following five criteria for determining whether a community is an environmental justice (EJ) community (or "underserved community").

- EJ community criterion 1: minority population higher than 50%
- EJ community criterion 2: minority population higher than 110% of reference area
- EJ community criterion 3: low-income population higher than 50%
- EJ community criterion 4: low-income population higher than 100% of reference area
- EJ community criterion 5: tribal communities

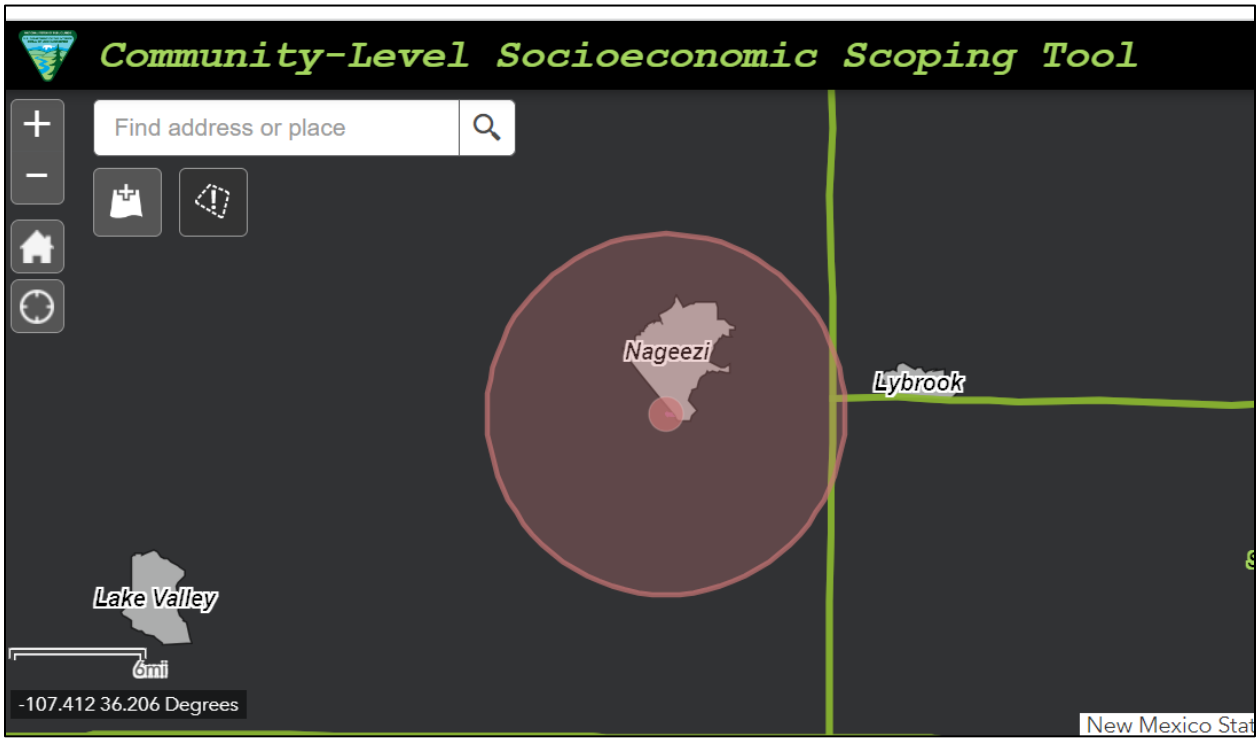
If at least one answer to the above five criteria is yea, then overall community is an EJ community.

Geographical Context

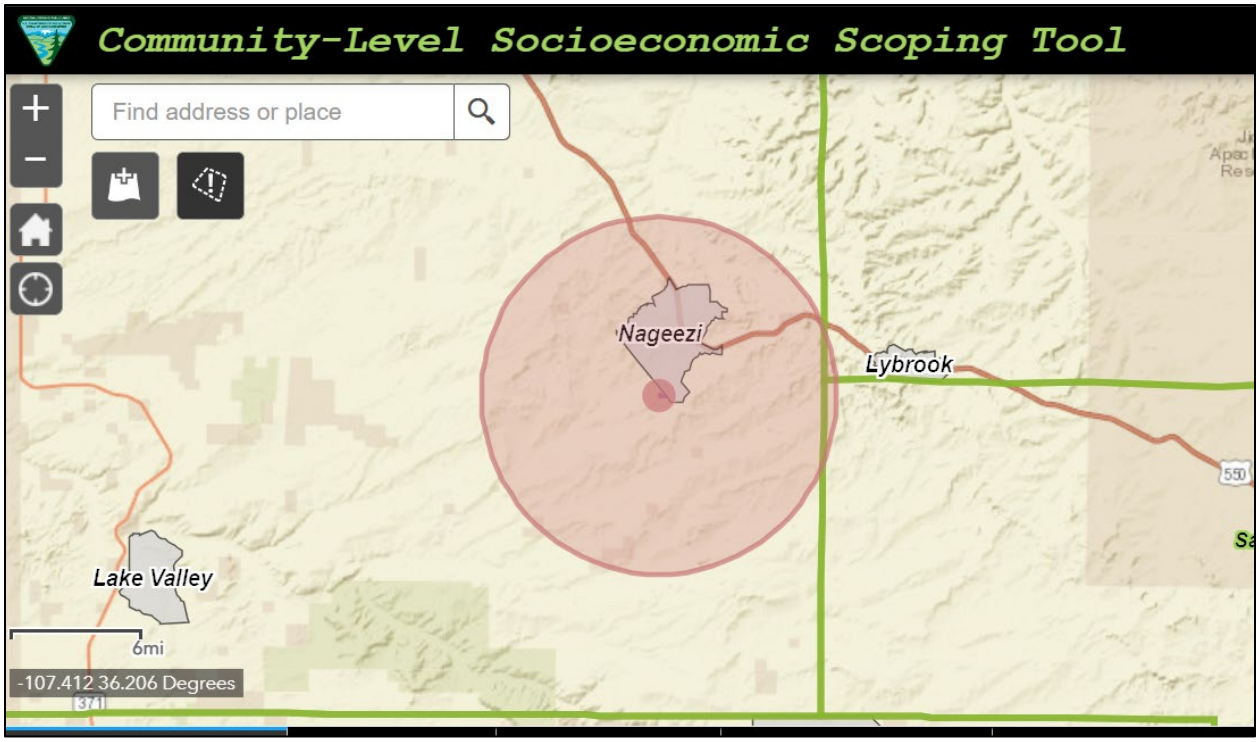
The following one community in the State of New Mexico surrounding the Greater Lybrook 772 well pad, also known as the GLU 053H are identified.

1. Nageezi CDP (census designated place)

   The community is located within San Juan County, and within a radius of 8 miles from the Well Pad. The indexing of the community corresponds to a general north to south direction on the Map. This indexing is used throughout this analysis especially in the "5. Findings, Insights and Conclusions" section.



Map 1a. Analysis Area: Communities *(Data source: based on USCB 2023c)*



Map 1b. Analysis Area: Communities *(Data source: based on USCB 2023c)*

Data Sources

The data source for this analysis is the American Community Survey (ACS) 5-Year Estimates published every year by the U.S. Census Bureau with the primary rationale that "the American Community Survey provides a wide range of important statistics about people and housing for every community in the nation. This survey is the only source of local estimates for most of the more than 40 topics it covers for communities across the nation." (USCB 2023b).

The statistical units for this analysis are places, including cities, towns, villages, boroughs, and census designated places (CDPs) when data are available at the level of places; or otherwise census tracts which are small and relatively permanent statistical subdivisions of a county or statistically equivalent entity that can be updated by local participants prior to each decennial. Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people (USCB 2023d).

Data for Communities

The datasets in this analysis are from both the latest 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates (USCB 2023a) are compiled for the following key indicators.

A. Population.

B. Median household income

C. Low-income population
D. Ethnicity composition
E. Unemployment rate
F. Population composition by age
G. Population with less than high school education (that is, percent of individuals aged 25 and over with less than high school degree
H. Limited English speaking (that is, the percentage of households in which no member 14 years old and over speaks only English or speaks a non-English language and speaks English "very well")
I. Employment by sector

The results of the datasets are presented in Table 1 through Table 5 and Figure 1 through Figure 2

- Table 1 Reference Area: Environmental Justice Considerations
- Table 2 Analysis Area: Environmental Justice Considerations
- Table 3 Analysis Area: Primary Socioeconomic Indicators
- Table 4 Analysis Area: Additional Socioeconomic Indicators
- Table 5 Analysis Area: Employment by Sector
- Figure 1 Analysis Area: Primary Socioeconomic Indicators
- Figure 2 Analysis Area: Additional Socioeconomic Indicators

Table 1. Reference Area: Environmental Justice Considerations

Reference area	San Juan County	New Mexico	United States
Total population in 2021	122,912	2,109,366	329,725,481
Median household incomes ($) in 2021	47,485	54,020	69,021
Low-income population in 2021	48.4%	39.1%	29.2%
Minority population in 2021	63.4%	64.0%	40.6%

Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates.

Table 2. Analysis Area: Environmental Justice Considerations

Analysis area	Nageezi CDP
Reference area	**San Juan County**
Total population in 2021	333
Median household incomes ($) in 2021	n/a
Low-income population in 2021	67.3%
Minority population in 2021	98.5%
EJ community criterion 1: minority population higher than 50%	YES
EJ community criterion 2: minority population higher than 110% of reference area	YES
EJ community criterion 3: low-income population higher than 50%	YES
EJ community criterion 4: low-income population higher than 100% of reference area	YES
EJ community criterion 5: tribal community	YES
EJ community (overall)	YES

Note: "n/a" indicates that the data point is not available.
Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates.

Table 3. Analysis Area: Primary Socioeconomic Indicators

Analysis area	Nageezi CDP	San Juan County	New Mexico	United States
Total population in 2016	259	122,537	2,082,669	318,558,162
Hispanic or Latino in 2016	1.2%	19.8%	47.8%	17.3%
Not Hispanic or Latino (white alone) population in 2016	1.2%	40.8%	38.7%	62.0%
Not Hispanic or Latino (other race) population in 2016	97.7%	39.5%	13.5%	20.7%
Median household incomes ($) in 2016	15,464	55,019	51,681	62,598
Low-income population in 2016	98.1%	41.7%	42.8%	33.6%
Minority population in 2016	98.8%	59.2%	61.3%	38.0%
Total population in 2021	333	122,912	2,109,366	329,725,481
Hispanic or Latino population in 2021	3.9%	21.4%	49.6%	18.4%
Not Hispanic or Latino (white alone) population in 2021	1.5%	36.6%	36.0%	59.4%
Not Hispanic or Latino (other race) population in 2021	94.6%	42.0%	14.4%	22.1%
Median household incomes ($) in 2021	n/a	47,485	54,020	69,021
Low-income population in 2021	67.3%	48.4%	39.1%	29.2%
Minority population in 2021	98.5%	63.4%	64.0%	40.6%

Table 4. Analysis Area: Additional Socioeconomic Indicators

Analysis area	Nageezi CDP	San Juan County	New Mexico	United States
Unemployment rates in 2016	19.4%	9.9%	8.5%	7.4%
Population under age 5 in 2016	7.7%	7.3%	6.4%	6.2%
Population age 5 to 64 in 2016	76.1%	79.5%	78.3%	79.3%
Population over age 64 in 2016	16.2%	13.2%	15.3%	14.5%
Population with less than high school education in 2016	42.7%	16.5%	15.4%	13.0%
Limited English speaking households in 2016	18.9%	3.3%	5.1%	4.5%
Unemployment rates in 2021	8.9%	8.2%	6.6%	5.5%
Population under age 5 in 2021	4.8%	6.3%	5.7%	5.9%
Population age 5 to 64 in 2021	82.3%	78.7%	76.8%	78.1%
Population over 64 in 2021	12.9%	14.9%	17.5%	16.0%
Population with less than high school education in 2021	34.0%	14.1%	13.2%	11.1%
Limited English speaking households in 2021	27.7%	7.0%	5.3%	4.2%

Note: "n/a" indicates that the data point is not available.
Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates.

Table 5. Analysis Area: Employment by Sector in 2021

Analysis area	Nageezi CDP	San Juan County	New Mexico	United States
ADM (2016)	6%	5%	8%	5%
ART (2016)	0%	10%	11%	10%
CON (2016)	0%	8%	7%	6%
EDU (2016)	24%	25%	25%	23%
FIN (2016)	0%	4%	5%	7%
INFO (2016)	0%	1%	2%	2%
MANU (2016)	50%	4%	5%	10%
NAT (2016)	10%	11%	4%	2%
OTHER (2016)	6%	6%	5%	5%
SCI (2016)	0%	6%	11%	11%
TRADE (2016)	0%	15%	14%	14%
TRANS (2016)	4%	7%	4%	5%
ADM (2021)	0%	6%	8%	5%
ART (2021)	3%	11%	10%	9%
CON (2021)	0%	7%	7%	7%
EDU (2021)	13%	26%	26%	23%
FIN (2021)	13%	3%	5%	7%
INFO (2021)	0%	1%	1%	2%
MANU (2021)	3%	3%	4%	10%
NAT (2021)	0%	11%	4%	2%
OTHER (2021)	0%	5%	5%	5%
SCI (2021)	67%	6%	12%	12%
TRADE (2021)	0%	14%	13%	14%
TRANS (2021)	3%	7%	5%	6%

Notes: ADM – Public administration and government; ART – Arts, entertainment, recreation, accommodation and food services; CON – Construction; EDU – Educational services, health care and social assistance; FIN – Finance, insurance, real estate, rental and leasing; INFO – Information; MAN – Manufacturing; NAT – Natural resources, agriculture and mining; OTHER – Other services, except public administration; SCI – Professional, scientific, technical and managerial services; TRADE – Wholesale trade and retail trade; TRANS – Transportation and warehousing and utilities; highlights in orange color, blue color and green color represent the top 1 through top 3 employment by population, respectively; "n/a" indicates that the data point is not available.
Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates.

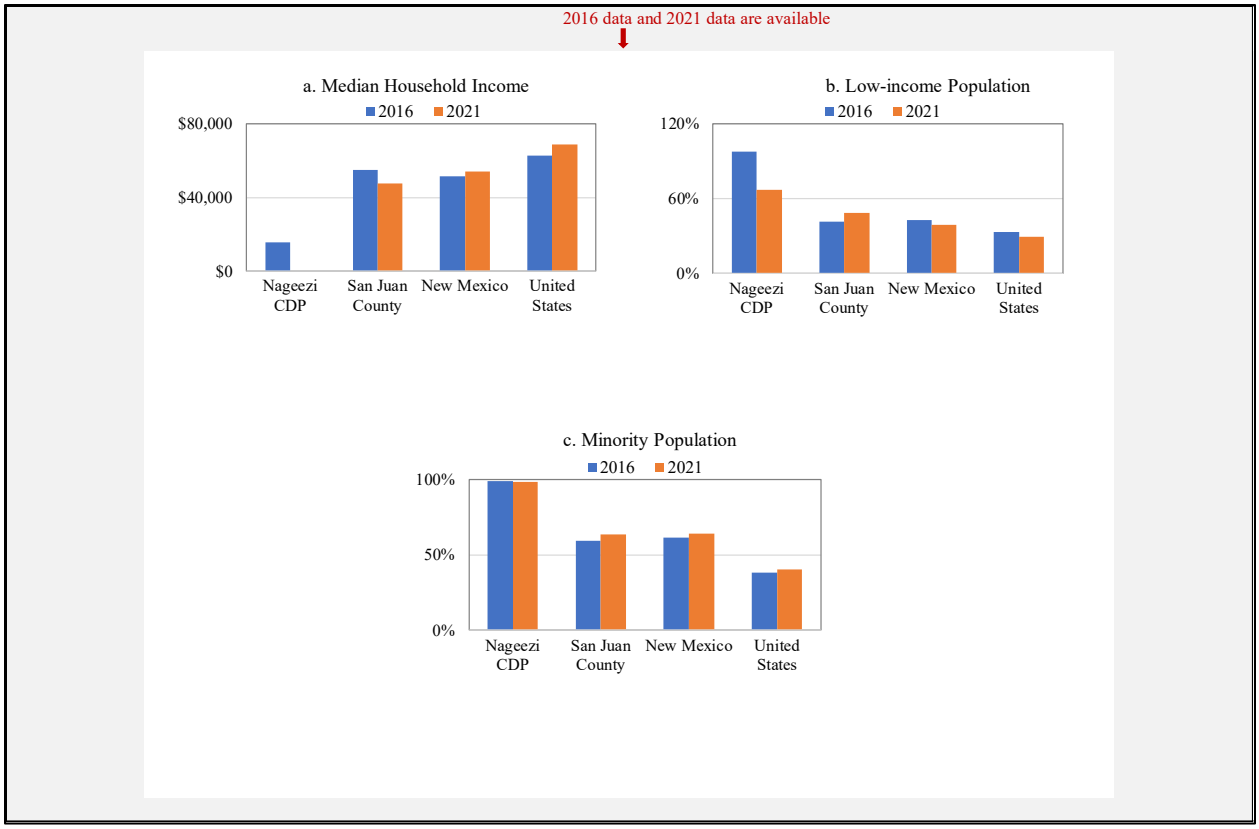


Figure 1 Analysis Area: Primary Socioeconomic Indicators

Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates; U.S. Bureau of Labor Statistics, 2023, Consumer Price Index Retroactive Series (R-CPI-U-RS), U.S. City Average, All Items.

Approval Date: 06/27/2023

Figure 2 Analysis Area: Additional Socioeconomic Indicators

Data source: compiled based on USCB, 2023a, 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates.

Findings, Insights, and Conclusions

The data compiled, analyzed and presented in Map 1, Table 1, Table 2, and Figure 1 indicate that, for the recent year 2021, one community within a radius of 8 miles from the Greater Lybrook 772 Well Pad should be considered as environmental justice communities of concern (Table 2).

- (1) Nageezi CDP based on EJ community criterion

EJ community criteria refer to the following.

- EJ community criterion 1: minority population higher than 50%
- EJ community criterion 2: minority population higher than 110% of reference area
- EJ community criterion 3: low-income population higher than 50%
- EJ community criterion 4: low-income population higher than 100% of reference area
- EJ community criterion 5: tribal communities

The data compiled, analyzed and presented in Map 1, Table 3, Table 4, Table 5, and Figure 2 indicate the following key socioeconomic characteristics of the analysis area in the year 2016 and the year 2021.

- In terms of unemployment rate, Nageezi CDP had a higher unemployment level in 2021 (more than 5% of the county level and the state level);
- In terms of senior population (that is population with age over 64), Nageezi had higher aged populations in 2021 (more than 200% of the county level and the state level);
- In terms of preliminary education level (that is less than high school education), Nageezi CDP had a remarkably higher rate in 2021 (more than 200% of the county level); and
- In terms of employed labor forces by sectors in 2021, the community overall had major employment in three sectors: (A) manufacturing, (B) educational services, health care and social assistance and (C) professional, scientific, technical and managerial services.

Based on the analyses conducted for the identified resource issues of this project, the geographical locations of the communities, the potential uses of the resources by the communities, and the combinations of socioeconomic characteristics of the communities:

- There are likely no disproportionately high and adverse human and environmental impacts on the EJ communities;
- The community in Nageezi CDP could be identified as having priority concerns that would benefit from programs that have the potential to reduce unemployment level; and
- The community in Nageezi CDP could be identified as having priority concerns that would benefit from programs that have the potential to improve education attainment level and enhance social support for senior population.

References

Council on Environmental Quality (CEQ). 1997. Environmental Justice: Guidance Under the National Environmental Policy Act. https://www.epa.gov/sites/default/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf.

Executive Order No. 12898. 1994. Federal Register Vol. 50, No. 32 (February 16, 1994). Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf.

U.S. Census Bureau (USCB). 2023a. 2017-2021 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates, https://data.census.gov/cedsci/table.

_____. 2023b. American Community Survey 2017-2021 5-Year Data Release, https://www.census.gov/newsroom/press-kits/2022/acs-5-year.html.

_____. 2023c. Cartographic Boundary Files, Year of 2021, Scale of 1: 500,000 https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary.html.

_____. 2023d. Glossary, https://www.census.gov/programs-surveys/geography/about/glossary.html. 2023

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Farmington District Office
6251 College Blvd, Suite A
Farmington, New Mexico 87402

In Reply Refer To:
3162.3-1(NMF0110)

Enduring Resources LLC
Greater Lybrook Unit 056H
Lease: NOG13121857 Unit: NMNM144419X
SH: NW¼SE¼ Section 23, T.23 N., R.9 W.
BH: SE¼SE¼ Section 25, T.23 N., R.9 W.
San Juan County, New Mexico

***Above Data Required on Well Sign**

GENERAL REQUIREMENTS FOR OIL AND GAS OPERATIONS ON FEDERAL AND INDIAN LEASES

The following special requirements apply and are effective when **checked**:

A. ☒ Note all surface/drilling conditions of approval attached.

B. ☒ The required wait on cement (WOC) time will be a minimum of 500 psi compressive strength at 60 degrees. Blowout preventor (BOP) nipple-up operations may then be initiated

C. ☐ Test the surface casing to a minimum of _____ psi for 30 minutes.

D. ☐ Test all casing strings below the surface casing to .22 psi/ft. of casing string length or 1500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield burst) for a minimum of 30 minutes.

E. ☒ Communitization Agreement covering the acreage dedicated to this well must be filed for approval with the Bureau of Land Management, New Mexico State Office, Reservoir Management Group, 301 Dinosaur Trail, Santa Fe, New Mexico 87508.
The effective date of the agreement must be **prior** to any sales.

Approval Date: 06/27/2023

F. ☐ The use of co-flex hose is authorized contingent upon the following:
1. From the BOP to the choke manifold: the co-flex hose must be hobbled on both ends and saddle to prevent whip.
2. From the choke manifold to the discharge tank: the co-flex hoses must be as straight as practical, hobbled on both ends and anchored to prevent whip.
3. The co-flex hose pressure rating must be at least commensurate with approved BOPE.

I. GENERAL

A. Full compliance with all applicable laws, regulations, and Onshore Orders, with the approved Permit to drill, and with the approved Surface Use and Operations Plan is required. Lessees and/or operators are fully accountable for the actions of their contractors and subcontractors. Failure to comply with these requirements and the filing of required reports will result in strict enforcement pursuant to 43 CFR 3163.1 or 3163.2.

B. Each well shall have a well sign in legible condition from spud date to final abandonment. The sign should show the operator's name, lease serial number, or unit name, well number, location of the well, and whether lease is Tribal or Allotted, (See 43 CFR 3162.6(b)).

C. A complete copy of the approved Application for Permit to Drill, along with any conditions of approval, shall be available to authorized personnel at the drill site whenever active drilling operations are under way.

E. As soon as practical, notice is required of all blowouts, fires and accidents involving life-threatening injuries or loss of life. (See NTL-3A).

F. Prior approval by the BLM-Authorized Office (Drilling and Production Section) is required for variance from the approved drilling program and before commencing plugging operations, plug back work casing repair work, corrective cementing operations, or suspending drilling operations indefinitely. Emergency approval may be obtained orally, but such approval is contingent upon filing of a notice of intent (on a Sundry Notice, Form 3160-5) within three business days (original and three copies of Federal leases and an original and four copies on Indian leases). **Any changes to the approved plan or any questions regarding drilling operations should be directed to BLM during regular business hours at 505-564-7600. Emergency program changes after hours should be directed to at Virgil Lucero at 505-793-1836.**

G. The Inspection and Enforcement Section (I&E), phone number (505-564-7750) is to be notified at least 24 hours in advance of BOP test, spudding, cementing, or plugging operations so that a BLM representative may witness the operations.

H. Unless drilling operations are commenced within two years, approval of the Application for Permit to Drill will expire. A written request for a two years extension may be granted if submitted prior to expiration.

I. From the time drilling operations are initiated and until drilling operations are completed, a member of the drilling crew or the tool pusher shall maintain rig surveillance at all time, unless the well is secured with blowout preventers or cement plugs.

J. If for any reason, drilling operations are suspended for more than 90 days, a written notice must be provided to this office outlining your plans for this well.

II. REPORTING REQUIREMENTS

A. For reporting purposes, all well Sundry notices, well completion and other well actions shall be referenced by the appropriate lease, communitization agreement and/or unit agreement numbers.

B. The following reports shall be filed with the BLM-Authorized Officer within 30 days after the work is completed.

1 .Original and three copies on Federal and an Original and five copies on Indian leases of Sundry Notice (Form 3150-5), giving complete information concerning.

a. Setting of each string of casing. Show size and depth of hole, grade and weight of casing, depth set, depth of any and all cementing tools that are used, amount (in cubic feet) and types of cement used, whether cement circulated to surface and all cement tops in the casing annulus, casing test method and results, and the date work was done. Show spud date on first report submitted.

b. Intervals tested, perforated (include; size, number and location of perforations), acidized, or fractured; and results obtained. Provide date work was done on well completion report and completion sundry notice.

c. Subsequent Report of Abandonment, show the manner in which the well was plugged, including depths where casing was cut and pulled, intervals (by depths) where cement plugs were replaced, and dates of the operations.

2. Well Completion Report (Form 3160-4) will be submitted with 30 days after well has been completed.

a. Initial Bottom Hole Pressure (BHP) for the producing formations. Show the BHP on the completion report. The pressure may be: 1) measured with a bottom hole bomb, or; 2) calculated based on shut in surface pressures (minimum seven day buildup) and fluid level shot.

3. Submit a cement evaluation log if cement is not circulated to surface.

III. DRILLER'S LOG

The following shall be entered in the daily driller's log: 1) Blowout preventer pressures tests, including test pressures and results. 2) Blowout preventer tests for proper functioning, 3) Blowout prevention drills conducted, 4) Casing run, including size, grade, weight, and depth set, 5) How pipe was cemented, including amount of cement, type, whether cement circulated to surface, location of cementing tools, etc., 6) Waiting on cement time for each casing string, 7) Casing pressure tests after cementing, including test pressure and results and 8) Estimated amounts of oil and gas recovered and/or produced during drill stem test.

IV. GAS FLARING

Gas produced from this well may not be vented or flared beyond an initial, authorized test period of * Days or 50 MMCF following its (completion)(recompletion), whichever first occurs, without the prior, written approval of the authorized officer. Should gas be vented or flared without approval beyond the test period authorized above, you may be directed to shut-in the well until the gas can be captured or approval to continue venting or flaring as uneconomic is granted. You shall be required to compensate the lessor for the portion of the gas vented or flared without approval which is determined to have been avoidably lost.

*30 days, unless a longer test period is specifically approved by the authorized officer. The 30-day period will commence upon the first gas to surface.

V. SAFETY

A. All rig heating stoves are to be of the explosion-proof type.

B. Rig safety lines are to be installed.

C. Hard hats and other Personal Protective Equipment (PPE) must be utilized.

VI. CHANGE OF PLANS OR ABANDONMENT

A. Any changes of plans required to mitigate unanticipated conditions encountered during drilling operations, will require approval as set forth in Section 1.F.

B. If the well is dry, it is to be plugged in accordance with 43 CFR 3162.3-4, approval of the proposed plugging program is required as set forth in Section 1.F. The report should show the total depth reached, the reason for plugging, and the proposed intervals, by depths, where cement plugs are to be placed, type of plugging mud, etc. A Subsequent Report of Abandonment is required as set forth in Section II.B.1c.

C. Unless a well has been properly cased and cemented, or properly plugged, the drilling rig must not be moved from the drill site without prior approval from the BLM-Authorized Officer.

VII. PHONE NUMBERS

A. For BOPE tests, cementing, and plugging operations the phone number is 505-564-7750 and must be called 24 hours in advance in order that a BLM representative may witness the operations.

B. Emergency program changes after hours contact:

Virgil Lucero (505) 793-1836
BLM 24 Hour Number (505) 564-7750

Approval Date: 06/27/2023

District I
1625 N. French Drive, Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
District II
811 S. First Street, Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720
District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
District IV
1220 S. St. Francis Drive, Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Drive
Santa Fe, NM 87505

Form C-102
Revised August 1, 2011

Submit one copy to
Appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	98157	LYBROOK MANCOS W

[4] Property Code	[5] Property Name	[5] Well Number
332891	GREATER LYBROOK UNIT	056H

[7] OGRID No.	[8] Operator Name	[9] Elevation
372286	ENDURING RESOURCES, LLC	6802'

[10] Surface Location

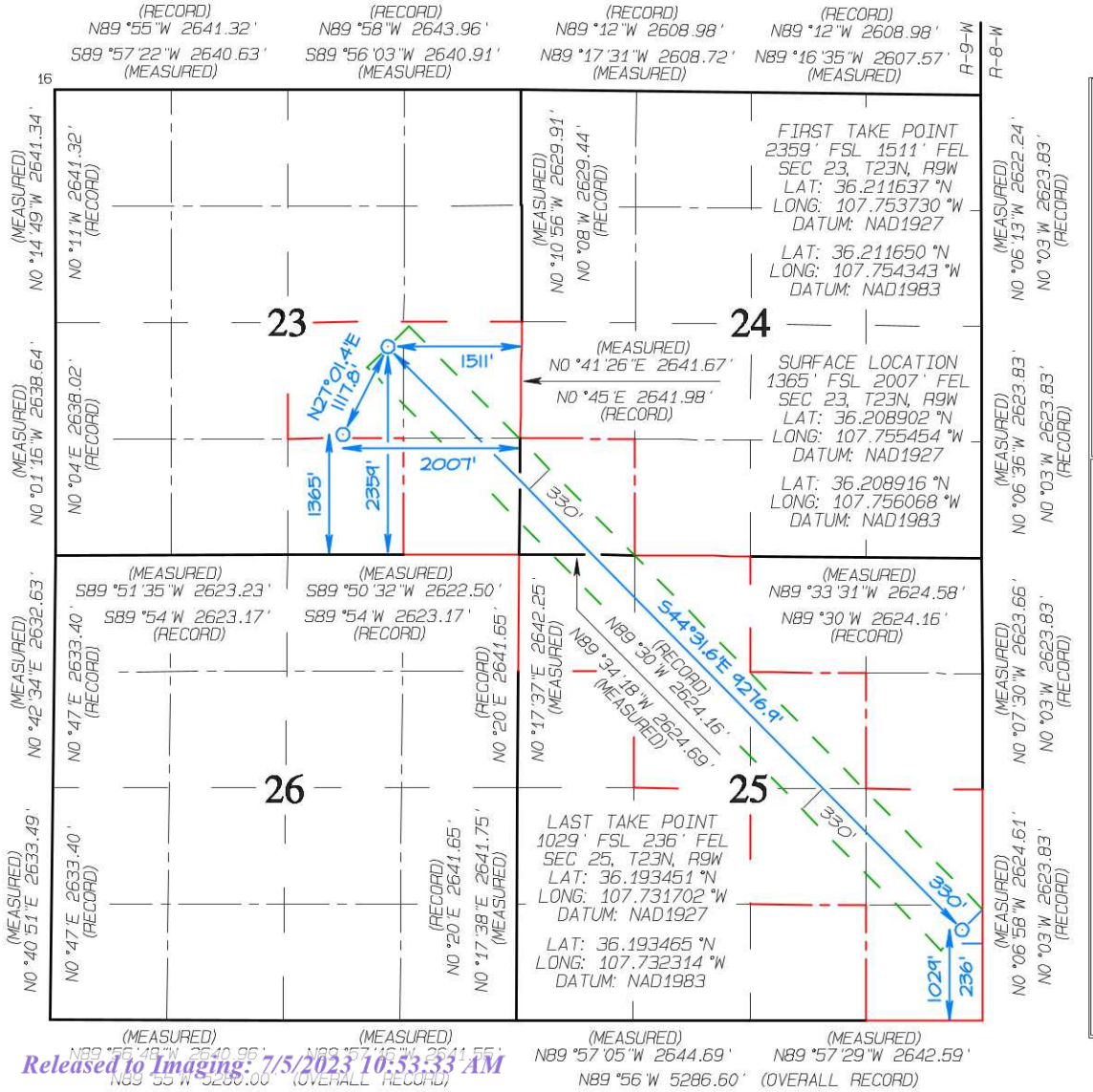
UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
J	23	23N	9W		1365	SOUTH	2007	EAST	SAN JUAN

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
P	25	23N	9W		1029	SOUTH	236	EAST	SAN JUAN

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
440.0 N/2 NW/4, SE/4 NW/4 SW/4 NE/4, N/2 SE/4 SE/4 SE/4 - Section 25 SW/4 SW/4 - Section 24 N/2 SE/4, SE/4 SE/4 - Section 23			R-22081

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom-hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Khem Suthiwan 6/2/2022
Signature Date

Khem Suthiwan
Printed Name

ksuthiwan@enduringresources.com
E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Date Revised: JUNE 2, 2022
Survey Date: SEPTEMBER 29, 2021

Signature and Seal of Professional Surveyor

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

JASON C. EDWARDS
Certificate Number 15269

District I
1625 N. French Drive, Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
District II
811 S. First Street, Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720
District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
District IV
1220 S. St. Francis Drive, Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Drive
Santa Fe, NM 87505

Form C-102
Revised August 1, 2011

Submit one copy to
Appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	98157	LYBROOK MANCOS W

[4] Property Code	[5] Property Name	[5] Well Number
332891	GREATER LYBROOK UNIT	056H

[7] OGRID No.	[8] Operator Name	[9] Elevation
372286	ENDURING RESOURCES, LLC	6802'

[10] Surface Location

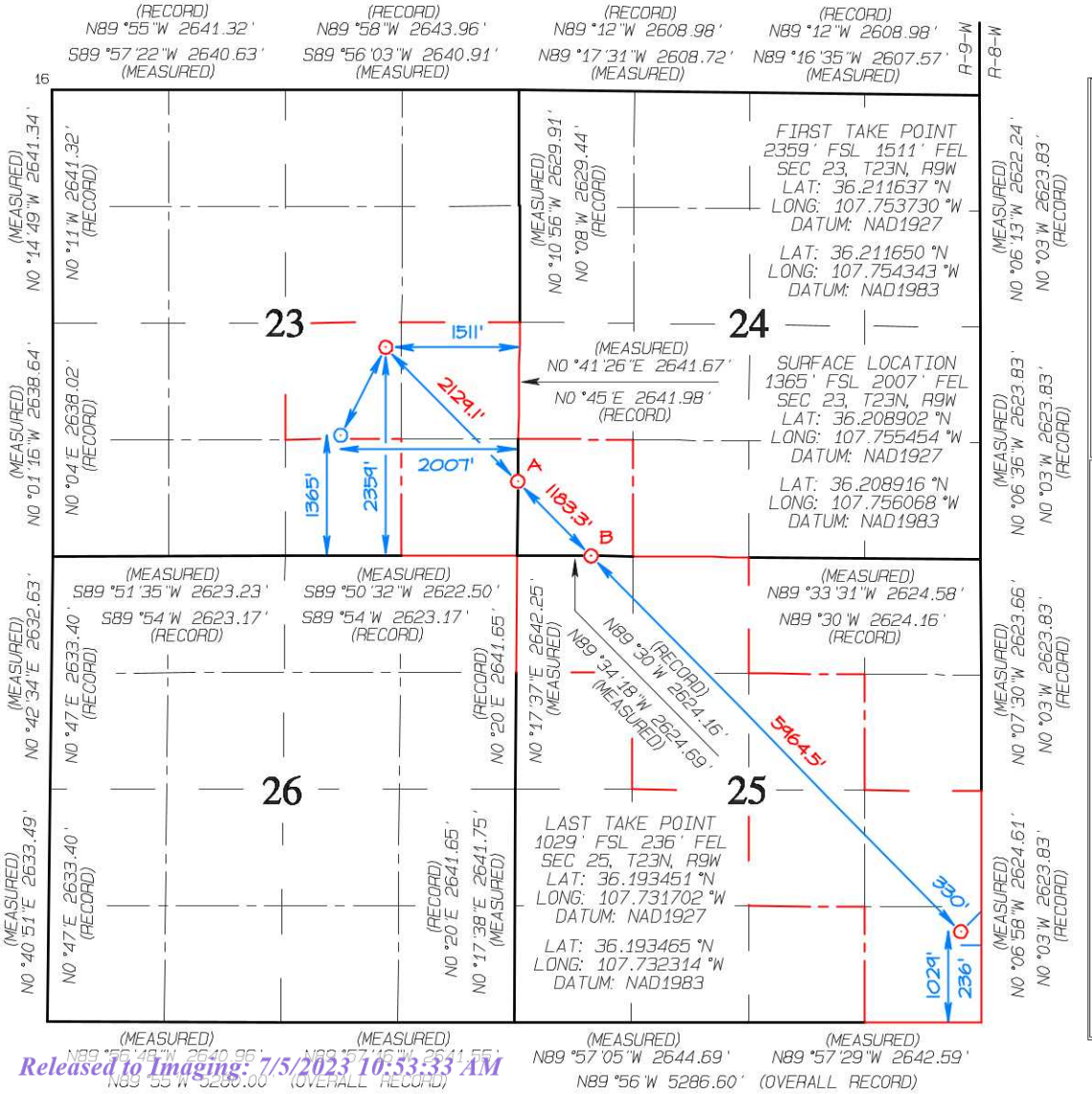
UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
J	23	23N	9W		1365	SOUTH	2007	EAST	SAN JUAN

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
P	25	23N	9W		1029	SOUTH	236	EAST	SAN JUAN

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
440.0 N/2 NW/4, SE/4 NW/4, SW/4 NE/4, N/2 SE/4, SE/4 SE/4 - Section 25; SW/4 SW/4 - Section 24; N/2 SE/4, SE/4 SE/4 - Section 23			R-22081

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom-hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Date Revised: JUNE 2, 2022
Survey Date: SEPTEMBER 29, 2021

Signature and Seal of Professional Surveyor

JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

JASON C. EDWARDS
Certificate Number 15269

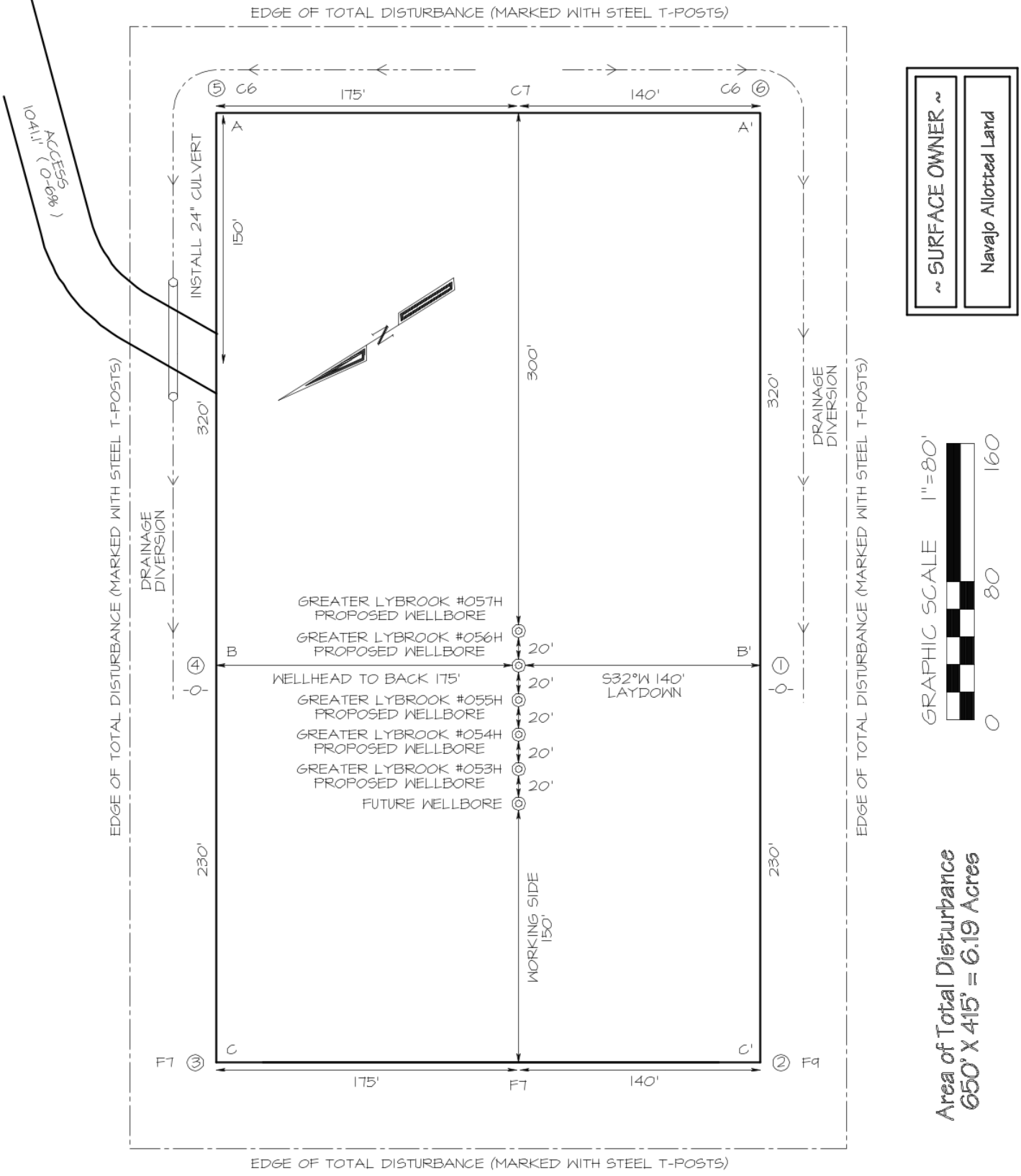
(A) 837' FSL 0' FWL
SEC 24, T23N, R9W
LAT: 36.207464 °N
LONG: 107.748673 °W
DATUM: NAD1927

LAT: 36.207477 °N
LONG: 107.749287 °W
DATUM: NAD1983

(B) 0' FSL 840' FWL
SEC 24, T23N, R9W
LAT: 36.205144 °N
LONG: 107.745863 °W
DATUM: NAD1927

LAT: 36.205157 °N
LONG: 107.746476 °W
DATUM: NAD1983

ENDURING RESOURCES, LLC GREATER LYBROOK UNIT #056H
1365' FSL & 2007' FEL, SECTION 23, T23N, R9W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6802'
LAT: 36°12'32.0488" LONG: 107°45'19.6347" DATUM: NAD1927

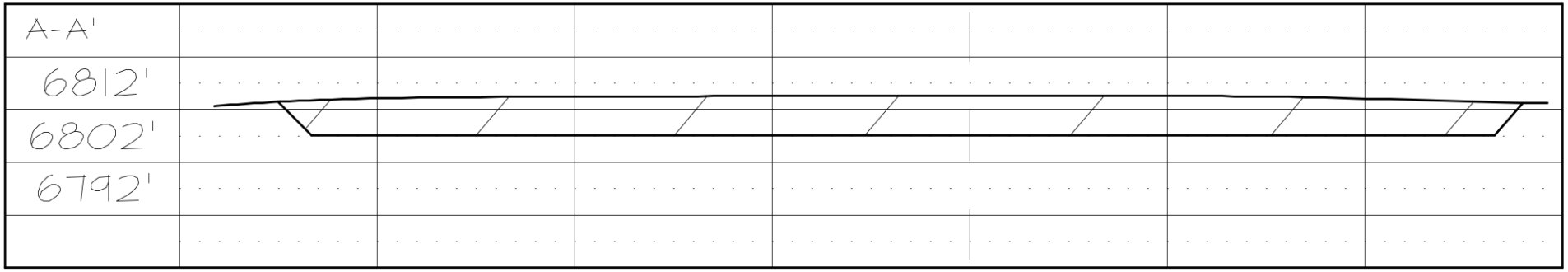


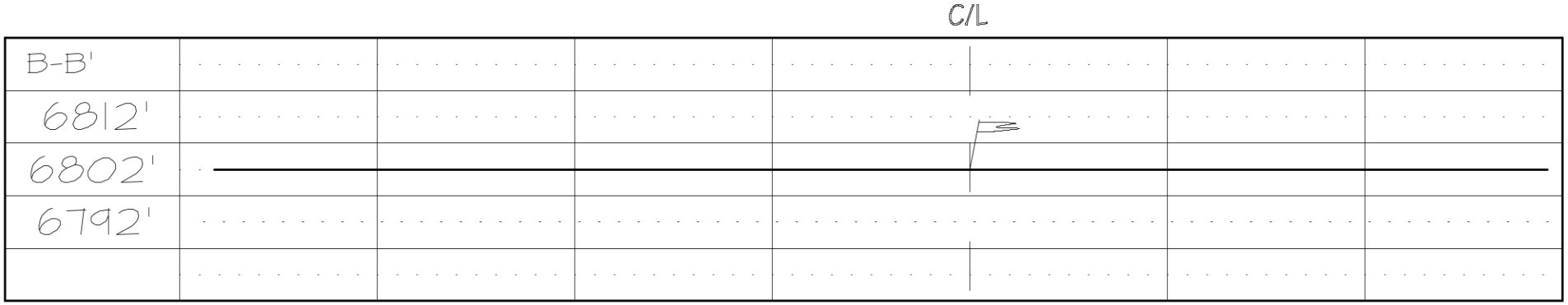
Steel T-Posts have been set to define Edge of Disturbance limits which are 50' offset from edge of wellpad.

ENDURING RESOURCES, LLC GREATER LYBROOK UNIT #056H
1365' FSL & 2007' FEL, SECTION 23, T23N, R9W, NMPM
SAN JUAN COUNTY, NEW MEXICO ELEVATION: 6802'

HORIZONTAL SCALE
1"=40'

VERTICAL SCALE
1"=30'

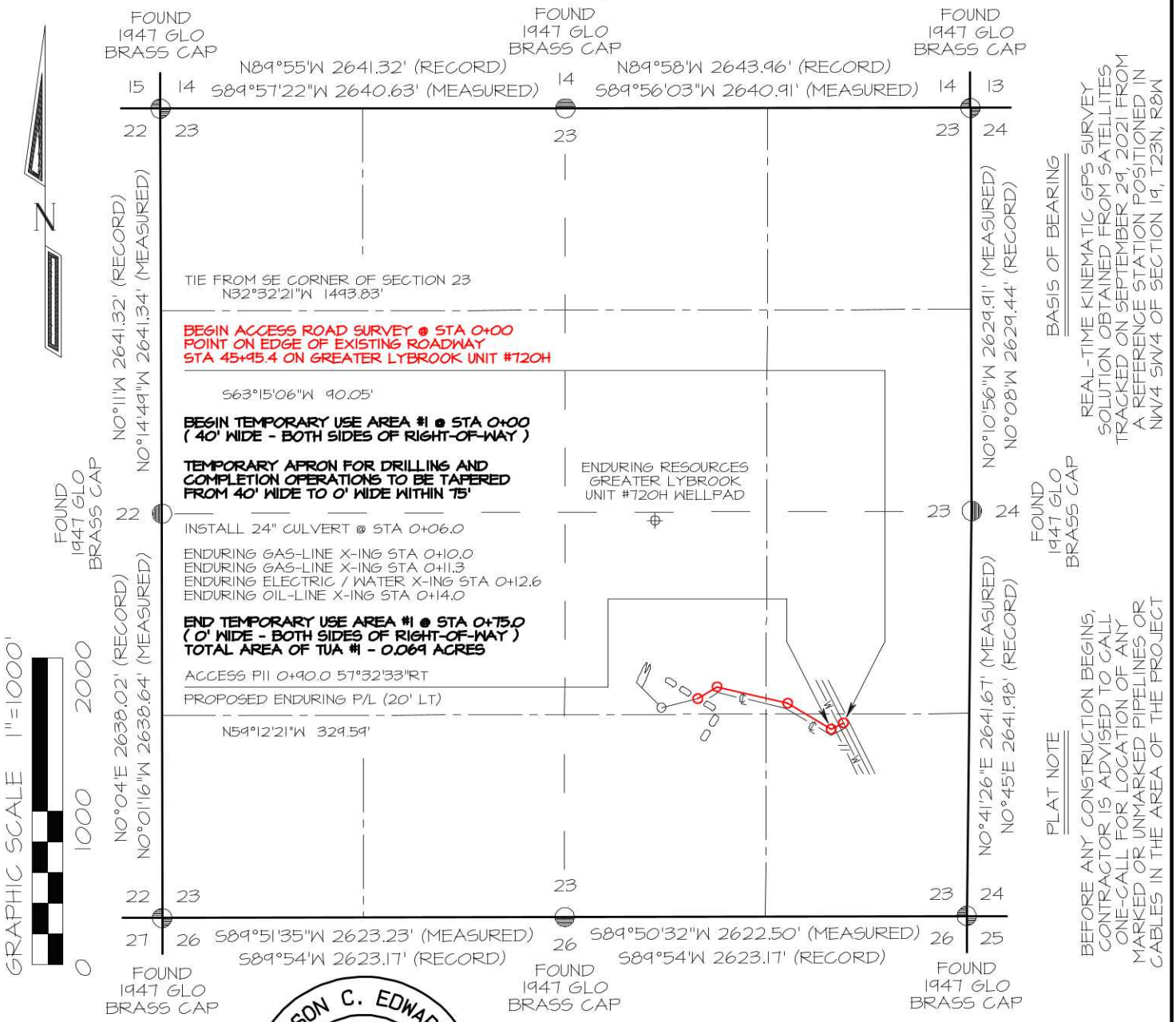




NCE SURVEYS IS NOT LIABLE FOR LOCATION OF UNDERGROUND UTILITIES OR PIPELINES.

CONTRACTOR SHOULD CONTACT ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED UNDERGROUND UTILITIES OR PIPELINES ON WELLPAD AND/OR ACCESS ROAD AT LEAST TWO WORKING DAYS PRIOR TO CONSTRUCTION.

ENDURING RESOURCES, LLC GREATER LYBROOK UNIT #056H
PROPOSED ACCESS ROAD SURVEY LOCATED IN
SE/4 OF SECTION 23, T23N, R9W, NMPM
SAN JUAN COUNTY, NEW MEXICO



JASON C. EDWARDS
NEW MEXICO
15269
REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Navajo Allotted Land (SE/4 Section 23)	
0+00 TO 10+41.1	1041.1 FT / 63.1 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

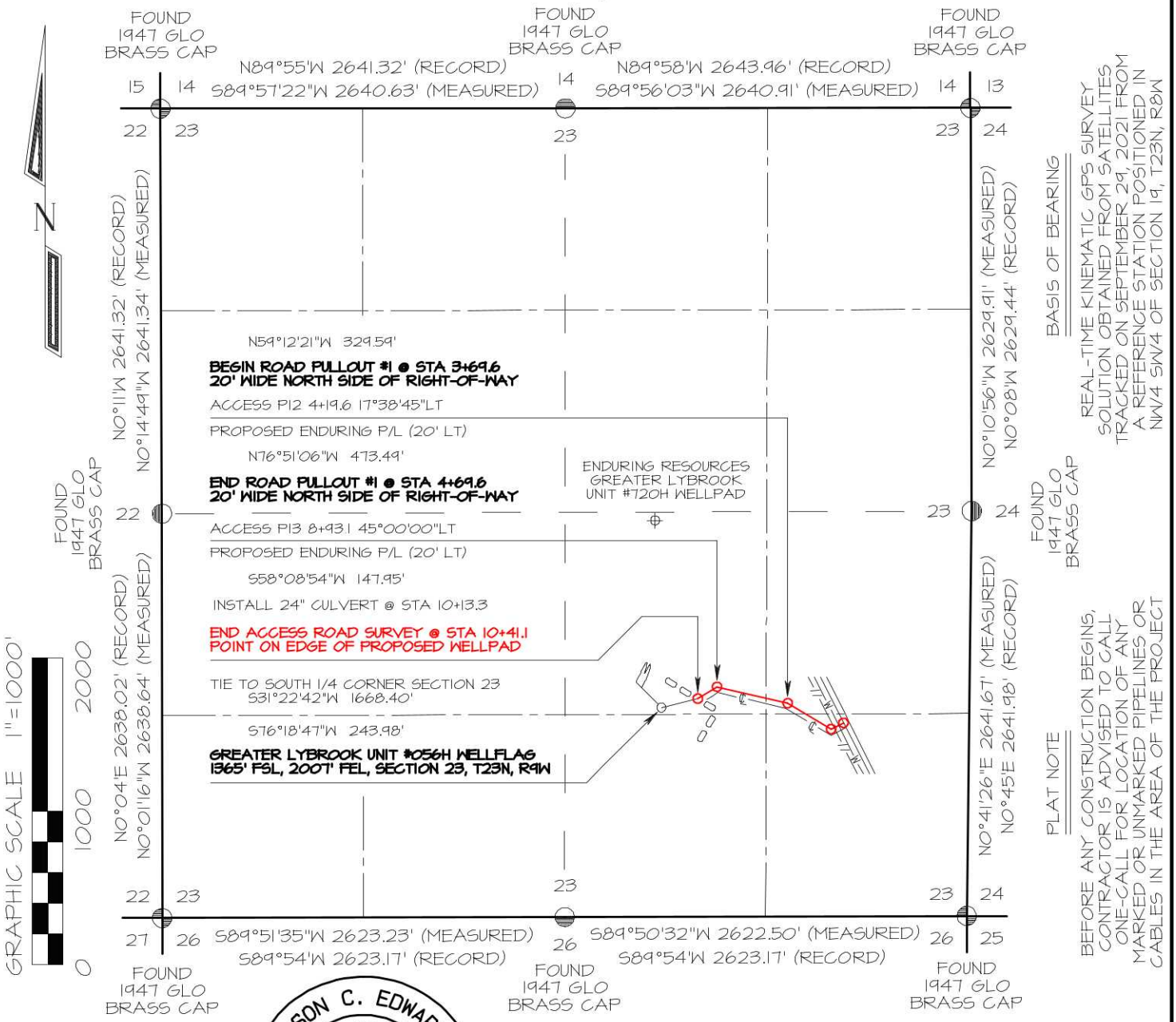
Date: June 2, 2022

Prepared for:
ENDURING RESOURCES, LLC
200 ENERGY COURT
FARMINGTON, NM 87401

Land Surveyor:
Jason C. Edwards
Mailing Address:
Post Office Box 6612
Farmington, NM 87499
Business Address:
111 East Pinon Street
Farmington, NM 87402
(505) 486-1695 (Office)
ncesurveys@comcast.net
NCE SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: EDO
SHEET 6 OF 10
FILENAME: 23423JAI

ENDURING RESOURCES, LLC GREATER LYBROOK UNIT #056H
PROPOSED ACCESS ROAD SURVEY LOCATED IN
SE/4 OF SECTION 23, T23N, R9W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED ON SEPTEMBER 29, 2021 FROM A REFERENCE STATION POSITIONED IN NW/4 SW/4 OF SECTION 19, T23N, R8W

PLAT NOTE

BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

~ SURFACE OWNERSHIP ~ Navajo Allotted Land (SE/4 Section 23)	
0+00 TO 10+41.1	1041.1 FT / 63.1 RODS

JASON C. EDWARDS NEW MEXICO 15269 REGISTERED PROFESSIONAL SURVEYOR

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS Date: June 2, 2022

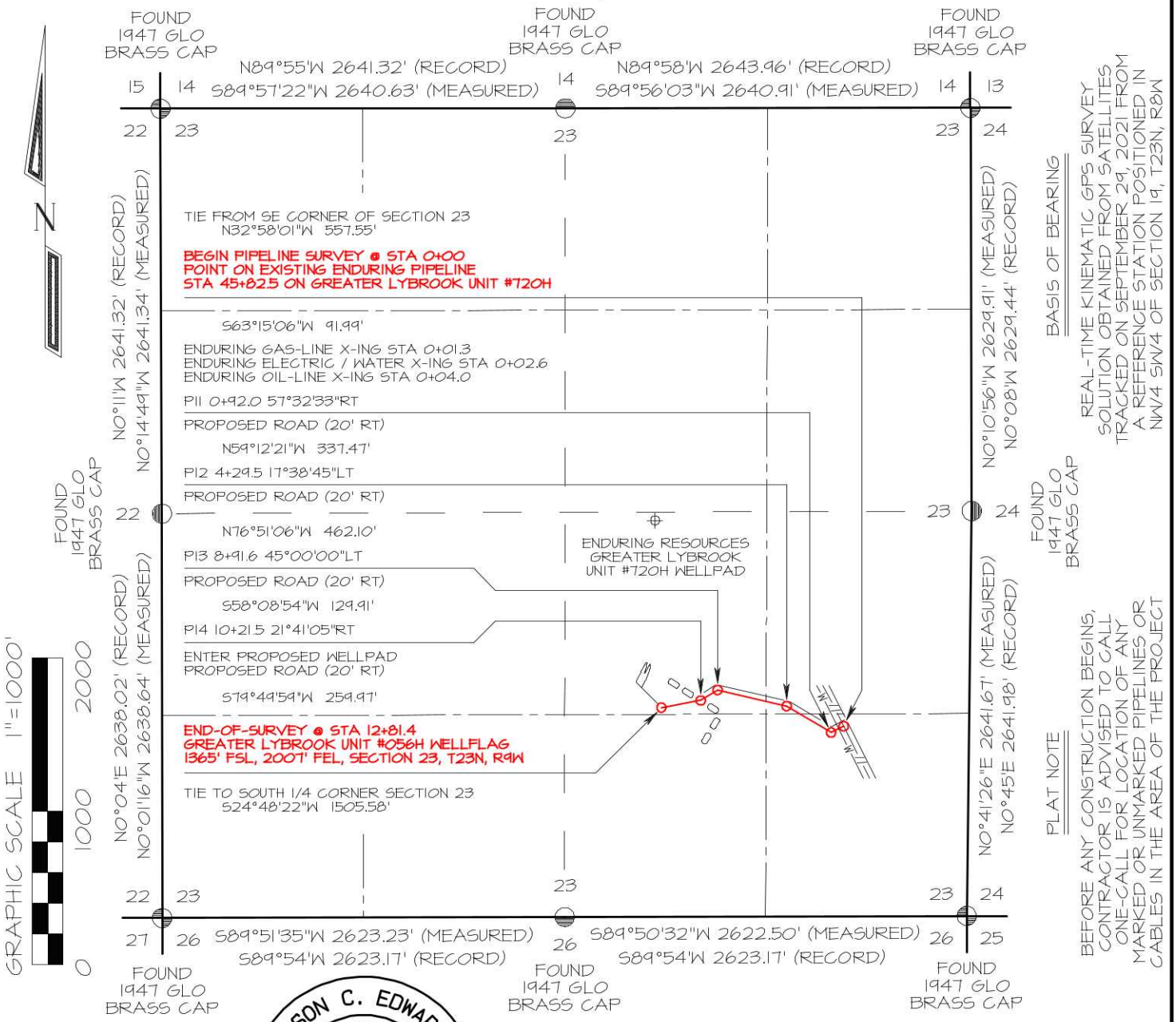
Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Prepared for:
ENDURING RESOURCES, LLC
200 ENERGY COURT
FARMINGTON, NM 87401

Land Surveyor:
Jason C. Edwards
Mailing Address:
Post Office Box 6612
Farmington, NM 87499
Business Address:
111 East Pinon Street
Farmington, NM 87402
(505) 486-1695 (Office)
ncesurveys@comcast.net
NCE SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: EDO
SHEET 7 OF 10
FILENAME: 23423JA2

ENDURING RESOURCES, LLC GREATER LYBROOK UNIT #056H
PROPOSED PIPELINE SURVEY LOCATED IN
SE/4 OF SECTION 23, T23N, R9W, NMPM
SAN JUAN COUNTY, NEW MEXICO



BASIS OF BEARING

REAL-TIME KINEMATIC GPS SURVEY SOLUTION OBTAINED FROM SATELLITES TRACKED ON SEPTEMBER 29, 2021 FROM A REFERENCE STATION POSITIONED IN NW/4 SW/4 OF SECTION 19, T23N, R8W

PLAT NOTE

BEFORE ANY CONSTRUCTION BEGINS, CONTRACTOR IS ADVISED TO CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED PIPELINES OR CABLES IN THE AREA OF THE PROJECT

JASON C. EDWARDS NEW MEXICO 15269 REGISTERED PROFESSIONAL SURVEYOR

~ SURFACE OWNERSHIP ~ Navajo Allotted Land (SE/4 Section 23)	
0+00 TO 12+81.4	1281.4 FT / 77.7 RODS

I, Jason C. Edwards, a registered Professional Surveyor under the laws of the State of New Mexico, hereby certify that this plat was prepared from field notes of an actual survey meeting the minimum requirements of the standards for easement surveys and is true and correct to the best of my knowledge and belief.

JASON C. EDWARDS

Jason C. Edwards, P.L.S.
New Mexico L.S. #15269

Date: June 2, 2022

Prepared for:
ENDURING RESOURCES, LLC
200 ENERGY COURT
FARMINGTON, NM 87401

Land Surveyor:
Jason C. Edwards
Mailing Address:
Post Office Box 6612
Farmington, NM 87499
Business Address:
111 East Pinon Street
Farmington, NM 87402
(505) 486-1695 (Office)
ncesurveys@comcast.net
NCE SURVEYS, INC.

CHECKED BY: JCE
DRAWN BY: EDO
SHEET 8 OF 10
FILENAME: 23423JG1

Directions from the Intersection of US Hwy 550 & US Hwy 64

in Bloomfield, NM to Enduring Resources, LLC Greater Lybrook Unit #056H

1365' FSL & 2007' FEL, Section 23, T23N, R9W, N.M.P.M., San Juan County, NM

Latitude: 36.208916°N Longitude: 107.756068°W Datum: NAD1983

From the intersection of US Hwy 550 & US Hwy 64 in Bloomfield, NM, travel Southerly on US Hwy 550 for 38.3 miles to Mile Marker 113.4;

Go Right (South-westerly) on County Road #7890 for 0.8 miles to fork in roadway;

Go Left (Southerly) remaining on County Road #7890 for 1.3 miles to 4-way intersection;

Go Left (South-easterly) remaining on County Road #7890 for 1.2 miles to 4-way intersection;

Go Right (Westerly) exiting County Road #7890 along existing roadway for 0.6 miles to fork in roadway;

Go Right (North-westerly) for 0.3 miles to new access on left-hand side of existing roadway which continues for 1041.1' to Enduring Greater Lybrook Unit #056H staked location.

State of New Mexico
Energy, Minerals and Natural Resources Department

Submit Electronically
Via E-permitting

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

NATURAL GAS MANAGEMENT PLAN

This Natural Gas Management Plan must be submitted with each Application for Permit to Drill (APD) for a new or recompleted well.

Section 1 – Plan Description
Effective May 25, 2021

I. Operator: Enduring Resources IV, LLC **OGRID:** 372286 **Date:** 10/26/2022

II. Type: ☒ Original ☐ Amendment due to ☐ 19.15.27.9.D(6)(a) NMAC ☐ 19.15.27.9.D(6)(b) NMAC ☐ Other.

If Other, please describe: _____

III. Well(s): Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	ULSTR	Footages	Anticipated Oil BBL/D	Anticipated Gas MCF/D	Anticipated Produced Water
Greater Lybrook Unit 053H	pending	Sec. 23, T23N, R9W	UL:C SHL:1397' FSL & 2058' FEL	650	1,700	1,200
Greater Lybrook Unit 054H	pending	Sec. 23, T23N, R9W	UL:C SHL:1386' FSL & 2041' FEL	650	1,700	1,200
Greater Lybrook Unit 055H	pending	Sec. 23, T23N, R9W	UL:C SHL:1376' FSL & 2024' FEL	650	1,700	1,200
Greater Lybrook Unit 056H	pending	Sec. 23, T23N, R9W	UL:C SHL:1365' FSL & 2007' FEL	650	1,700	1,200
Greater Lybrook Unit 772H	pending	Sec. 23, T23N, R9W	UL:C SHL:1448' FSL & 1981' FEL	650	1,700	1,200

IV. Central Delivery Point Name: 2-9 Gas Receipt & Trunk 1 Transfer Gas Receipt [See 19.15.27.9(D)(1) NMAC]

V. Anticipated Schedule: Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	Spud Date	TD Reached Date	Completion Commencement Date	Initial Flow Back Date	First Production Date
Greater Lybrook Unit 053H	pending	12/16/2022	1/13/2023	1/21/2023	2/21/2023	2/24/2023
Greater Lybrook Unit 054H	pending	12/13/2022	1/8/2023	1/21/2023	2/21/2023	2/24/2023
Greater Lybrook Unit 055H	pending	12/11/2022	1/3/2023	1/21/2023	2/21/2023	2/24/2023
Greater Lybrook Unit 056H	pending	12/9/2022	12/28/2022	1/21/2023	2/21/2023	2/24/2023
Greater Lybrook Unit 772H	pending	12/7/2023	12/23/2022	1/21/2023	2/21/2023	2/24/2023

VI. Separation Equipment: ☒ Attach a complete description of how Operator will size separation equipment to optimize gas capture.

VII. Operational Practices: ☒ Attach a complete description of the actions Operator will take to comply with the requirements of Subsection A through F of 19.15.27.8 NMAC.

VIII. Best Management Practices: ☒ Attach a complete description of Operator's best management practices to minimize venting during active and planned maintenance.

Section 2 – Enhanced Plan
EFFECTIVE APRIL 1, 2022

Beginning April 1, 2022, an operator that is not in compliance with its statewide natural gas capture requirement for the applicable reporting area must complete this section.

☒ Operator certifies that it is not required to complete this section because Operator is in compliance with its statewide natural gas capture requirement for the applicable reporting area.

IX. Anticipated Natural Gas Production:

Well	API	Anticipated Average Natural Gas Rate MCF/D	Anticipated Volume of Natural Gas for the First Year MCF

X. Natural Gas Gathering System (NGGS):

Operator	System	ULSTR of Tie-in	Anticipated Gathering Start Date	Available Maximum Daily Capacity of System Segment Tie-in

XI. Map. ☐ Attach an accurate and legible map depicting the location of the well(s), the anticipated pipeline route(s) connecting the production operations to the existing or planned interconnect of the natural gas gathering system(s), and the maximum daily capacity of the segment or portion of the natural gas gathering system(s) to which the well(s) will be connected.

XII. Line Capacity. The natural gas gathering system ☒ will ☐ will not have capacity to gather 100% of the anticipated natural gas production volume from the well prior to the date of first production.

XIII. Line Pressure. Operator ☒ does ☐ does not anticipate that its existing well(s) connected to the same segment, or portion, of the natural gas gathering system(s) described above will continue to meet anticipated increases in line pressure caused by the new well(s).

☐ Attach Operator's plan to manage production in response to the increased line pressure.

XIV. Confidentiality: ☐ Operator asserts confidentiality pursuant to Section 71-2-8 NMSA 1978 for the information provided in Section 2 as provided in Paragraph (2) of Subsection D of 19.15.27.9 NMAC, and attaches a full description of the specific information for which confidentiality is asserted and the basis for such assertion.

Section 3 - Certifications

Effective May 25, 2021

Operator certifies that, after reasonable inquiry and based on the available information at the time of submittal:

☒ Operator will be able to connect the well(s) to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system; or

☐ Operator will not be able to connect to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system. ***If Operator checks this box, Operator will select one of the following:***

Well Shut-In. ☐ Operator will shut-in and not produce the well until it submits the certification required by Paragraph (4) of Subsection D of 19.15.27.9 NMAC; or

Venting and Flaring Plan. ☐ Operator has attached a venting and flaring plan that evaluates and selects one or more of the potential alternative beneficial uses for the natural gas until a natural gas gathering system is available, including:

- **(a)** power generation on lease;
- **(b)** power generation for grid;
- **(c)** compression on lease;
- **(d)** liquids removal on lease;
- **(e)** reinjection for underground storage;
- **(f)** reinjection for temporary storage;
- **(g)** reinjection for enhanced oil recovery;
- **(h)** fuel cell production; and
- **(i)** other alternative beneficial uses approved by the division.

Section 4 - Notices

1. If, at any time after Operator submits this Natural Gas Management Plan and before the well is spud:

(a) Operator becomes aware that the natural gas gathering system it planned to connect the well(s) to has become unavailable or will not have capacity to transport one hundred percent of the production from the well(s), no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised venting and flaring plan containing the information specified in Paragraph (5) of Subsection D of 19.15.27.9 NMAC; or

(b) Operator becomes aware that it has, cumulatively for the year, become out of compliance with its baseline natural gas capture rate or natural gas capture requirement, no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised Natural Gas Management Plan for each well it plans to spud during the next 90 days containing the information specified in Paragraph (2) of Subsection D of 19.15.27.9 NMAC, and shall file an update for each Natural Gas Management Plan until Operator is back in compliance with its baseline natural gas capture rate or natural gas capture requirement.

2. OCD may deny or conditionally approve an APD if Operator does not make a certification, fails to submit an adequate venting and flaring plan which includes alternative beneficial uses for the anticipated volume of natural gas produced, or if OCD determines that Operator will not have adequate natural gas takeaway capacity at the time a well will be spud.

I certify that, after reasonable inquiry, the statements in and attached to this Natural Gas Management Plan are true and correct to the best of my knowledge and acknowledge that a false statement may be subject to civil and criminal penalties under the Oil and Gas Act.

Signature: Khem Suthiwan
Printed Name: Khem Suthiwan
Title: Regulatory Manager
E-mail Address: ksuthiwan@enduringresources.com
Date: 10/26/2022
Phone: (303) 350-5721

OIL CONSERVATION DIVISION **(Only applicable when submitted as a standalone form)**
Approved By:
Title:
Approval Date:
Conditions of Approval:

Attachments:

Separation Equipment: Below is a complete description of how Operator will size separation equipment to optimize gas capture.

Description of how separation equipment will be sized to optimize gas capture:
Well separation equipment is sized to have appropriate residence time and vapor space to remove gas particles on the micron scale per typical engineering calculations and/or operational experience. Furthermore, a sales scrubber downstream of the well separators is planned in order to capture any additional liquids if present. All gas is routed to end users or the sales pipeline under normal operating conditions.

Operational & Best Management Practices: Below is a complete description of the actions the Operator will take to comply with the requirements of Subsection A through F of 19.15.27.8 NMAC. Additionally, below is a complete description of Operator's best management practices to minimize venting during active and planned maintenance.

Drilling Operations:
Enduring Resources will minimize venting by:

- Gas will only be vented to the atmosphere to avoid risk of immediate or substantial adverse impact to employee safety, public health, and the environment.
- If utilized, flare stacks shall be located at a minimum of 100 feet from the nearest surface hole location

Completion Operations:
Enduring Resources will minimize venting by:

- Separator operation will commence as soon as technically feasible.
- Gas will route immediately to a collection system or applied to other beneficial use, such as a fuel source for onsite equipment.
- During initial flowback and if technically feasible, flaring shall occur rather than venting.
- If natural gas does not meet pipeline standards, gas will be vented or flared. A gas analysis will be performed twice weekly until standards are met (for up to 60 days). This is not anticipated to occur.
- If required, all venting and flaring of natural gas during flowback operations shall be performed in compliance with Subsections B, C and D of 19.15.27.8 NMAC.

Production Operations:
Enduring Resources will minimize venting by:

- Shutting in the wells if the pipeline is not available. No flaring of high pressure gas will occur.
- Utilizing gas for equipment fuel, heater fuel, and artificial lift when allowable.
- Capturing low pressure gas via a gas capture system when allowable.

In General:

- All venting and flaring from drilling, flowback and operation phases shall be reported in compliance with Subsection G of 19.15.27.8 NMAC.
- If utilized, flare stacks shall be located at a minimum of 100 feet from the nearest surface hole location and 100 ft from the permanent facility storage tanks.

Flowback Strategy
After the fracture treatment/completion operations, well(s) will be produced to temporary production tanks and gas will be flared or vented. During flowback, the fluids and sand content will be monitored. When the produced fluids contain minimal sand, the wells will be turned to production facilities. Gas sales should start as soon as the wells start flowing through the production facilities, unless there are operational issues on Gas Transporter system at that time. Based on current information, it is Operator's belief the system can take this gas upon completion of the well(s).

Safety requirements during cleanout operations from the use of underbalanced air cleanout systems may necessitate that sand and non-pipeline quality gas be vented and/or flared rather than sold on a temporary basis.

Alternatives to Reduce Flaring

Below are alternatives considered from a conceptual standpoint to reduce the amount of gas flared.

- Power Generation – On lease
  - Only a portion of gas is consumed operating the generator, remainder of gas will be flared
- Compressed Natural Gas – On lease
  - Gas flared would be minimal, but might be uneconomical to operate when gas volume declines
- NGL Removal – On lease
  - Plants are expensive, residue gas is still flared, and uneconomical to operate when gas volume declines
- Power generation for grid;
- Liquids removal on lease;
- Reinjection for underground storage;
- Reinjection for temporary storage;
- Reinjection for enhanced oil recovery;
- Fuel cell production; and
- Other alternative beneficial uses approved by the division.

ENDURING RESOURCES IV, LLC
6300 S SYRACUSE WAY, SUITE 525
CENTENNIAL, COLORADO 80211

DRILLING PLAN: ***Drill, complete, and equip single lateral in the Mancos-I formation***

WELL INFORMATION:

Name: **GREATER LYBROOK UNIT 056H**
API Number: not yet assigned
AFE Number: *not yet assigned*
ER Well Number: *not yet assigned*
State: New Mexico
County: San Juan
Surface Elevation: 6,802 ft ASL (GL) 6,815 ft ASL (KB)
Surface Location: 23-23N-09W Sec-Twn-Rng 1,365 ft FSL 2,007 ft FEL
36.208916 ° N latitude 107.756068 ° W longitude (NAD 83)
BH Location: 25-23N-09W Sec-Twn-Rng 1,029 ft FSL 236 ft FEL
36.193465 ° N latitude 107.732314 ° W longitude (NAD 83)
Driving Directions: **FROM THE INTERSECTION OF US HWY 550 & US HWY 64 IN BLOOMFIELD, NM:**
South on US Hwy 550 for 38.3 miles to MM 113.4, Right (Southwest) on CR #7890 for 0.8 miles to fork, Left (South) remaining on CR #7890 for 1.3 miles to 4-way intersection, Left (Southeast) remaining on CR #7890 for 1.2 miles to 4-way intersection; Right (West) exiting CR #7890 along existing roadway for 0.6 mile to fork; Right (Northwest) for 0.3 miles to new access road; Left on access road for 0.2 miles to W LYBROOK UNIT 772H PAD (772H, 773H, 774H, 775H, 776H wells).

GEOLOGIC AND RESERVOIR INFORMATION:

Prognosis:

Formation Tops	TVD (ft ASL)	TVD (ft KB)	MD (ft KB)	O / G / W	Pressure
Ojo Alamo	6,398	417	417	W	normal
Kirtland	6,295	520	520	W	normal
Fruitland	6,095	720	720	G, W	sub
Pictured Cliffs	5,715	1,100	1,101	G, W	sub
Lewis	5,593	1,222	1,226	G, W	normal
Chacra	5,324	1,491	1,507	G, W	normal
Cliff House	4,267	2,548	2,676	G, W	sub
Menefee	4,242	2,573	2,704	G, W	normal
Point Lookout	3,285	3,530	3,765	G, W	normal
Mancos	3,140	3,675	3,926	O,G	sub (~0.38)
Gallup (MNCS_A)	2,780	4,035	4,326	O,G	sub (~0.38)
MNCS_B	2,669	4,146	4,443	O,G	sub (~0.38)
MNCS_C	2,579	4,236	4,536	O,G	sub (~0.38)
MNCS_Cms	2,539	4,276	4,578	O,G	sub (~0.38)
MNCS_D	2,390	4,425	4,740	O,G	sub (~0.38)
MNCS_E	2,275	4,540	4,878	O,G	sub (~0.38)
MNCS_F	2,212	4,603	4,966	O,G	sub (~0.38)
MNCS_G	2,141	4,674	5,089	O,G	sub (~0.38)
MNCS_H	2,096	4,719	5,181	O,G	sub (~0.38)
MNCS_I	2,052	4,763	5,307	O,G	sub (~0.38)
FTP TARGET	**2,035**	**4,780**	**5,451**	**O,G**	**sub (~0.38)**
PROJECTED TD	**2,088**	**4,727**	**14,728**	**O,G**	**sub (~0.38)**

Surface: Nacimiento
Oil & Gas Zones: Several gas bearing zones will be encountered; target formation is the Gallup

Pressure: Normal (0.43 psi/ft) or sub-normal pressure gradients anticipated in all formations

Max. pressure gradient:	0.43	psi/ft	Evacuated hole gradient:	0.22	psi/ft
Maximum anticipated BH pressure, assuming maximum pressure gradient:				**2,060**	**psi**
Maximum anticipated surface pressure, assuming partially evacuated hole:				**1,010**	**psi**

Temperature: **Maximum anticipated BHT is 125° F or less**

H_2S INFORMATION:

H_2S Zones: Encountering hydrogen-sulfide bearing zones is **NOT** anticipated.

Safety: Sensors and alarms will be placed in the substructure, on the rig floor, above the pits, and at the shakers.

LOGGING, CORING, AND TESTING:

Mud Logs: None planned; remote geo-steering from drill out of 9-5/8" casing to TD; gas detection from drillout of 13-3/8" casing to TD.

MWD / LWD: Gamma Ray from drillout of 13-3/8" casing to TD

Open Hole Logs: None planned

Testing: None planned

Coring: None planned

Cased Hole Logs: CBL on 5-1/2" casing from deepest free-fall depth to surface

DRILLING RIG INFORMATION:

Contractor: Ensign

Rig No.: 145

Draw Works: Lewco LDS 1500K (1,000 hp)

Mast: ADR 1000 Cantilever Triple (134 ft, 500,000 lbs)

Top Drive: Tesco 350-EXI-600 (250 ton)

Prime Movers: 2 - CAT 3512 (1,350 hp), 1 -CAT C32 (1,100 hp)

Pumps: 2 - Mudder MD11 (5,000 psi)

BOPE 1: T3 Annular & Shaffer double gate ram (13-5/8", 5,000 psi)

Int Hole BOPE 2: T3 annular(13-5/8", 5,000 psi)

Prod Hole BOPE 2: T3 annular/ Townsend Double gate(11", 5,000 psi)

Choke 3", 5,000 psi

KB-GL (ft): 12.5

Note: Actual drilling rig may vary depending on availability at time the well is scheduled to be drilled.

Note: BOPE 2 are alternate stacks to be used only if problems with rig height and BOP 1 height are encountered.

BOPE REQUIREMENTS:

See attached diagram for details regarding BOPE specifications and configuration.

1) Rig will be equipped with upper and lower kelly cocks with handles available.

2) Inside BOP and TIW valves will be available to use on all sizes and threads of drill pipe used while drilling the well.

2) BOP accumulator will have enough capacity to open the HCR valve, close all rams and annular preventer, and retain minimum of 200 psi above precharge on the closing manifold without the use of closing pumps. The fluid reservoir capacity shall be at least double the usable fluid volume of the accumulator system capacity, and the fluid level shall be maintained at manufacturer's recommendation. There will be two additional sources of power for the closing pumps (electric and air). Sufficient nitrogen bottles will be available and will be recharged when pressure falls below manufacturer's recommended minimum.

3) BOP testing shall be conducted (a) when initially installed, (b) whenever any seal is broken or repaired, (c) if the time since the previous test exceeds 30 days. Tests will be conducted using a test plug. BOP ram preventers will be tested to 3,000 psig for 10 minutes, and the annular preventer will be tested to 1,500 psi for 10 minutes. Ram and annular preventers will be tested to 250 psi for 5 minutes. Additionally, BOP and casing strings will be tested to .22 psi/ft or 1,500 psi, whichever is greater but not exceeding 70% of yield strength of the casing, for 30 minutes, prior to drilling out 13-3/8" and 9-5/8" casing. Rams and hydraulically operated remote choke line valve will be function tested daily at a minimum.

4) Remote valve for BOP rams, HCR, and choke shall be placed in a location that is readily available to the driller. The remote BOP valve shall be capable of closing and opening the rams.

5) Manual locking devices (hand wheels) shall be intalled on rams. A valve will be installed on the annular preventer's closing line as close as possible to the preventer to act as a locking device.The valve will be maintained in the open position and shall only be closed when the there is no power to the accumulator.

FLUIDS AND SOLIDS CONTROL PROGRAM:

Fluid Measurement: Pumps shall be equipped with stroke counters with displays in the dog-house. Slow pump speed shall be recorded daily and after mudding up, at a minimum, on the drilling report. A Pit Volume Totalizer will be installed and the readout will be displayed in the dog-house. Gas-detecting equipment will be installed at the shakers, and readouts will be available in the dog-house and the in the geologist's work-station (if geologist or mud-logger is on-site).

Closed-Loop System: A fully, closed-loop system will be utilized. The system will consist of above-ground piping and above-ground storage tanks and bins. The system will not entail any earthen pits, below-grade storage, or drying pads. All equipment will be disassembled and removed from the site when drilling operations cease. The system will be capable of storing all fluids and generated cuttings and of preventing uncontrolled releases of the same. The system will be operated in an efficient manner to allow the recycling and reuse of as much fluid as possible and to minimimize the amount of fluids and solids that require disposal.

Fluid Disposal : Fluids that cannot be reused, recycled, or returned to the supplier will be hauled to and disposed of at an approved disposal site (Industrial Ecosystem, Inc. or Envirotech, Inc.).

Solids Disposal : Drilling solids will be stored (until haul-off) on-site in separate containers with no other waste, debris, or garbage products. Waste solids will be hauled to and disposed of at an approved disposal site (Industrial Ecosystem, Inc. or Envirotech, Inc.).

Fluid Program: See "Detailed Drilling Plan" section and attached Newpark mud program for additional details.

DETAILED DRILLING PLAN:

SURFACE: ***Drill vertically to casing setting depth (plus necessary rathole), run casing, cement casing to surface.***

0 ft (MD)	to	350 ft (MD)	Hole Section Length:	350 ft
0 ft (TVD)	to	350 ft (TVD)	Casing Required:	350 ft

Note: Surface hole may be drilled, cased, and cemented with a smaller rig in advance of the drilling rig.

Fluid:

Type	MW (ppg)	FL (mL/30 min)	PV (cp)	YP (lb/100 sqft)	pH	Comments
Fresh Water	8.4	N/C	2 - 8	2 - 12	9.0	Spud mud

Hole Size: 17-1/2"

Bit / Motor: Mill Tooth or PDC, no motor

MWD / Survey: No MWD, deviation survey

Logging: None

Casing Specs:

		Wt (lb/ft)	Grade	Conn.	Collapse (psi)	Burst (psi)	Tens. Body (lbs)	Tens. Conn (lbs)
Specs	13.375	54.5	J-55	BTC	1,130	2,730	853,000	909,000
Loading					153	581	116,634	116,634
Min. S.F.					**7.39**	**4.70**	**7.31**	**7.79**

Assumptions: Collapse: fully evacuated casing with 8.4 ppg equivalent external pressure gradient
Burst: maximum anticipated surface pressure with 9.5 ppg fluid inside casing while drilling intermediate hole and 8.4 ppg equivalent external pressure gradient
Tension: buoyed weight in 8.4 ppg fluid with 100,000 lbs over-pull

MU Torque (ft lbs): *Minumum: N/A Optimum: N/A Maximum: N/A*

Make-up as per API Buttress Connection running procedure.

Casing Summary: Float shoe, 1 jt casing, float collar, casing to surface

Centralizers: 2 centralizers per jt stop-banded 10' from each collar on bottom 3 jts, 1 centralizer per 2 jts to surface

Cement:

Type	Weight (ppg)	Yield (cuft/sk)	Water (gal/sk)	Hole Cap. (cuft/ft)	% Excess	Planned TOC (ft MD)	Total Cmt (sx)
TYPE III	14.6	1.39	6.686	0.6946	100%	0	350

Calculated cement volumes assume gauge hole and the excess noted in table

Notify NMOCD & BLM if cement is not circulated to surface. Cement must achieve 500 psi compressive strength before drilling out.

INTERMEDIATE: *Drill as per directional plan to casing setting depth, run casing, cement casing to surface.*

350 ft (MD)	to	2,812 ft (MD)	Hole Section Length:	2,462 ft
350 ft (TVD)	to	2,673 ft (TVD)	Casing Required:	2,812 ft

Fluid:	Type	MW (ppg)	FL (mL/30 min)	PV (cp)	YP (lb/100 sqft)	pH	Comments
	LSND (KCl)	8.8 - 9.5	20	8 - 14	8 - 14	9.0 - 9.5	No OBM

Hole Size: 12-1/4"
Bit / Motor: 12-1/4" PDC bit w/mud motor
MWD / Survey: MWD Survey with inclination and azimuth survey (every 100' at a minimum), GR optional
Logging: None
Pressure Test: NU BOPE and test (as noted above); pressure test 13-3/8" casing to **1,500** psi for 30 minutes.

Casing Specs:		Wt (lb/ft)	Grade	Conn.	Collapse (psi)	Burst (psi)	Tens. Body (lbs)	Tens. Conn (lbs)
Specs	9.625	36.0	J-55	LTC	2,020	3,520	564,000	453,000
Loading					1,168	1,163	188,279	188,279
Min. S.F.					**1.73**	**3.03**	**3.00**	**2.41**

Assumptions: Collapse: fully evacuated casing with 8.4 ppg equivalent external pressure gradient
Burst: maximum anticipated surface pressure with 9.5 ppg fluid inside casing while drilling production hole and 8.4 ppg equivalent external pressure gradient
Tension: buoyed weight in 8.4 ppg fluid with 100,000 lbs over-pull

MU Torque (ft lbs): *Minumum: 3,400 Optimum: 4,530 Maximum: 5,660*
Casing Summary: Float shoe, 1 jt casing, float collar, casing to surface
Centralizers: 1 per joint in non-vertical hole; 1 per 2-joints in vertical hole

Cement:	Type	Weight (ppg)	Yield (cuft/sk)	Water (gal/sk)	% Excess	Planned TOC (ft MD)	Total Cmt (sx)
Lead	III:POZ Blend	12.5	2.140	12.05	70%	0	547
Tail	Type III	14.6	1.380	6.64	20%	2,312	136

Annular Capacity	0.3627	cuft/ft	*9-5/8" casing x 13-3/8" casing annulus*
	0.3132	cuft/ft	*9-5/8" casing x 12-1/4" hole annulus*

Calculated cement volumes assume gauge hole and the excess noted in table
Notify NMOCD & BLM if cement is not circulated to surface. Cement must achieve 500 psi compressive strength before drilling out.

PRODUCTION: *Drill to TD following directional plan, run casing, cement casing to surface.*

2,812 ft (MD)	to	14,728 ft (MD)	Hole Section Length:	11,916 ft
2,673 ft (TVD)	to	4,727 ft (TVD)	Casing Required:	14,728 ft

Estimated KOP:	4,291 ft (MD)	4,004 ft (TVD)
Estimated Landing Point (FTP):	5,451 ft (MD)	4,780 ft (TVD)
Estimated Lateral Length:	9,277 ft (MD)	

Fluid:	Type	MW (ppg)	FL (mL/30')	PV (cp)	YP (lb/100 sqft)	pH	Comments
	LSND (FW)	8.8 - 9.5	20	8 - 14	8 - 14	9.0 - 9.5	OBM as contingency

Hole Size: 8-1/2"
Bit / Motor: 8-1/2" PDC bit w/mud motor

MWD / Survey: MWD with GR, inclination, and azimuth (survey every joint from KOP to Landing Point and survey every 100' minimum before KOP and after Landing Point)

Logging: GR MWD for entire section, no mud-log or cuttings sampling, no OH WL logs

Pressure Test: NU BOPE and test (as noted above); pressure test 9-5/8" casing to **1,500** psi for 30 minutes.

Casing Specs:	Size (in)	Wt (lb/ft)	Grade	Conn.	Collapse (psi)	Burst (psi)	Tens. Body (lbs)	Tens. Conn (lbs)
Specs	5.500	17.0	P-110	LTC	7,460	10,640	546,000	445,000
Loading					2,335	8,942	316,052	316,052
Min. S.F.					**3.19**	**1.19**	**1.73**	**1.41**

Assumptions: Collapse: fully evacuated casing with 9.5 ppg fluid in the annulus (floating casing during running)
Burst: 8,500 psi maximum surface treating pressure with 10.2 ppg equivalent mud weight sand laden fluid with 8.4 ppg equivalent external pressure gradient
Tension: buoyed weight in 9.0 ppg fluid with 100,000 lbs over-pull

MU Torque (ft lbs): *Minumum: 3,470 Optimum: 4,620 Maximum: 5,780*

Casing Summary: Float shoe, 1 jt casing, float collar, 1 jt casing, float collar, 20' marker joint, toe-intitiation sleeve, casing to KOP with 20' marker joints spaced evenly in lateral every 2,000', floatation sub at KOP, casing to surface. The toe-initiation sleeve (last-take-point) cannot be placed closer than 330' to the unit boundary when measured perpendicular to the well path.

Centralizers: *Centralizer count and placement may be adjusted based on well conditions and as-drilled surveys.*
Lateral: 1 centralizer per joint
Landing point to 9-5/8" shoe: 1 centralizer per joint
9-5/8" shoe to surface: 1 centralizer per 2 joints

Cement:	**Type**	**Weight (ppg)**	**Yield (cuft/sk)**	**Water (gal/sk)**	**% Excess**	**Planned TOC (ft MD)**	**Total Cmt (sx)**
Lead	Type III	12.4	2.360	13.40	50%	0	541
Tail	G:POZ blend	13.3	1.560	7.70	10%	4,326	1,680

Annular Capacity 0.2691 cuft/ft *5-1/2" casing x 9-5/8" casing annulus*
0.2291 cuft/ft *5-1/2" casing x 8-1/2" hole annulus*

Calculated cement volumes assume gauge hole and the excess noted in table
Notify NMOCD & BLM if cement is not circulated to surface.

Note: This well will not be considered an unorthodox well location as defintied by NMAC19.15.16.15.C.5. As defined in NMAC 19.15.16.15.C.1.a and 19.15.16.15.C.1.b, no point in the completed interval shall be closer to the unit boundary than 100' measured along the azimuth of the well or 330' measured perpendicular to the azimuth well. The boundaries of the completed interval, as defined by NMAC 19.15.16.7.B, are the last take point and first take point, as defined by NMAC 19.15.16.7.E and NMAC 19.15.16.7.J, respectively. In the case of this well, the last take point will be the bottom toe-initiation sleeve, and the first take point will be the top perforation. **Neither the toe-initiation sleeve nor the top perforation shall be closer to the unit boundary than 100' measured along the azimuth of the well or 330' measured perpendicular to the azimuth of the well.**

FINISH WELL: ***ND BOP, cap well, RDMO.***

COMPLETION AND PRODUCTION PLAN:

Frac: 40 plug-and-perf stages with 280,000 bbls slickwater fluid and 17,000,000 lbs of proppant (estimated)
Flowback: Flow back through production tubing as pressures allow
Production: Produce through production tubing via gas-lift into permanent production and storage facilities

ESTIMATED START DATES:

Drilling: 4/1/2022
Completion: 5/31/2022
Production: 7/15/2022

Prepared by: **Alec Bridge** **11/22/2021**

Well: Greater Lybrook Unit No. 056H
Site: Greater Lybrook 57 Pad (53,54,55,56 & 57)
Project: San Juan County, New Mexico NAD83 NM W
Design: rev1
Rig: Ensign 773

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
G Lybrook 056 LTP 1029 FSL 236 FEL r1	4718.00	-5618.04	7013.43	1889734.094	2752898.763	36.193465000	-107.732314000
G Lybrook 056 vs=3745	4772.00	-1926.25	3382.11	1893425.881	2749267.452	36.203616465	-107.744609433
G Lybrook 056 vs=0	4774.00	743.64	755.95	1896095.766	2746641.297	36.210957165	-107.753503436
G Lybrook 056 FTP 2359 FSL 1511 FEL	4780.00	995.64	508.07	1896347.769	2746393.422	36.211650000	-107.754343000

Section Details

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 3°/100' build
3	1655.44	25.66	359.19	1627.12	188.38	-2.67	3.00	359.19	-136.17	Begin 25.66° tangent
4	4285.60	25.66	359.19	3997.83	1327.33	-18.82	0.00	0.00	-959.43	Begin 10°/100' drop build/turn
5	5082.13	60.00	135.47	4667.43	1239.25	268.44	10.00	142.53	-695.19	Begin 60.00° tangent
6	5142.13	60.00	135.47	4697.43	1202.21	304.88	0.00	0.00	-643.23	Begin 10°/100' build
7	5442.44	90.03	135.47	4774.19	997.76	505.99	10.00	0.01	-356.44	Begin 90.03° lateral
8	9543.89	90.03	135.47	4772.00	-1926.25	3382.11	0.00	0.00	3745.01	Begin 2°/100' build
9	9572.31	90.60	135.47	4771.84	-1946.51	3402.04	2.00	0.01	3773.43	Begin 90.60° lateral
0	14722.57	90.60	135.47	4718.00	-5618.04	7013.43	0.00	0.00	8923.41	PBHL/TD @ 14722.57 MD 4718.00 TVD

Azimuths to Grid North
True North: -0.05°
Magnetic North: 8.56°

Magnetic Field
Strength: 49101.4nT
Dip Angle: 62.69°
Date: 5/11/2023
Model: IGRF2020

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: New Mexico Western Zone
System Datum: Mean Sea Level
Depth Reference: RKB=6802+28 @ 6830.00ft (Ensign 773)

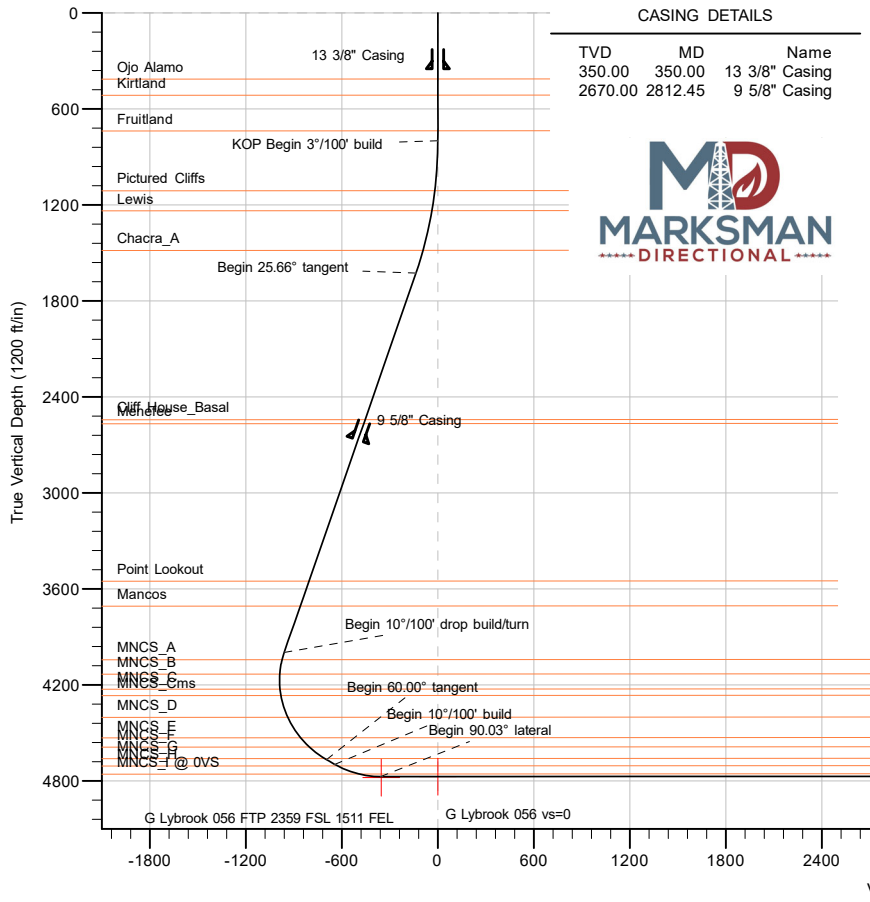
Surface location:

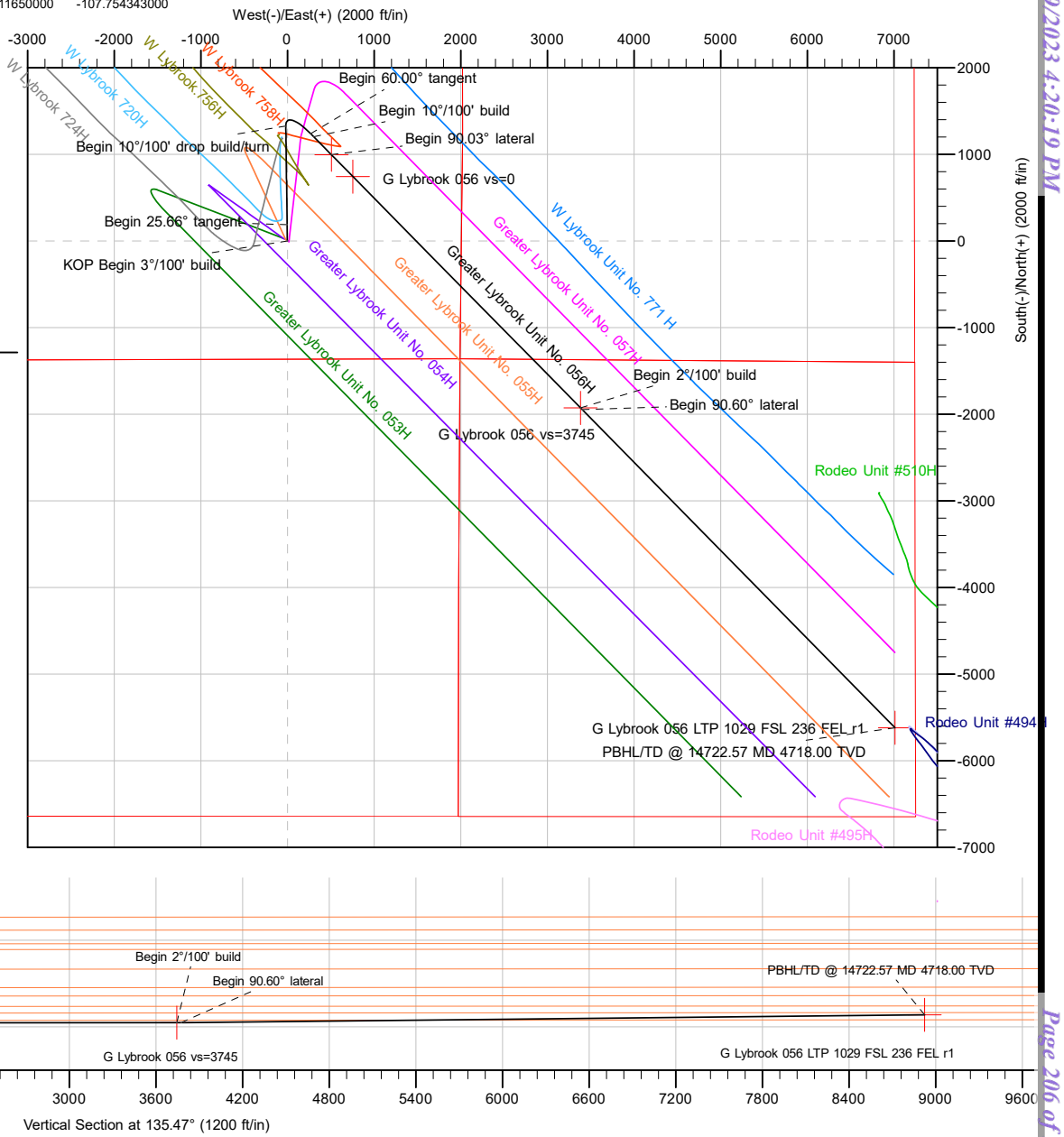
Northing	Easting	Latitude	Longitude
1895352.127	2745885.349	36.208916000	-107.756068000

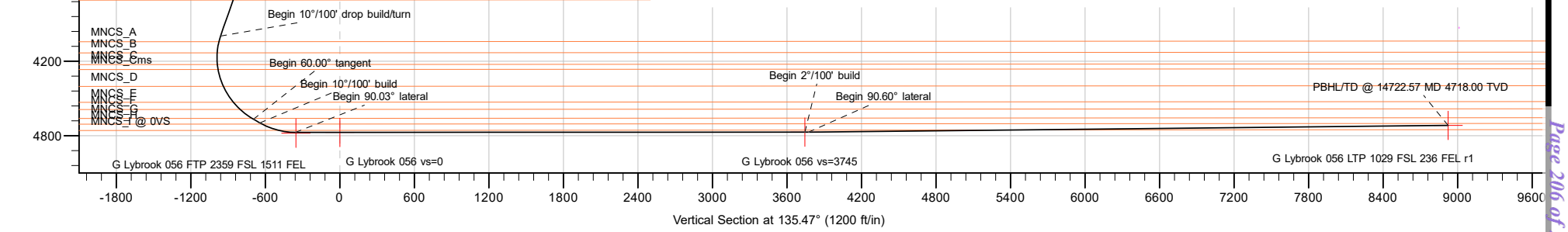
Total Corr (M=>G): To convert a Magnetic Direction to a Grid Direction, Add 8.56°

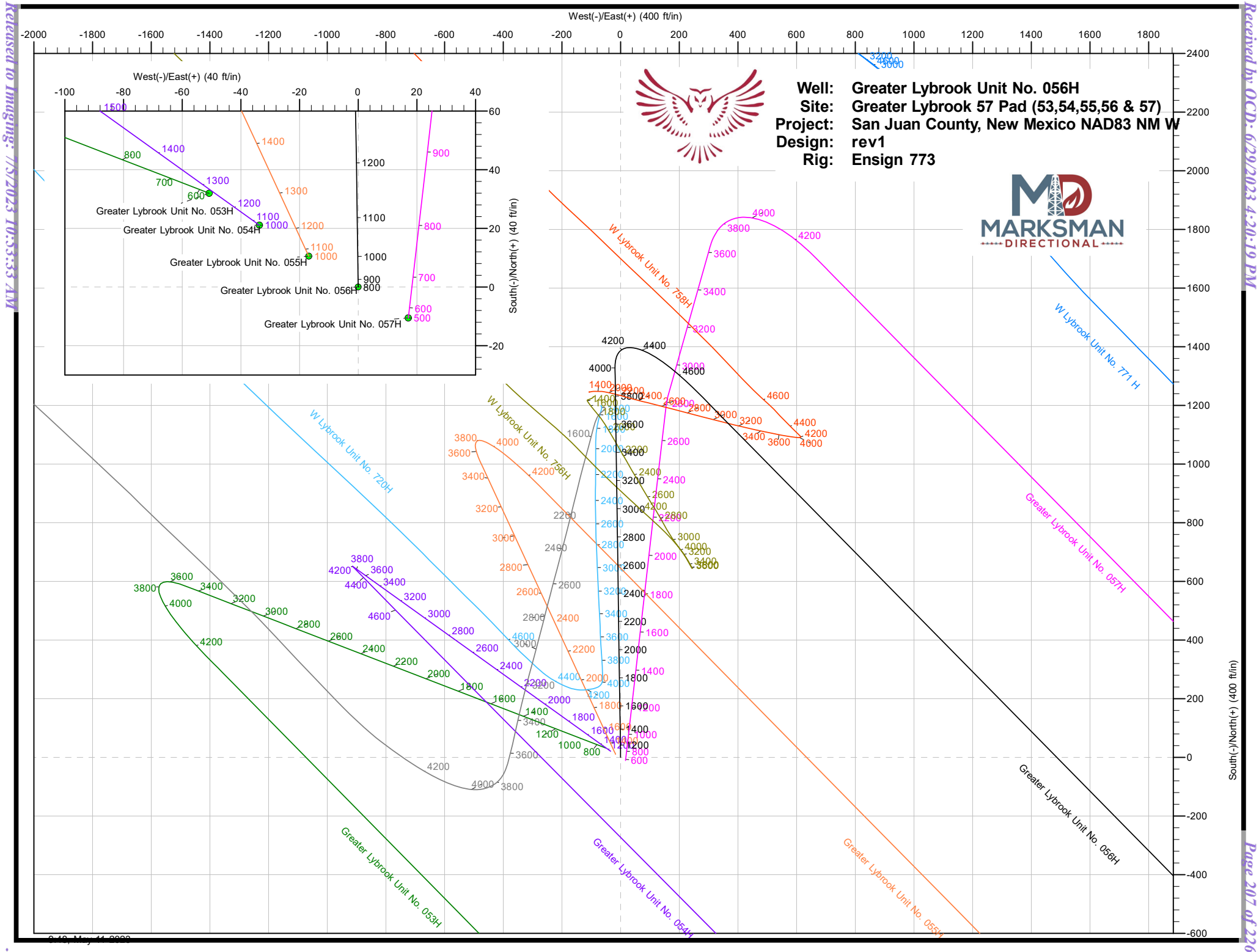
CASING DETAILS

TVD	MD	Name
350.00	350.00	13 3/8" Casing
2670.00	2812.45	9 5/8" Casing









Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Project San Juan County, New Mexico NAD83 NM W

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site Greater Lybrook 57 Pad (53,54,55,56 & 57)

Site Position:		**Northing:**	1,895,341.584 usft	**Latitude:**	36.208887000
From:	Lat/Long	**Easting:**	2,745,902.467 usft	**Longitude:**	-107.756010000
Position Uncertainty:	0.00 ft	**Slot Radius:**	13-3/16 "		

Well Greater Lybrook Unit No. 056H, Surf loc: 1365 FSL 2007 FEL Section 23-T23N-T09W

Well Position	**+N/-S**	0.00 ft	**Northing:**	1,895,352.127 usft	**Latitude:**	36.208916000
	+E/-W	0.00 ft	**Easting:**	2,745,885.348 usft	**Longitude:**	-107.756068000
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	ft	**Ground Level:**	6,802.00 ft
Grid Convergence:		0.05 °				

Wellbore Original Hole

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	5/11/2023	8.60	62.69	49,101.36326535

Design rev1

Audit Notes:

Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	135.47

Plan Survey Tool Program **Date** 5/11/2023

	Depth From (ft)	Depth To (ft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	14,722.56	rev1 (Original Hole)	MWD	
				OWSG MWD - Standard	

Planning Report

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Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Plan Sections

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,655.44	25.66	359.19	1,627.12	188.38	-2.67	3.00	3.00	0.00	359.19	
4,285.60	25.66	359.19	3,997.83	1,327.33	-18.82	0.00	0.00	0.00	0.00	
5,082.13	60.00	135.47	4,667.43	1,239.25	268.44	10.00	4.31	17.11	142.53	
5,142.13	60.00	135.47	4,697.43	1,202.21	304.88	0.00	0.00	0.00	0.00	
5,442.44	90.03	135.47	4,774.19	997.76	505.99	10.00	10.00	0.00	0.01	
9,543.89	90.03	135.47	4,772.00	-1,926.25	3,382.11	0.00	0.00	0.00	0.00	G Lybrook 056 vs=37
9,572.31	90.60	135.47	4,771.84	-1,946.51	3,402.04	2.00	2.00	0.00	0.01	
14,722.57	90.60	135.47	4,718.00	-5,618.05	7,013.43	0.00	0.00	0.00	0.00	G Lybrook 056 LTP 1(

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
350.00	0.00	0.00	350.00	0.00	0.00	0.00	0.00	0.00	0.00
13 3/8" Casing									
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
414.00	0.00	0.00	414.00	0.00	0.00	0.00	0.00	0.00	0.00
Ojo Alamo									
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
514.00	0.00	0.00	514.00	0.00	0.00	0.00	0.00	0.00	0.00
Kirtland									
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
737.00	0.00	0.00	737.00	0.00	0.00	0.00	0.00	0.00	0.00
Fruitland									
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP Begin 3°/100' build									
900.00	3.00	359.19	899.95	2.62	-0.04	-1.89	3.00	3.00	0.00
1,000.00	6.00	359.19	999.63	10.46	-0.15	-7.56	3.00	3.00	0.00
1,100.00	9.00	359.19	1,098.77	23.51	-0.33	-16.99	3.00	3.00	0.00
1,113.40	9.40	359.19	1,112.00	25.65	-0.36	-18.54	3.00	3.00	0.00
Pictured Cliffs									
1,200.00	12.00	359.19	1,197.08	41.73	-0.59	-30.16	3.00	3.00	0.00
1,240.91	13.23	359.19	1,237.00	50.66	-0.72	-36.62	3.00	3.00	0.00
Lewis									
1,300.00	15.00	359.19	1,294.31	65.07	-0.92	-47.03	3.00	3.00	0.00
1,400.00	18.00	359.19	1,390.18	93.47	-1.33	-67.56	3.00	3.00	0.00
1,500.00	21.00	359.19	1,484.43	126.84	-1.80	-91.68	3.00	3.00	0.00
1,500.61	21.02	359.19	1,485.00	127.06	-1.80	-91.84	3.00	3.00	0.00
Chacra_A									
1,600.00	24.00	359.19	1,576.81	165.10	-2.34	-119.34	3.00	3.00	0.00
1,655.44	25.66	359.19	1,627.12	188.38	-2.67	-136.17	3.00	3.00	0.00
Begin 25.66° tangent									
1,700.00	25.66	359.19	1,667.29	207.67	-2.94	-150.11	0.00	0.00	0.00
1,800.00	25.66	359.19	1,757.42	250.98	-3.56	-181.41	0.00	0.00	0.00
1,900.00	25.66	359.19	1,847.56	294.28	-4.17	-212.71	0.00	0.00	0.00
2,000.00	25.66	359.19	1,937.69	337.59	-4.79	-244.02	0.00	0.00	0.00
2,100.00	25.66	359.19	2,027.83	380.89	-5.40	-275.32	0.00	0.00	0.00
2,200.00	25.66	359.19	2,117.96	424.19	-6.01	-306.62	0.00	0.00	0.00
2,300.00	25.66	359.19	2,208.10	467.50	-6.63	-337.92	0.00	0.00	0.00
2,400.00	25.66	359.19	2,298.24	510.80	-7.24	-369.22	0.00	0.00	0.00
2,500.00	25.66	359.19	2,388.37	554.10	-7.86	-400.52	0.00	0.00	0.00
2,600.00	25.66	359.19	2,478.51	597.41	-8.47	-431.82	0.00	0.00	0.00
2,670.44	25.66	359.19	2,542.00	627.91	-8.90	-453.87	0.00	0.00	0.00
Cliff House_Basal									
2,698.18	25.66	359.19	2,567.00	639.92	-9.07	-462.55	0.00	0.00	0.00
Menefee									
2,700.00	25.66	359.19	2,568.64	640.71	-9.09	-463.12	0.00	0.00	0.00
2,800.00	25.66	359.19	2,658.78	684.01	-9.70	-494.42	0.00	0.00	0.00
2,812.45	25.66	359.19	2,670.00	689.41	-9.78	-498.32	0.00	0.00	0.00
9 5/8" Casing									
2,900.00	25.66	359.19	2,748.91	727.32	-10.31	-525.73	0.00	0.00	0.00

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,000.00	25.66	359.19	2,839.05	770.62	-10.93	-557.03	0.00	0.00	0.00
3,100.00	25.66	359.19	2,929.18	813.93	-11.54	-588.33	0.00	0.00	0.00
3,200.00	25.66	359.19	3,019.32	857.23	-12.16	-619.63	0.00	0.00	0.00
3,300.00	25.66	359.19	3,109.46	900.53	-12.77	-650.93	0.00	0.00	0.00
3,400.00	25.66	359.19	3,199.59	943.84	-13.38	-682.23	0.00	0.00	0.00
3,500.00	25.66	359.19	3,289.73	987.14	-14.00	-713.53	0.00	0.00	0.00
3,600.00	25.66	359.19	3,379.86	1,030.44	-14.61	-744.83	0.00	0.00	0.00
3,700.00	25.66	359.19	3,470.00	1,073.75	-15.23	-776.13	0.00	0.00	0.00
3,790.98	25.66	359.19	3,552.00	1,113.14	-15.78	-804.61	0.00	0.00	0.00
Point Lookout									
3,800.00	25.66	359.19	3,560.13	1,117.05	-15.84	-807.44	0.00	0.00	0.00
3,900.00	25.66	359.19	3,650.27	1,160.36	-16.45	-838.74	0.00	0.00	0.00
3,962.94	25.66	359.19	3,707.00	1,187.61	-16.84	-858.44	0.00	0.00	0.00
Mancos									
4,000.00	25.66	359.19	3,740.40	1,203.66	-17.07	-870.04	0.00	0.00	0.00
4,100.00	25.66	359.19	3,830.54	1,246.96	-17.68	-901.34	0.00	0.00	0.00
4,200.00	25.66	359.19	3,920.68	1,290.27	-18.30	-932.64	0.00	0.00	0.00
4,285.60	25.66	359.19	3,997.83	1,327.33	-18.82	-959.43	0.00	0.00	0.00
Begin 10°/100' drop build/turn									
4,300.00	24.53	1.30	4,010.87	1,333.44	-18.80	-963.77	10.00	-7.83	14.65
4,333.88	22.01	7.04	4,042.00	1,346.78	-17.86	-972.62	10.00	-7.44	16.95
MNCS_A									
4,350.00	20.90	10.22	4,057.00	1,352.61	-16.98	-976.16	10.00	-6.93	19.71
4,400.00	17.90	22.31	4,104.18	1,368.50	-12.48	-984.33	10.00	-6.00	24.19
4,429.13	16.58	31.10	4,132.00	1,376.20	-8.63	-987.13	10.00	-4.52	30.16
MNCS_B									
4,450.00	15.89	38.15	4,152.04	1,381.00	-5.33	-988.23	10.00	-3.29	33.80
4,500.00	15.29	56.70	4,200.23	1,390.01	4.41	-987.82	10.00	-1.21	37.09
4,527.77	15.63	67.05	4,227.00	1,393.48	10.92	-985.73	10.00	1.24	37.28
MNCS_C									
4,550.00	16.24	74.84	4,248.38	1,395.46	16.68	-983.10	10.00	2.73	35.07
4,569.43	16.98	81.12	4,267.00	1,396.61	22.11	-980.12	10.00	3.84	32.32
MNCS_Cms									
4,600.00	18.50	89.84	4,296.12	1,397.31	31.37	-974.12	10.00	4.97	28.52
4,650.00	21.68	101.14	4,343.09	1,395.55	48.38	-960.94	10.00	6.35	22.59
4,700.00	25.42	109.47	4,388.93	1,390.18	67.57	-943.65	10.00	7.49	16.65
4,714.54	26.58	111.46	4,402.00	1,387.95	73.54	-937.88	10.00	7.99	13.72
MNCS_D									
4,750.00	29.52	115.70	4,433.29	1,381.26	88.80	-922.40	10.00	8.28	11.95
4,800.00	33.84	120.50	4,475.84	1,368.84	111.91	-897.35	10.00	8.64	9.60
4,850.00	38.31	124.32	4,516.25	1,353.03	136.72	-868.68	10.00	8.94	7.63
4,869.03	40.04	125.57	4,531.00	1,346.14	146.57	-856.86	10.00	9.09	6.61
MNCS_E									
4,900.00	42.88	127.44	4,554.21	1,333.94	163.04	-836.61	10.00	9.17	6.02
4,947.88	47.32	129.96	4,588.00	1,312.72	189.48	-802.94	10.00	9.28	5.26
MNCS_F									
4,950.00	47.52	130.06	4,589.43	1,311.72	190.68	-801.38	10.00	9.34	4.86
5,000.00	52.21	132.32	4,621.66	1,286.54	219.42	-763.28	10.00	9.39	4.52
5,050.00	56.94	134.30	4,650.63	1,258.58	249.04	-722.57	10.00	9.46	3.97
5,067.58	58.61	134.95	4,660.00	1,248.14	259.62	-707.71	10.00	9.50	3.68
MNCS_G									
5,082.13	60.00	135.47	4,667.43	1,239.25	268.44	-695.19	10.00	9.52	3.56
Begin 60.00° tangent									

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,100.00	60.00	135.47	4,676.36	1,228.22	279.29	-679.72	0.00	0.00	0.00
5,142.13	60.00	135.47	4,697.43	1,202.21	304.88	-643.23	0.00	0.00	0.00
Begin 10°/100' build									
5,150.00	60.79	135.47	4,701.32	1,197.33	309.68	-636.39	10.00	10.00	0.00
5,161.87	61.97	135.47	4,707.00	1,189.91	316.98	-625.97	10.00	10.00	0.00
MNCS_H									
5,200.00	65.79	135.47	4,723.79	1,165.50	340.99	-591.74	10.00	10.00	0.00
5,250.00	70.79	135.47	4,742.28	1,132.40	373.55	-545.30	10.00	10.00	0.00
5,300.00	75.79	135.47	4,756.65	1,098.27	407.12	-497.43	10.00	10.00	0.00
5,301.42	75.93	135.47	4,757.00	1,097.29	408.09	-496.05	10.00	10.00	0.00
MNCS_I @ 0VS									
5,350.00	80.79	135.47	4,766.80	1,063.38	441.45	-448.49	10.00	10.00	0.00
5,400.00	85.79	135.47	4,772.64	1,027.99	476.26	-398.84	10.00	10.00	0.00
5,442.44	90.03	135.47	4,774.19	997.76	505.99	-356.44	10.00	10.00	0.00
Begin 90.03° lateral									
5,500.00	90.03	135.47	4,774.16	956.72	546.36	-298.88	0.00	0.00	0.00
5,600.00	90.03	135.47	4,774.11	885.43	616.48	-198.88	0.00	0.00	0.00
5,700.00	90.03	135.47	4,774.05	814.14	686.60	-98.88	0.00	0.00	0.00
5,800.00	90.03	135.47	4,774.00	742.85	756.73	1.12	0.00	0.00	0.00
5,900.00	90.03	135.47	4,773.95	671.56	826.85	101.12	0.00	0.00	0.00
6,000.00	90.03	135.47	4,773.89	600.26	896.98	201.12	0.00	0.00	0.00
6,100.00	90.03	135.47	4,773.84	528.97	967.10	301.12	0.00	0.00	0.00
6,200.00	90.03	135.47	4,773.79	457.68	1,037.23	401.12	0.00	0.00	0.00
6,300.00	90.03	135.47	4,773.73	386.39	1,107.35	501.12	0.00	0.00	0.00
6,400.00	90.03	135.47	4,773.68	315.09	1,177.48	601.12	0.00	0.00	0.00
6,500.00	90.03	135.47	4,773.63	243.80	1,247.60	701.12	0.00	0.00	0.00
6,600.00	90.03	135.47	4,773.57	172.51	1,317.72	801.12	0.00	0.00	0.00
6,700.00	90.03	135.47	4,773.52	101.22	1,387.85	901.12	0.00	0.00	0.00
6,800.00	90.03	135.47	4,773.47	29.93	1,457.97	1,001.12	0.00	0.00	0.00
6,900.00	90.03	135.47	4,773.41	-41.37	1,528.10	1,101.12	0.00	0.00	0.00
7,000.00	90.03	135.47	4,773.36	-112.66	1,598.22	1,201.12	0.00	0.00	0.00
7,100.00	90.03	135.47	4,773.31	-183.95	1,668.35	1,301.12	0.00	0.00	0.00
7,200.00	90.03	135.47	4,773.25	-255.24	1,738.47	1,401.12	0.00	0.00	0.00
7,300.00	90.03	135.47	4,773.20	-326.53	1,808.60	1,501.12	0.00	0.00	0.00
7,400.00	90.03	135.47	4,773.15	-397.83	1,878.72	1,601.12	0.00	0.00	0.00
7,500.00	90.03	135.47	4,773.09	-469.12	1,948.84	1,701.12	0.00	0.00	0.00
7,600.00	90.03	135.47	4,773.04	-540.41	2,018.97	1,801.12	0.00	0.00	0.00
7,700.00	90.03	135.47	4,772.99	-611.70	2,089.09	1,901.12	0.00	0.00	0.00
7,800.00	90.03	135.47	4,772.93	-682.99	2,159.22	2,001.12	0.00	0.00	0.00
7,900.00	90.03	135.47	4,772.88	-754.29	2,229.34	2,101.12	0.00	0.00	0.00
8,000.00	90.03	135.47	4,772.83	-825.58	2,299.47	2,201.12	0.00	0.00	0.00
8,100.00	90.03	135.47	4,772.77	-896.87	2,369.59	2,301.12	0.00	0.00	0.00
8,200.00	90.03	135.47	4,772.72	-968.16	2,439.72	2,401.12	0.00	0.00	0.00
8,300.00	90.03	135.47	4,772.66	-1,039.46	2,509.84	2,501.12	0.00	0.00	0.00
8,400.00	90.03	135.47	4,772.61	-1,110.75	2,579.96	2,601.12	0.00	0.00	0.00
8,500.00	90.03	135.47	4,772.56	-1,182.04	2,650.09	2,701.12	0.00	0.00	0.00
8,600.00	90.03	135.47	4,772.50	-1,253.33	2,720.21	2,801.12	0.00	0.00	0.00
8,700.00	90.03	135.47	4,772.45	-1,324.62	2,790.34	2,901.12	0.00	0.00	0.00
8,800.00	90.03	135.47	4,772.40	-1,395.92	2,860.46	3,001.12	0.00	0.00	0.00
8,900.00	90.03	135.47	4,772.34	-1,467.21	2,930.59	3,101.12	0.00	0.00	0.00
9,000.00	90.03	135.47	4,772.29	-1,538.50	3,000.71	3,201.12	0.00	0.00	0.00
9,100.00	90.03	135.47	4,772.24	-1,609.79	3,070.84	3,301.12	0.00	0.00	0.00
9,200.00	90.03	135.47	4,772.18	-1,681.08	3,140.96	3,401.12	0.00	0.00	0.00

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
9,300.00	90.03	135.47	4,772.13	-1,752.38	3,211.08	3,501.12	0.00	0.00	0.00
9,400.00	90.03	135.47	4,772.08	-1,823.67	3,281.21	3,601.12	0.00	0.00	0.00
9,500.00	90.03	135.47	4,772.02	-1,894.96	3,351.33	3,701.12	0.00	0.00	0.00
9,543.89	90.03	135.47	4,772.00	-1,926.25	3,382.11	3,745.01	0.00	0.00	0.00
Begin 2°/100' build									
9,572.31	90.60	135.47	4,771.84	-1,946.51	3,402.04	3,773.43	2.00	2.00	0.00
Begin 90.60° lateral									
9,600.00	90.60	135.47	4,771.55	-1,966.25	3,421.46	3,801.11	0.00	0.00	0.00
9,700.00	90.60	135.47	4,770.51	-2,037.54	3,491.58	3,901.11	0.00	0.00	0.00
9,800.00	90.60	135.47	4,769.46	-2,108.83	3,561.70	4,001.10	0.00	0.00	0.00
9,900.00	90.60	135.47	4,768.42	-2,180.12	3,631.82	4,101.10	0.00	0.00	0.00
10,000.00	90.60	135.47	4,767.37	-2,251.40	3,701.94	4,201.09	0.00	0.00	0.00
10,100.00	90.60	135.47	4,766.33	-2,322.69	3,772.06	4,301.09	0.00	0.00	0.00
10,200.00	90.60	135.47	4,765.28	-2,393.98	3,842.18	4,401.08	0.00	0.00	0.00
10,300.00	90.60	135.47	4,764.24	-2,465.27	3,912.30	4,501.08	0.00	0.00	0.00
10,400.00	90.60	135.47	4,763.19	-2,536.56	3,982.42	4,601.07	0.00	0.00	0.00
10,500.00	90.60	135.47	4,762.15	-2,607.85	4,052.54	4,701.07	0.00	0.00	0.00
10,600.00	90.60	135.47	4,761.10	-2,679.13	4,122.66	4,801.06	0.00	0.00	0.00
10,700.00	90.60	135.47	4,760.05	-2,750.42	4,192.78	4,901.05	0.00	0.00	0.00
10,800.00	90.60	135.47	4,759.01	-2,821.71	4,262.90	5,001.05	0.00	0.00	0.00
10,900.00	90.60	135.47	4,757.96	-2,893.00	4,333.02	5,101.04	0.00	0.00	0.00
11,000.00	90.60	135.47	4,756.92	-2,964.29	4,403.14	5,201.04	0.00	0.00	0.00
11,100.00	90.60	135.47	4,755.87	-3,035.58	4,473.26	5,301.03	0.00	0.00	0.00
11,200.00	90.60	135.47	4,754.83	-3,106.86	4,543.38	5,401.03	0.00	0.00	0.00
11,300.00	90.60	135.47	4,753.78	-3,178.15	4,613.50	5,501.02	0.00	0.00	0.00
11,400.00	90.60	135.47	4,752.74	-3,249.44	4,683.62	5,601.02	0.00	0.00	0.00
11,500.00	90.60	135.47	4,751.69	-3,320.73	4,753.75	5,701.01	0.00	0.00	0.00
11,600.00	90.60	135.47	4,750.65	-3,392.02	4,823.87	5,801.01	0.00	0.00	0.00
11,700.00	90.60	135.47	4,749.60	-3,463.31	4,893.99	5,901.00	0.00	0.00	0.00
11,800.00	90.60	135.47	4,748.55	-3,534.59	4,964.11	6,000.99	0.00	0.00	0.00
11,900.00	90.60	135.47	4,747.51	-3,605.88	5,034.23	6,100.99	0.00	0.00	0.00
12,000.00	90.60	135.47	4,746.46	-3,677.17	5,104.35	6,200.98	0.00	0.00	0.00
12,100.00	90.60	135.47	4,745.42	-3,748.46	5,174.47	6,300.98	0.00	0.00	0.00
12,200.00	90.60	135.47	4,744.37	-3,819.75	5,244.59	6,400.97	0.00	0.00	0.00
12,300.00	90.60	135.47	4,743.33	-3,891.04	5,314.71	6,500.97	0.00	0.00	0.00
12,400.00	90.60	135.47	4,742.28	-3,962.32	5,384.83	6,600.96	0.00	0.00	0.00
12,500.00	90.60	135.47	4,741.24	-4,033.61	5,454.95	6,700.96	0.00	0.00	0.00
12,600.00	90.60	135.47	4,740.19	-4,104.90	5,525.07	6,800.95	0.00	0.00	0.00
12,700.00	90.60	135.47	4,739.15	-4,176.19	5,595.19	6,900.95	0.00	0.00	0.00
12,800.00	90.60	135.47	4,738.10	-4,247.48	5,665.31	7,000.94	0.00	0.00	0.00
12,900.00	90.60	135.47	4,737.05	-4,318.76	5,735.43	7,100.93	0.00	0.00	0.00
13,000.00	90.60	135.47	4,736.01	-4,390.05	5,805.55	7,200.93	0.00	0.00	0.00
13,100.00	90.60	135.47	4,734.96	-4,461.34	5,875.67	7,300.92	0.00	0.00	0.00
13,200.00	90.60	135.47	4,733.92	-4,532.63	5,945.79	7,400.92	0.00	0.00	0.00
13,300.00	90.60	135.47	4,732.87	-4,603.92	6,015.91	7,500.91	0.00	0.00	0.00
13,400.00	90.60	135.47	4,731.83	-4,675.21	6,086.03	7,600.91	0.00	0.00	0.00
13,500.00	90.60	135.47	4,730.78	-4,746.49	6,156.16	7,700.90	0.00	0.00	0.00
13,600.00	90.60	135.47	4,729.74	-4,817.78	6,226.28	7,800.90	0.00	0.00	0.00
13,700.00	90.60	135.47	4,728.69	-4,889.07	6,296.40	7,900.89	0.00	0.00	0.00
13,800.00	90.60	135.47	4,727.65	-4,960.36	6,366.52	8,000.89	0.00	0.00	0.00
13,900.00	90.60	135.47	4,726.60	-5,031.65	6,436.64	8,100.88	0.00	0.00	0.00
14,000.00	90.60	135.47	4,725.55	-5,102.94	6,506.76	8,200.87	0.00	0.00	0.00
14,100.00	90.60	135.47	4,724.51	-5,174.22	6,576.88	8,300.87	0.00	0.00	0.00
14,200.00	90.60	135.47	4,723.46	-5,245.51	6,647.00	8,400.86	0.00	0.00	0.00

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,300.00	90.60	135.47	4,722.42	-5,316.80	6,717.12	8,500.86	0.00	0.00	0.00
14,400.00	90.60	135.47	4,721.37	-5,388.09	6,787.24	8,600.85	0.00	0.00	0.00
14,500.00	90.60	135.47	4,720.33	-5,459.38	6,857.36	8,700.85	0.00	0.00	0.00
14,600.00	90.60	135.47	4,719.28	-5,530.67	6,927.48	8,800.84	0.00	0.00	0.00
14,700.00	90.60	135.47	4,718.24	-5,601.95	6,997.60	8,900.84	0.00	0.00	0.00
14,722.57	90.60	135.47	4,718.00	-5,618.05	7,013.43	8,923.41	0.00	0.00	0.00
PBHL/TD @ 14722.57 MD 4718.00 TVD									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
G Lybrook 056 LTP 102 - plan hits target center - Point	0.00	0.00	4,718.00	-5,618.05	7,013.43	1,889,734.094	2,752,898.763	36.193465000	-107.732314000
G Lybrook 056 vs=3745 - plan hits target center - Point	0.00	0.01	4,772.00	-1,926.25	3,382.11	1,893,425.881	2,749,267.452	36.203616465	-107.744609433
G Lybrook 056 vs=0 - plan hits target center - Point	0.00	0.01	4,774.00	743.64	755.95	1,896,095.766	2,746,641.297	36.210957165	-107.753503437
G Lybrook 056 FTP 235 - plan misses target center by 5.81ft at 5445.41ft MD (4774.19 TVD, 995.65 N, 508.07 E) - Point	0.00	0.00	4,780.00	995.64	508.07	1,896,347.769	2,746,393.422	36.211650000	-107.754343000

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
350.00	350.00	13 3/8" Casing	13-5/8	17-1/2
2,812.45	2,670.00	9 5/8" Casing	9-5/8	12-1/4

Planning Report

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Formations

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
414.00	414.00	Ojo Alamo		-0.03	135.47
514.00	514.00	Kirtland		-0.03	135.47
737.00	737.00	Fruitland		-0.03	135.47
1,113.40	1,112.00	Pictured Cliffs		-0.03	135.47
1,240.91	1,237.00	Lewis		-0.03	135.47
1,500.61	1,485.00	Chacra_A		-0.03	135.47
2,670.44	2,542.00	Cliff House_Basal		-0.03	135.47
2,698.18	2,567.00	Menefee		-0.03	135.47
3,790.98	3,552.00	Point Lookout		-0.03	135.47
3,962.94	3,707.00	Mancos		-0.03	135.47
4,333.88	4,042.00	MNCS_A		-0.03	135.47
4,429.13	4,132.00	MNCS_B		-0.03	135.47
4,527.77	4,227.00	MNCS_C		-0.03	135.47
4,569.43	4,267.00	MNCS_Cms		-0.03	135.47
4,714.54	4,402.00	MNCS_D		-0.03	135.47
4,869.03	4,531.00	MNCS_E		-0.03	135.47
4,947.88	4,588.00	MNCS_F		-0.03	135.47
5,067.58	4,660.00	MNCS_G		-0.03	135.47
5,161.87	4,707.00	MNCS_H		-0.03	135.47
5,301.42	4,757.00	MNCS_I @ 0VS		-0.03	135.47

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
800.00	800.00	0.00	0.00	KOP Begin 3°/100' build
1,655.44	1,627.12	188.38	-2.67	Begin 25.66° tangent
4,285.60	3,997.83	1,327.33	-18.82	Begin 10°/100' drop build/turn
5,082.13	4,667.43	1,239.25	268.44	Begin 60.00° tangent
5,142.13	4,697.43	1,202.21	304.88	Begin 10°/100' build
5,442.44	4,774.19	997.76	505.99	Begin 90.03° lateral
9,543.89	4,772.00	-1,926.25	3,382.11	Begin 2°/100' build
9,572.31	4,771.84	-1,946.51	3,402.04	Begin 90.60° lateral
14,722.57	4,718.00	-5,618.05	7,013.43	PBHL/TD @ 14722.57 MD 4718.00 TVD

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Project San Juan County, New Mexico NAD83 NM W

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site Greater Lybrook 57 Pad (53,54,55,56 & 57)

Site Position:		**Northing:**	1,895,341.584 usft	**Latitude:**	36.208887000
From:	Lat/Long	**Easting:**	2,745,902.467 usft	**Longitude:**	-107.756010000
Position Uncertainty:	0.00 ft	**Slot Radius:**	13-3/16 "		

Well Greater Lybrook Unit No. 056H, Surf loc: 1365 FSL 2007 FEL Section 23-T23N-T09W

Well Position	**+N/-S**	0.00 ft	**Northing:**	1,895,352.127 usft	**Latitude:**	36.208916000
	+E/-W	0.00 ft	**Easting:**	2,745,885.348 usft	**Longitude:**	-107.756068000
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	ft	**Ground Level:**	6,802.00 ft
Grid Convergence:		0.05 °				

Wellbore Original Hole

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	5/11/2023	8.60	62.69	49,101.36326535

Design rev1

Audit Notes:

Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	135.47

Plan Survey Tool Program **Date** 5/11/2023

	Depth From (ft)	Depth To (ft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	14,722.56	rev1 (Original Hole)	MWD OWSG MWD - Standard	

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Plan Sections

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,655.44	25.66	359.19	1,627.12	188.38	-2.67	3.00	3.00	0.00	359.19	
4,285.60	25.66	359.19	3,997.83	1,327.33	-18.82	0.00	0.00	0.00	0.00	
5,082.13	60.00	135.47	4,667.43	1,239.25	268.44	10.00	4.31	17.11	142.53	
5,142.13	60.00	135.47	4,697.43	1,202.21	304.88	0.00	0.00	0.00	0.00	
5,442.44	90.03	135.47	4,774.19	997.76	505.99	10.00	10.00	0.00	0.01	
9,543.89	90.03	135.47	4,772.00	-1,926.25	3,382.11	0.00	0.00	0.00	0.00	G Lybrook 056 vs=37
9,572.31	90.60	135.47	4,771.84	-1,946.51	3,402.04	2.00	2.00	0.00	0.01	
14,722.57	90.60	135.47	4,718.00	-5,618.05	7,013.43	0.00	0.00	0.00	0.00	G Lybrook 056 LTP 1(

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
100.00	0.00	0.00	100.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
200.00	0.00	0.00	200.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
300.00	0.00	0.00	300.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
350.00	0.00	0.00	350.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
13 3/8" Casing									
400.00	0.00	0.00	400.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
414.00	0.00	0.00	414.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
Ojo Alamo									
500.00	0.00	0.00	500.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
514.00	0.00	0.00	514.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
Kirtland									
600.00	0.00	0.00	600.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
700.00	0.00	0.00	700.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
737.00	0.00	0.00	737.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
Fruitland									
800.00	0.00	0.00	800.00	0.00	0.00	1,895,352.127	2,745,885.348	36.208916000	-107.756068000
KOP Begin 3°/100' build									
900.00	3.00	359.19	899.95	2.62	-0.04	1,895,354.744	2,745,885.311	36.208923190	-107.756068118
1,000.00	6.00	359.19	999.63	10.46	-0.15	1,895,362.589	2,745,885.200	36.208944739	-107.756068474
1,100.00	9.00	359.19	1,098.77	23.51	-0.33	1,895,375.638	2,745,885.015	36.208980588	-107.756069066
1,113.40	9.40	359.19	1,112.00	25.65	-0.36	1,895,377.782	2,745,884.984	36.208986476	-107.756069163
Pictured Cliffs									
1,200.00	12.00	359.19	1,197.08	41.73	-0.59	1,895,393.858	2,745,884.756	36.209030640	-107.756069893
1,240.91	13.23	359.19	1,237.00	50.66	-0.72	1,895,402.790	2,745,884.630	36.209055176	-107.756070298
Lewis									
1,300.00	15.00	359.19	1,294.31	65.07	-0.92	1,895,417.197	2,745,884.426	36.209094756	-107.756070952
1,400.00	18.00	359.19	1,390.18	93.47	-1.33	1,895,445.593	2,745,884.023	36.209172762	-107.756072240
1,500.00	21.00	359.19	1,484.43	126.84	-1.80	1,895,478.966	2,745,883.550	36.209264443	-107.756073754
1,500.61	21.02	359.19	1,485.00	127.06	-1.80	1,895,479.184	2,745,883.547	36.209265042	-107.756073764
Chacra_A									
1,600.00	24.00	359.19	1,576.81	165.10	-2.34	1,895,517.226	2,745,883.007	36.209369548	-107.756075489
1,655.44	25.66	359.19	1,627.12	188.38	-2.67	1,895,540.505	2,745,882.677	36.209433498	-107.756076545
Begin 25.66° tangent									
1,700.00	25.66	359.19	1,667.29	207.67	-2.94	1,895,559.801	2,745,882.403	36.209486507	-107.756077421
1,800.00	25.66	359.19	1,757.42	250.98	-3.56	1,895,603.105	2,745,881.789	36.209605468	-107.756079385
1,900.00	25.66	359.19	1,847.56	294.28	-4.17	1,895,646.409	2,745,881.175	36.209724428	-107.756081350
2,000.00	25.66	359.19	1,937.69	337.59	-4.79	1,895,689.712	2,745,880.561	36.209843389	-107.756083314
2,100.00	25.66	359.19	2,027.83	380.89	-5.40	1,895,733.016	2,745,879.947	36.209962349	-107.756085279
2,200.00	25.66	359.19	2,117.96	424.19	-6.01	1,895,776.319	2,745,879.333	36.210081310	-107.756087244
2,300.00	25.66	359.19	2,208.10	467.50	-6.63	1,895,819.623	2,745,878.719	36.210200270	-107.756089208
2,400.00	25.66	359.19	2,298.24	510.80	-7.24	1,895,862.926	2,745,878.105	36.210319230	-107.756091173
2,500.00	25.66	359.19	2,388.37	554.10	-7.86	1,895,906.230	2,745,877.491	36.210438191	-107.756093137
2,600.00	25.66	359.19	2,478.51	597.41	-8.47	1,895,949.534	2,745,876.877	36.210557151	-107.756095102
2,670.44	25.66	359.19	2,542.00	627.91	-8.90	1,895,980.038	2,745,876.445	36.210640950	-107.756096486
Cliff House_Basal									
2,698.18	25.66	359.19	2,567.00	639.92	-9.07	1,895,992.048	2,745,876.274	36.210673944	-107.756097031
Menefee									
2,700.00	25.66	359.19	2,568.64	640.71	-9.09	1,895,992.837	2,745,876.263	36.210676112	-107.756097066
2,800.00	25.66	359.19	2,658.78	684.01	-9.70	1,896,036.141	2,745,875.649	36.210795072	-107.756099031
2,812.45	25.66	359.19	2,670.00	689.41	-9.78	1,896,041.532	2,745,875.573	36.210809883	-107.756099276
9 5/8" Casing									
2,900.00	25.66	359.19	2,748.91	727.32	-10.31	1,896,079.444	2,745,875.035	36.210914033	-107.756100996

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
3,000.00	25.66	359.19	2,839.05	770.62	-10.93	1,896,122.748	2,745,874.421	36.211032993	-107.756102960
3,100.00	25.66	359.19	2,929.18	813.93	-11.54	1,896,166.051	2,745,873.807	36.211151953	-107.756104925
3,200.00	25.66	359.19	3,019.32	857.23	-12.16	1,896,209.355	2,745,873.193	36.211270914	-107.756106889
3,300.00	25.66	359.19	3,109.46	900.53	-12.77	1,896,252.659	2,745,872.579	36.211389874	-107.756108854
3,400.00	25.66	359.19	3,199.59	943.84	-13.38	1,896,295.962	2,745,871.965	36.211508835	-107.756110819
3,500.00	25.66	359.19	3,289.73	987.14	-14.00	1,896,339.266	2,745,871.351	36.211627795	-107.756112783
3,600.00	25.66	359.19	3,379.86	1,030.44	-14.61	1,896,382.569	2,745,870.737	36.211746755	-107.756114748
3,700.00	25.66	359.19	3,470.00	1,073.75	-15.23	1,896,425.873	2,745,870.123	36.211865716	-107.756116712
3,790.98	25.66	359.19	3,552.00	1,113.14	-15.78	1,896,465.269	2,745,869.564	36.211973942	-107.756118500
Point Lookout									
3,800.00	25.66	359.19	3,560.13	1,117.05	-15.84	1,896,469.177	2,745,869.509	36.211984676	-107.756118677
3,900.00	25.66	359.19	3,650.27	1,160.36	-16.45	1,896,512.480	2,745,868.895	36.212103637	-107.756120642
3,962.94	25.66	359.19	3,707.00	1,187.61	-16.84	1,896,539.735	2,745,868.508	36.212178510	-107.756121878
Mancos									
4,000.00	25.66	359.19	3,740.40	1,203.66	-17.07	1,896,555.784	2,745,868.281	36.212222597	-107.756122606
4,100.00	25.66	359.19	3,830.54	1,246.96	-17.68	1,896,599.087	2,745,867.667	36.212341557	-107.756124571
4,200.00	25.66	359.19	3,920.68	1,290.27	-18.30	1,896,642.391	2,745,867.053	36.212460518	-107.756126536
4,285.60	25.66	359.19	3,997.83	1,327.33	-18.82	1,896,679.458	2,745,866.527	36.212562347	-107.756128217
Begin 10°/100' drop build/turn									
4,300.00	24.53	1.30	4,010.87	1,333.44	-18.80	1,896,685.566	2,745,866.551	36.212579125	-107.756128121
4,333.88	22.01	7.04	4,042.00	1,346.78	-17.86	1,896,698.906	2,745,867.489	36.212615769	-107.756124905
MNCS_A									
4,350.00	20.90	10.22	4,057.00	1,352.61	-16.98	1,896,704.733	2,745,868.369	36.212631774	-107.756121906
4,400.00	17.90	22.31	4,104.18	1,368.50	-12.48	1,896,720.626	2,745,872.870	36.212675423	-107.756106605
4,429.13	16.58	31.10	4,132.00	1,376.20	-8.63	1,896,728.326	2,745,876.716	36.212696570	-107.756093546
MNCS_B									
4,450.00	15.89	38.15	4,152.04	1,381.00	-5.33	1,896,733.124	2,745,880.019	36.212709742	-107.756082335
4,500.00	15.29	56.70	4,200.23	1,390.01	4.41	1,896,742.133	2,745,889.763	36.212734468	-107.756049279
4,527.77	15.63	67.05	4,227.00	1,393.48	10.92	1,896,745.602	2,745,896.269	36.212743986	-107.756027216
MNCS_C									
4,550.00	16.24	74.84	4,248.38	1,395.46	16.68	1,896,747.583	2,745,902.027	36.212749414	-107.756007690
4,569.43	16.98	81.12	4,267.00	1,396.61	22.11	1,896,748.731	2,745,907.454	36.212752556	-107.755989292
MNCS_Cms									
4,600.00	18.50	89.84	4,296.12	1,397.31	31.37	1,896,749.434	2,745,916.718	36.212754465	-107.755957884
4,650.00	21.68	101.14	4,343.09	1,395.55	48.38	1,896,747.670	2,745,933.724	36.212749584	-107.755900241
4,700.00	25.42	109.47	4,388.93	1,390.18	67.57	1,896,742.306	2,745,952.915	36.212734807	-107.755835198
4,714.54	26.58	111.46	4,402.00	1,387.95	73.54	1,896,740.075	2,745,958.887	36.212728666	-107.755814961
MNCS_D									
4,750.00	29.52	115.70	4,433.29	1,381.26	88.80	1,896,733.383	2,745,974.146	36.212710247	-107.755763251
4,800.00	33.84	120.50	4,475.84	1,368.84	111.91	1,896,720.968	2,745,997.255	36.212676090	-107.755684948
4,850.00	38.31	124.32	4,516.25	1,353.03	136.72	1,896,705.155	2,746,022.065	36.212632597	-107.755600885
4,869.03	40.04	125.57	4,531.00	1,346.14	146.57	1,896,698.268	2,746,031.917	36.212613657	-107.755567508
MNCS_E									
4,900.00	42.88	127.44	4,554.21	1,333.94	163.04	1,896,686.066	2,746,048.389	36.212580099	-107.755511700
4,947.88	47.32	129.96	4,588.00	1,312.72	189.48	1,896,664.848	2,746,074.831	36.212521753	-107.755422124
MNCS_F									
4,950.00	47.52	130.06	4,589.43	1,311.72	190.68	1,896,663.845	2,746,076.026	36.212518994	-107.755418074
5,000.00	52.21	132.32	4,621.66	1,286.54	219.42	1,896,638.661	2,746,104.765	36.212449749	-107.755320719
5,050.00	56.94	134.30	4,650.63	1,258.58	249.04	1,896,610.707	2,746,134.388	36.212372891	-107.755220375
5,067.58	58.61	134.95	4,660.00	1,248.14	259.62	1,896,600.261	2,746,144.970	36.212344171	-107.755184533
MNCS_G									
5,082.13	60.00	135.47	4,667.43	1,239.25	268.44	1,896,591.377	2,746,153.788	36.212319748	-107.755154665
Begin 60.00° tangent									

Planning Report - Geographic

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Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,100.00	60.00	135.47	4,676.36	1,228.22	279.29	1,896,580.347	2,746,164.639	36.212289421	-107.755117911
5,142.13	60.00	135.47	4,697.43	1,202.21	304.88	1,896,554.335	2,746,190.228	36.212217908	-107.755031239
Begin 10°/100' build									
5,150.00	60.79	135.47	4,701.32	1,197.33	309.68	1,896,549.459	2,746,195.024	36.212204502	-107.755014992
5,161.87	61.97	135.47	4,707.00	1,189.91	316.98	1,896,542.034	2,746,202.328	36.212184089	-107.754990253
MNCS_H									
5,200.00	65.79	135.47	4,723.79	1,165.50	340.99	1,896,517.629	2,746,226.336	36.212116993	-107.754908937
5,250.00	70.79	135.47	4,742.28	1,132.40	373.55	1,896,484.524	2,746,258.901	36.212025978	-107.754798634
5,300.00	75.79	135.47	4,756.65	1,098.27	407.12	1,896,450.396	2,746,292.472	36.211932149	-107.754684925
5,301.42	75.93	135.47	4,757.00	1,097.29	408.09	1,896,449.413	2,746,293.439	36.211929447	-107.754681651
MNCS_I @ 0VS									
5,350.00	80.79	135.47	4,766.80	1,063.38	441.45	1,896,415.504	2,746,326.794	36.211836221	-107.754568674
5,400.00	85.79	135.47	4,772.64	1,027.99	476.26	1,896,380.114	2,746,361.605	36.211738924	-107.754450765
5,442.44	90.03	135.47	4,774.19	997.76	505.99	1,896,349.885	2,746,391.339	36.211655817	-107.754350055
Begin 90.03° lateral									
5,500.00	90.03	135.47	4,774.16	956.72	546.36	1,896,308.849	2,746,431.703	36.211542996	-107.754213340
5,600.00	90.03	135.47	4,774.11	885.43	616.48	1,896,237.557	2,746,501.827	36.211346993	-107.753975825
5,700.00	90.03	135.47	4,774.05	814.14	686.60	1,896,166.265	2,746,571.951	36.211150989	-107.753738311
5,800.00	90.03	135.47	4,774.00	742.85	756.73	1,896,094.973	2,746,642.076	36.210954985	-107.753500798
5,900.00	90.03	135.47	4,773.95	671.56	826.85	1,896,023.681	2,746,712.200	36.210758980	-107.753263286
6,000.00	90.03	135.47	4,773.89	600.26	896.98	1,895,952.389	2,746,782.324	36.210562975	-107.753025776
6,100.00	90.03	135.47	4,773.84	528.97	967.10	1,895,881.097	2,746,852.449	36.210366970	-107.752788267
6,200.00	90.03	135.47	4,773.79	457.68	1,037.23	1,895,809.805	2,746,922.573	36.210170964	-107.752550759
6,300.00	90.03	135.47	4,773.73	386.39	1,107.35	1,895,738.513	2,746,992.697	36.209974957	-107.752313252
6,400.00	90.03	135.47	4,773.68	315.09	1,177.48	1,895,667.221	2,747,062.821	36.209778950	-107.752075746
6,500.00	90.03	135.47	4,773.63	243.80	1,247.60	1,895,595.929	2,747,132.946	36.209582943	-107.751838242
6,600.00	90.03	135.47	4,773.57	172.51	1,317.72	1,895,524.637	2,747,203.070	36.209386935	-107.751600738
6,700.00	90.03	135.47	4,773.52	101.22	1,387.85	1,895,453.345	2,747,273.194	36.209190927	-107.751363236
6,800.00	90.03	135.47	4,773.47	29.93	1,457.97	1,895,382.054	2,747,343.318	36.208994918	-107.751125735
6,900.00	90.03	135.47	4,773.41	-41.37	1,528.10	1,895,310.762	2,747,413.443	36.208798908	-107.750888235
7,000.00	90.03	135.47	4,773.36	-112.66	1,598.22	1,895,239.470	2,747,483.567	36.208602898	-107.750650737
7,100.00	90.03	135.47	4,773.31	-183.95	1,668.35	1,895,168.178	2,747,553.692	36.208406888	-107.750413239
7,200.00	90.03	135.47	4,773.25	-255.24	1,738.47	1,895,096.886	2,747,623.817	36.208210877	-107.750175743
7,300.00	90.03	135.47	4,773.20	-326.53	1,808.60	1,895,025.594	2,747,693.941	36.208014866	-107.749938248
7,400.00	90.03	135.47	4,773.15	-397.83	1,878.72	1,894,954.302	2,747,764.065	36.207818854	-107.749700754
7,500.00	90.03	135.47	4,773.09	-469.12	1,948.84	1,894,883.010	2,747,834.189	36.207622842	-107.749463262
7,600.00	90.03	135.47	4,773.04	-540.41	2,018.97	1,894,811.718	2,747,904.314	36.207426829	-107.749225770
7,700.00	90.03	135.47	4,772.99	-611.70	2,089.09	1,894,740.426	2,747,974.438	36.207230816	-107.748988280
7,800.00	90.03	135.47	4,772.93	-682.99	2,159.22	1,894,669.134	2,748,044.562	36.207034803	-107.748750791
7,900.00	90.03	135.47	4,772.88	-754.29	2,229.34	1,894,597.842	2,748,114.687	36.206838789	-107.748513303
8,000.00	90.03	135.47	4,772.83	-825.58	2,299.47	1,894,526.550	2,748,184.811	36.206642774	-107.748275816
8,100.00	90.03	135.47	4,772.77	-896.87	2,369.59	1,894,455.258	2,748,254.935	36.206446759	-107.748038330
8,200.00	90.03	135.47	4,772.72	-968.16	2,439.72	1,894,383.966	2,748,325.059	36.206250743	-107.747800846
8,300.00	90.03	135.47	4,772.66	-1,039.46	2,509.84	1,894,312.674	2,748,395.184	36.206054727	-107.747563363
8,400.00	90.03	135.47	4,772.61	-1,110.75	2,579.96	1,894,241.382	2,748,465.308	36.205858711	-107.747325881
8,500.00	90.03	135.47	4,772.56	-1,182.04	2,650.09	1,894,170.090	2,748,535.432	36.205662694	-107.747088400
8,600.00	90.03	135.47	4,772.50	-1,253.33	2,720.21	1,894,098.799	2,748,605.557	36.205466676	-107.746850920
8,700.00	90.03	135.47	4,772.45	-1,324.62	2,790.34	1,894,027.507	2,748,675.681	36.205270658	-107.746613442
8,800.00	90.03	135.47	4,772.40	-1,395.92	2,860.46	1,893,956.215	2,748,745.805	36.205074640	-107.746375965
8,900.00	90.03	135.47	4,772.34	-1,467.21	2,930.59	1,893,884.923	2,748,815.929	36.204878621	-107.746138489
9,000.00	90.03	135.47	4,772.29	-1,538.50	3,000.71	1,893,813.631	2,748,886.054	36.204682602	-107.745901014
9,100.00	90.03	135.47	4,772.24	-1,609.79	3,070.84	1,893,742.339	2,748,956.178	36.204486582	-107.745663540
9,200.00	90.03	135.47	4,772.18	-1,681.08	3,140.96	1,893,671.047	2,749,026.302	36.204290562	-107.745426067
9,300.00	90.03	135.47	4,772.13	-1,752.38	3,211.08	1,893,599.755	2,749,096.426	36.204094541	-107.745188596

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Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,400.00	90.03	135.47	4,772.08	-1,823.67	3,281.21	1,893,528.463	2,749,166.551	36.203898520	-107.744951126
9,500.00	90.03	135.47	4,772.02	-1,894.96	3,351.33	1,893,457.171	2,749,236.675	36.203702498	-107.744713657
9,543.89	90.03	135.47	4,772.00	-1,926.25	3,382.11	1,893,425.881	2,749,267.452	36.203616465	-107.744609433
Begin 2°/100' build									
9,572.31	90.60	135.47	4,771.84	-1,946.51	3,402.04	1,893,405.621	2,749,287.381	36.203560756	-107.744541947
Begin 90.60° lateral									
9,600.00	90.60	135.47	4,771.55	-1,966.25	3,421.46	1,893,385.880	2,749,306.798	36.203506480	-107.744476194
9,700.00	90.60	135.47	4,770.51	-2,037.54	3,491.58	1,893,314.592	2,749,376.918	36.203310467	-107.744238741
9,800.00	90.60	135.47	4,769.46	-2,108.83	3,561.70	1,893,243.304	2,749,447.039	36.203114455	-107.744001289
9,900.00	90.60	135.47	4,768.42	-2,180.12	3,631.82	1,893,172.016	2,749,517.159	36.202918441	-107.743763838
10,000.00	90.60	135.47	4,767.37	-2,251.40	3,701.94	1,893,100.728	2,749,587.279	36.202722428	-107.743526388
10,100.00	90.60	135.47	4,766.33	-2,322.69	3,772.06	1,893,029.440	2,749,657.400	36.202526413	-107.743288939
10,200.00	90.60	135.47	4,765.28	-2,393.98	3,842.18	1,892,958.152	2,749,727.520	36.202330399	-107.743051492
10,300.00	90.60	135.47	4,764.24	-2,465.27	3,912.30	1,892,886.863	2,749,797.640	36.202134384	-107.742814046
10,400.00	90.60	135.47	4,763.19	-2,536.56	3,982.42	1,892,815.575	2,749,867.761	36.201938368	-107.742576601
10,500.00	90.60	135.47	4,762.15	-2,607.85	4,052.54	1,892,744.287	2,749,937.881	36.201742352	-107.742339157
10,600.00	90.60	135.47	4,761.10	-2,679.13	4,122.66	1,892,672.999	2,750,008.001	36.201546336	-107.742101714
10,700.00	90.60	135.47	4,760.05	-2,750.42	4,192.78	1,892,601.711	2,750,078.122	36.201350319	-107.741864273
10,800.00	90.60	135.47	4,759.01	-2,821.71	4,262.90	1,892,530.423	2,750,148.242	36.201154301	-107.741626832
10,900.00	90.60	135.47	4,757.96	-2,893.00	4,333.02	1,892,459.134	2,750,218.363	36.200958283	-107.741389393
11,000.00	90.60	135.47	4,756.92	-2,964.29	4,403.14	1,892,387.846	2,750,288.483	36.200762265	-107.741151955
11,100.00	90.60	135.47	4,755.87	-3,035.58	4,473.26	1,892,316.558	2,750,358.603	36.200566246	-107.740914518
11,200.00	90.60	135.47	4,754.83	-3,106.86	4,543.38	1,892,245.270	2,750,428.724	36.200370226	-107.740677083
11,300.00	90.60	135.47	4,753.78	-3,178.15	4,613.50	1,892,173.982	2,750,498.844	36.200174206	-107.740439648
11,400.00	90.60	135.47	4,752.74	-3,249.44	4,683.62	1,892,102.694	2,750,568.964	36.199978186	-107.740202215
11,500.00	90.60	135.47	4,751.69	-3,320.73	4,753.75	1,892,031.406	2,750,639.085	36.199782165	-107.739964783
11,600.00	90.60	135.47	4,750.65	-3,392.02	4,823.87	1,891,960.117	2,750,709.205	36.199586144	-107.739727352
11,700.00	90.60	135.47	4,749.60	-3,463.31	4,893.99	1,891,888.829	2,750,779.325	36.199390122	-107.739489923
11,800.00	90.60	135.47	4,748.55	-3,534.59	4,964.11	1,891,817.541	2,750,849.446	36.199194100	-107.739252494
11,900.00	90.60	135.47	4,747.51	-3,605.88	5,034.23	1,891,746.253	2,750,919.566	36.198998077	-107.739015067
12,000.00	90.60	135.47	4,746.46	-3,677.17	5,104.35	1,891,674.965	2,750,989.687	36.198802054	-107.738777641
12,100.00	90.60	135.47	4,745.42	-3,748.46	5,174.47	1,891,603.677	2,751,059.807	36.198606030	-107.738540216
12,200.00	90.60	135.47	4,744.37	-3,819.75	5,244.59	1,891,532.388	2,751,129.927	36.198410006	-107.738302792
12,300.00	90.60	135.47	4,743.33	-3,891.04	5,314.71	1,891,461.100	2,751,200.048	36.198213982	-107.738065369
12,400.00	90.60	135.47	4,742.28	-3,962.32	5,384.83	1,891,389.812	2,751,270.168	36.198017956	-107.737827948
12,500.00	90.60	135.47	4,741.24	-4,033.61	5,454.95	1,891,318.524	2,751,340.288	36.197821931	-107.737590528
12,600.00	90.60	135.47	4,740.19	-4,104.90	5,525.07	1,891,247.236	2,751,410.409	36.197625905	-107.737353109
12,700.00	90.60	135.47	4,739.15	-4,176.19	5,595.19	1,891,175.948	2,751,480.529	36.197429878	-107.737115691
12,800.00	90.60	135.47	4,738.10	-4,247.48	5,665.31	1,891,104.660	2,751,550.649	36.197233851	-107.736878274
12,900.00	90.60	135.47	4,737.05	-4,318.76	5,735.43	1,891,033.371	2,751,620.770	36.197037824	-107.736640859
13,000.00	90.60	135.47	4,736.01	-4,390.05	5,805.55	1,890,962.083	2,751,690.890	36.196841796	-107.736403445
13,100.00	90.60	135.47	4,734.96	-4,461.34	5,875.67	1,890,890.795	2,751,761.011	36.196645767	-107.736166031
13,200.00	90.60	135.47	4,733.92	-4,532.63	5,945.79	1,890,819.507	2,751,831.131	36.196449738	-107.735928620
13,300.00	90.60	135.47	4,732.87	-4,603.92	6,015.91	1,890,748.219	2,751,901.251	36.196253709	-107.735691209
13,400.00	90.60	135.47	4,731.83	-4,675.21	6,086.03	1,890,676.931	2,751,971.372	36.196057679	-107.735453799
13,500.00	90.60	135.47	4,730.78	-4,746.49	6,156.16	1,890,605.642	2,752,041.492	36.195861649	-107.735216391
13,600.00	90.60	135.47	4,729.74	-4,817.78	6,226.28	1,890,534.354	2,752,111.612	36.195665618	-107.734978984
13,700.00	90.60	135.47	4,728.69	-4,889.07	6,296.40	1,890,463.066	2,752,181.733	36.195469587	-107.734741578
13,800.00	90.60	135.47	4,727.65	-4,960.36	6,366.52	1,890,391.778	2,752,251.853	36.195273555	-107.734504173
13,900.00	90.60	135.47	4,726.60	-5,031.65	6,436.64	1,890,320.490	2,752,321.973	36.195077523	-107.734266769
14,000.00	90.60	135.47	4,725.55	-5,102.94	6,506.76	1,890,249.202	2,752,392.094	36.194881490	-107.734029367
14,100.00	90.60	135.47	4,724.51	-5,174.22	6,576.88	1,890,177.914	2,752,462.214	36.194685457	-107.733791966
14,200.00	90.60	135.47	4,723.46	-5,245.51	6,647.00	1,890,106.625	2,752,532.334	36.194489423	-107.733554566
14,300.00	90.60	135.47	4,722.42	-5,316.80	6,717.12	1,890,035.337	2,752,602.455	36.194293389	-107.733317167

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,400.00	90.60	135.47	4,721.37	-5,388.09	6,787.24	1,889,964.049	2,752,672.575	36.194097354	-107.733079769
14,500.00	90.60	135.47	4,720.33	-5,459.38	6,857.36	1,889,892.761	2,752,742.696	36.193901319	-107.732842372
14,600.00	90.60	135.47	4,719.28	-5,530.67	6,927.48	1,889,821.473	2,752,812.816	36.193705284	-107.732604977
14,700.00	90.60	135.47	4,718.24	-5,601.95	6,997.60	1,889,750.185	2,752,882.936	36.193509248	-107.732367583
14,722.57	90.60	135.47	4,718.00	-5,618.05	7,013.43	1,889,734.094	2,752,898.763	36.193465000	-107.732314000
PBHL/TD @ 14722.57 MD 4718.00 TVD									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
G Lybrook 056 FTP 235	0.00	0.00	4,780.00	995.64	508.07	1,896,347.769	2,746,393.422	36.211650000	-107.754343000
- plan misses target center by 5.81ft at 5445.41ft MD (4774.19 TVD, 995.65 N, 508.07 E)									
- Point									
G Lybrook 056 LTP 102	0.00	0.00	4,718.00	-5,618.05	7,013.43	1,889,734.094	2,752,898.763	36.193465000	-107.732314000
- plan hits target center									
- Point									
G Lybrook 056 vs=0	0.00	0.01	4,774.00	743.64	755.95	1,896,095.766	2,746,641.297	36.210957165	-107.753503437
- plan hits target center									
- Point									
G Lybrook 056 vs=3745	0.00	0.01	4,772.00	-1,926.25	3,382.11	1,893,425.881	2,749,267.452	36.203616465	-107.744609433
- plan hits target center									
- Point									

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
350.00	350.00	13 3/8" Casing	13-5/8	17-1/2
2,812.45	2,670.00	9 5/8" Casing	9-5/8	12-1/4

Planning Report - Geographic

Database:	DB_Decv0422v16	**Local Co-ordinate Reference:**	Well Greater Lybrook Unit No. 056H
Company:	Enduring Resources LLC	**TVD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Project:	San Juan County, New Mexico NAD83 NM W	**MD Reference:**	RKB=6802+28 @ 6830.00ft (Ensign 773)
Site:	Greater Lybrook 57 Pad (53,54,55,56 & 57)	**North Reference:**	Grid
Well:	Greater Lybrook Unit No. 056H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Formations

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
414.00	414.00	Ojo Alamo		-0.03	135.47
514.00	514.00	Kirtland		-0.03	135.47
737.00	737.00	Fruitland		-0.03	135.47
1,113.40	1,112.00	Pictured Cliffs		-0.03	135.47
1,240.91	1,237.00	Lewis		-0.03	135.47
1,500.61	1,485.00	Chacra_A		-0.03	135.47
2,670.44	2,542.00	Cliff House_Basal		-0.03	135.47
2,698.18	2,567.00	Menefee		-0.03	135.47
3,790.98	3,552.00	Point Lookout		-0.03	135.47
3,962.94	3,707.00	Mancos		-0.03	135.47
4,333.88	4,042.00	MNCS_A		-0.03	135.47
4,429.13	4,132.00	MNCS_B		-0.03	135.47
4,527.77	4,227.00	MNCS_C		-0.03	135.47
4,569.43	4,267.00	MNCS_Cms		-0.03	135.47
4,714.54	4,402.00	MNCS_D		-0.03	135.47
4,869.03	4,531.00	MNCS_E		-0.03	135.47
4,947.88	4,588.00	MNCS_F		-0.03	135.47
5,067.58	4,660.00	MNCS_G		-0.03	135.47
5,161.87	4,707.00	MNCS_H		-0.03	135.47
5,301.42	4,757.00	MNCS_I @ 0VS		-0.03	135.47

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
800.00	800.00	0.00	0.00	KOP Begin 3°/100' build
1,655.44	1,627.12	188.38	-2.67	Begin 25.66° tangent
4,285.60	3,997.83	1,327.33	-18.82	Begin 10°/100' drop build/turn
5,082.13	4,667.43	1,239.25	268.44	Begin 60.00° tangent
5,142.13	4,697.43	1,202.21	304.88	Begin 10°/100' build
5,442.44	4,774.19	997.76	505.99	Begin 90.03° lateral
9,543.89	4,772.00	-1,926.25	3,382.11	Begin 2°/100' build
9,572.31	4,771.84	-1,946.51	3,402.04	Begin 90.60° lateral
14,722.57	4,718.00	-5,618.05	7,013.43	PBHL/TD @ 14722.57 MD 4718.00 TVD

WELL NAME: **GREATER LYBROOK UNIT 056H**

OBJECTIVE: **Drill, complete, and equip single lateral in the Mancos-I formation**

API Number: *not yet assigned*

AFE Number: *not yet assigned*

ER Well Number: *not yet assigned*

State: New Mexico

County: San Juan

Surface Elev.:	6,802	ft ASL (GL)	6,815	ft ASL (KB)		
Surface Location:	23-23N-09W	Sec-Twn- Rng	1,365	ft FSL	2,007	ft FEL
BH Location:	25-23N-09W	Sec-Twn- Rng	1029	ft FSL	236	ft FEL

Driving Directions: ***FROM THE INTERSECTION OF US HWY 550 & US HWY 64 IN BLOOMFIELD, NM:***

South on US Hwy 550 for 38.3 miles to MM 113.4, Right (Southwest) on CR #7890 for 0.8 miles to fork, Left (South) remaining on CR #7890 for 1.3 miles to 4-way intersection, Left (Southeast) remaining on CR #7890 for 1.2 miles to 4-way intersection; Right (West) exiting CR #7890 along existing roadway for 0.6 mile to fork; Right (Northwest) for 0.3 miles to new access road; Left on access road for 0.2 miles to W LYBROOK UNIT 772H PAD (772H, 773H, 774H, 775H, 776H wells).

QUICK REFERENCE		
Sur TD (MD)	350	ft
Int TD (MD)	2,812	ft
KOP (MD)	4,291	ft
KOP (TVD)	4,004	ft
Target (TVD)	4,780	ft
Curve BUR	10	°/100 ft
POE (MD)	5,451	ft
TD (MD)	14,728	ft
Lat Len (ft)	9,277	ft

WELL CONSTRUCTION SUMMARY:

	Hole (in)	TD MD (ft)	Csg (in)	Csg (lb/ft)	Csg (grade)	Csg (conn)	Csg Top (ft)	Csg Bot (ft)
Surface	17.500	350	13.375	54.5	J-55	BTC	0	350
Intermediate	12.250	2,812	9.625	36.0	J-55	LTC	0	2,812
Production	8.500	14,728	5.500	17.0	P-110	LTC	0	14,728

CEMENT PROPERTIES SUMMARY:

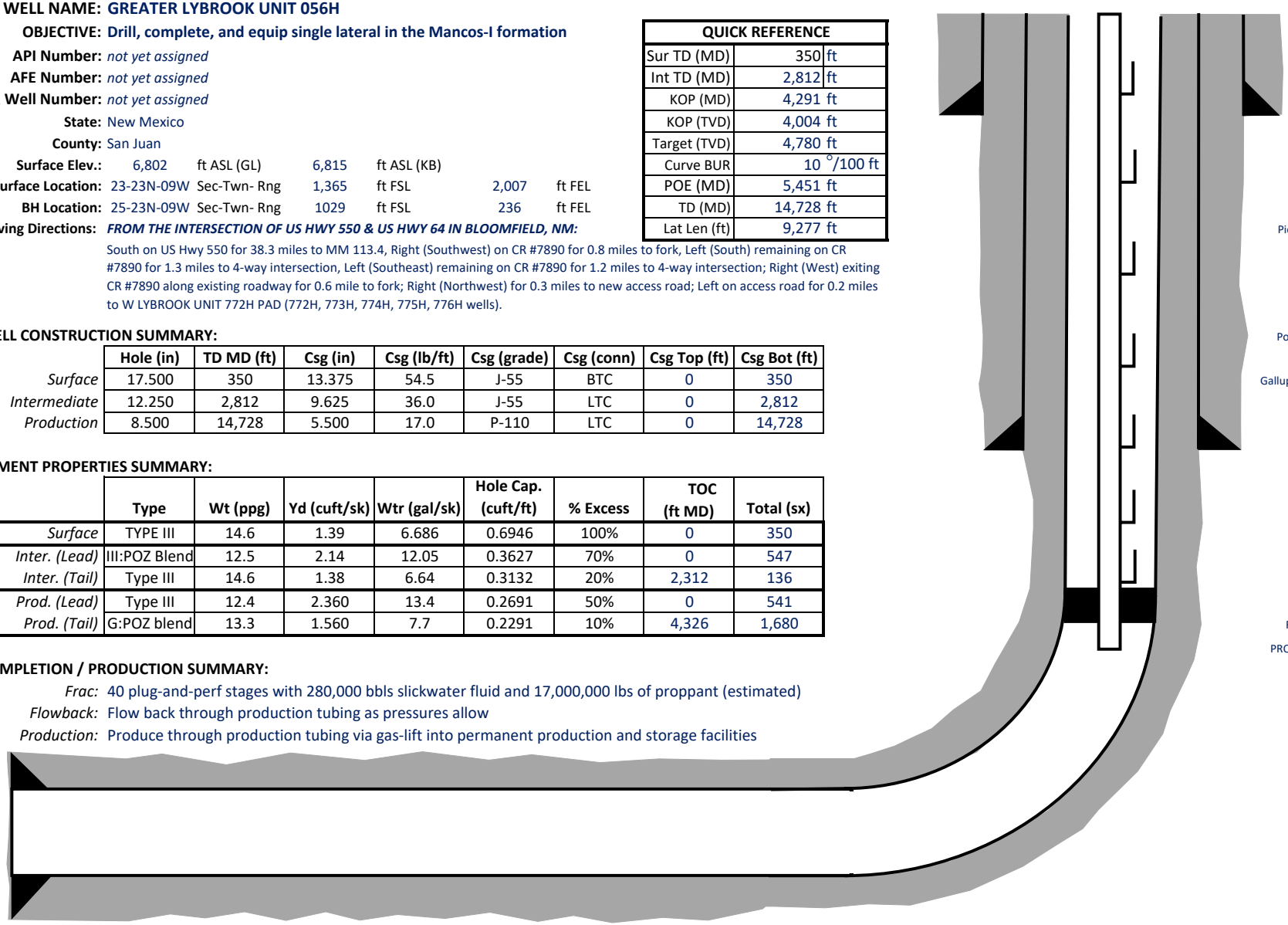
	Type	Wt (ppg)	Yd (cuft/sk)	Wtr (gal/sk)	Hole Cap. (cuft/ft)	% Excess	TOC (ft MD)	Total (sx)
Surface	TYPE III	14.6	1.39	6.686	0.6946	100%	0	350
Inter. (Lead)	III:POZ Blend	12.5	2.14	12.05	0.3627	70%	0	547
Inter. (Tail)	Type III	14.6	1.38	6.64	0.3132	20%	2,312	136
Prod. (Lead)	Type III	12.4	2.360	13.4	0.2691	50%	0	541
Prod. (Tail)	G:POZ blend	13.3	1.560	7.7	0.2291	10%	4,326	1,680

COMPLETION / PRODUCTION SUMMARY:

Frac: 40 plug-and-perf stages with 280,000 bbls slickwater fluid and 17,000,000 lbs of proppant (estimated)

Flowback: Flow back through production tubing as pressures allow

Production: Produce through production tubing via gas-lift into permanent production and storage facilities

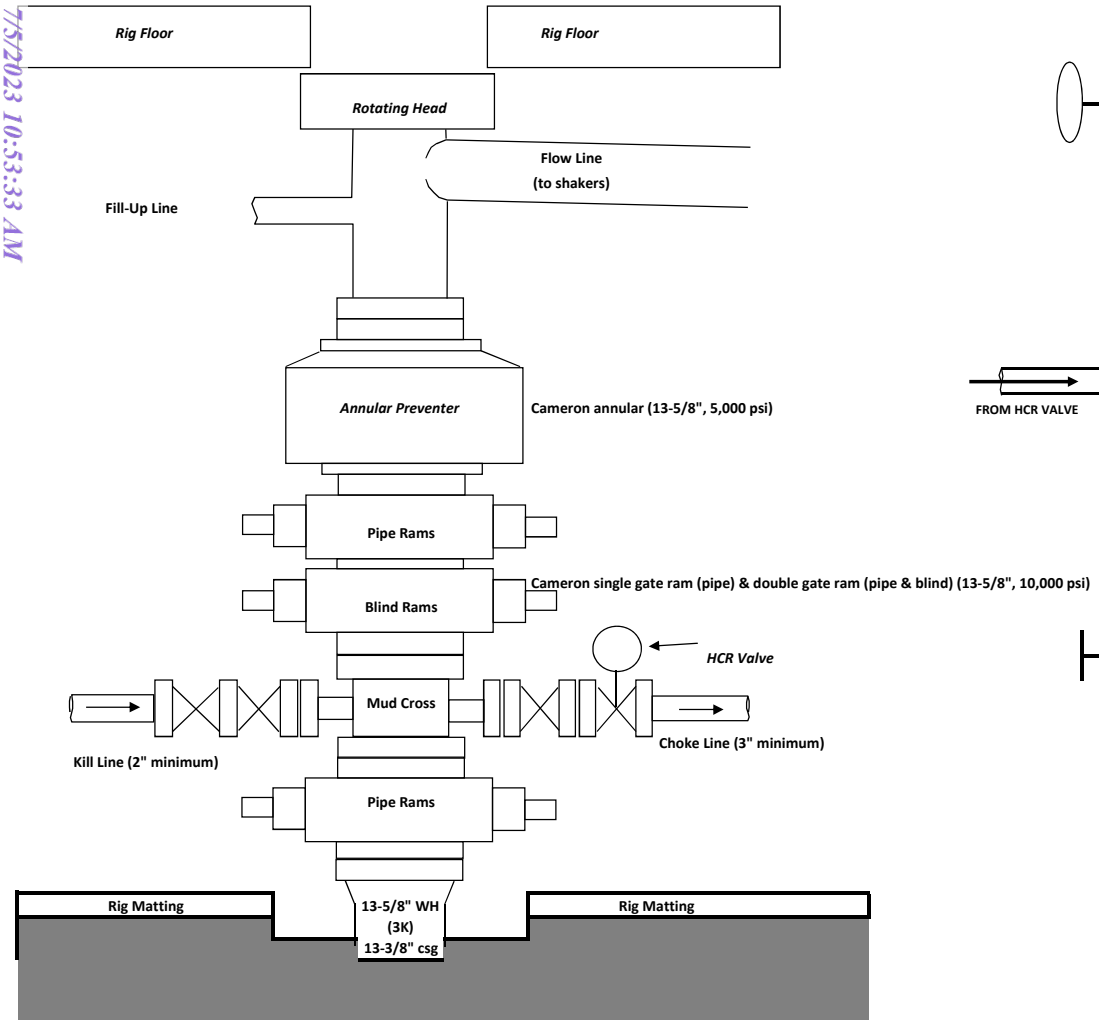


Tops	TVD (ft KB)	MD (ft KB)
Ojo Alamo	417	417
Kirtland	520	520
Fruitland	720	720
Pictured Cliffs	1,100	1,101
Lewis	1,222	1,226
Chacra	1,491	1,507
Cliff House	2,548	2,676
Menefee	2,573	2,704
Point Lookout	3,530	3,765
Mancos	3,675	3,926
Gallup (MNCS_A)	4,035	4,326
MNCS_B	4,146	4,443
MNCS_C	4,236	4,536
MNCS_Cms	4,276	4,578
MNCS_D	4,425	4,740
MNCS_E	4,540	4,878
MNCS_F	4,603	4,966
MNCS_G	4,674	5,089
MNCS_H	4,719	5,181
MNCS_I	4,763	5,307
FTP TARGET	4,780	5,451
PROJECTED TD	4,727	14,728

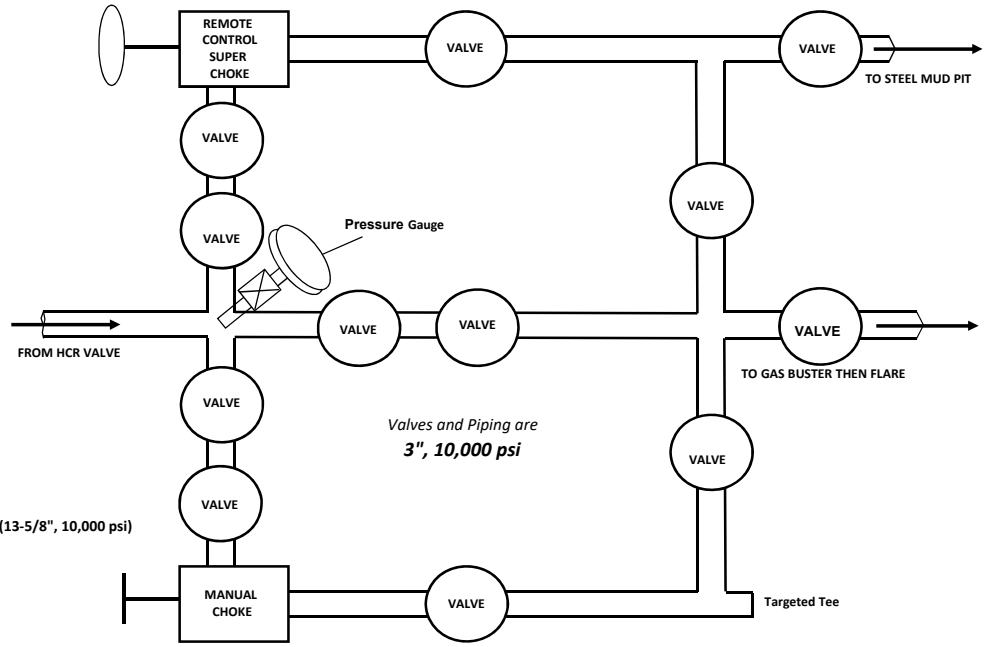
BOPE & CHOKE MANIFOLD DIAGRAMS

NOTE: EXACT BOPE AND CHOKE CONFIRGURATION AND COMPONENTS MAY DIFFER FROM WHAT IS DEPICTED IN THE DIGRAMS BELOW DEPENDING ON THE RIG AND ITS ASSOCIATED EQUIPMENT. RAM PREVENTERS, ANNULAR PREVENTERS, AND CHOKE MANIFOLD AND COMPONENTS WILL BE RATED TO 3,000 PSI MINIMUM.

BOPE



CHOKE MANIFOLD



District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 234630

CONDITIONS

Operator: ENDURING RESOURCES, LLC 6300 S Syracuse Way, Suite 525 Centennial, CO 80111	OGRID: 372286
	Action Number: 234630
	Action Type: [C-101] BLM - Federal/Indian Land Lease (Form 3160-3)

CONDITIONS

Created By	Condition	Condition Date
ward.rikala	Notify OCD 24 hours prior to casing & cement	7/5/2023
ward.rikala	Will require a File As Drilled C-102 and a Directional Survey with the C-104	7/5/2023
ward.rikala	Once the well is spud, to prevent ground water contamination through whole or partial conduits from the surface, the operator shall drill without interruption through the fresh water zone or zones and shall immediately set in cement the water protection string	7/5/2023
ward.rikala	Cement is required to circulate on both surface and intermediate1 strings of casing	7/5/2023
ward.rikala	Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system	7/5/2023