Supplemental Environmental Assessment

for

Thurston Energy, LLC Proposed
Ouray National Wildlife Refuge 2-Well Development Program
in Uintah County, Utah

U.S. Department of Interior
Fish & Wildlife Service
Interior Regions 5 and 7
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Note to Readers

The following Supplemental Environmental Assessment (SEA) for the Thurston Energy 2-Well Proposal (originally released for review in January 2015) was prepared in response to a change in application by the project proponents Thurston Energy LLC (Thurston). In a Special Use Permit (SUP) application submitted on August 8, 2018 Thurston proposed the following modifications to their original proposal:

- Construction of two (2) well pads, each 2.55 acres in size within an average disturbed area of 3.2 acres (versus two (2) well pads, each 1.66 acres in size within an average disturbed area of 2.2 acres plus a produced fluid treatment and tank battery pad of 1.38 acres within a disturbed area of 1.81 acres on top of the bluff within the Ouray NWR under the Approved Action (AA). Increased size of well pads to accommodate tank batteries, produced fluid treatment equipment, and turn around for tanker trucks;
- Construction of approximately 420 feet of new access road (versus 597.6 feet under AA);
- Installation of 7,216 feet of 3-inch surface, high-density polyethylene (HDPE) natural gas pipeline laid by hand from the nearest gas gathering trunk line on top of the bluff within the Ouray NWR to the well pads (versus 7,131 feet of bundled, 8-inch, surface, HDPE, heat-traced, 3-phase [mixed oil, gas, and water] production pipeline under AA). Change mandated by lack of sufficient margin of safety for the long-term use of the bundled, 8-inch, heat traced, HDPE pipe product operated at its maximum allowable manufacturer-rated pressure for crude oil service due to the elevation difference between the wells and the produced fluid treatment and tank battery pad on top of the bluff;
- Elimination of approximately 9,768 feet of overhead electric power lines under AA;
- Tank Batteries and produced fluid treatment equipment would be placed on the well pads in accordance with Best Management Practices for the Three Rivers field (versus located on a separate produced fluid treatment and tank battery pad on top of the bluff within the Ouray NWR under AA);
- Approximately 1-4 tanker trucks on Refuge/NFH roadway daily during 30-40 year production phase generally declining with time (versus no tanker traffic following construction and development under AA).

Much of the original National Environmental Policy Act (NEPA) analysis is still appropriate; so the majority of the 2015 EA was Incorporated By Reference as denoted by (IBR) in the text. To more clearly demonstrate the effects of the modifications, only those sections impacted by the change in application were expanded, allowing the reader to focus more clearly on the new analysis. For comparison, the original EA has been appended in this SEA (Appendix 1).

The original EA format and Table of Contents were retained to allow the reader to more easily compare the two documents. The one notable change is that the proposed action from the original EA became the approved action in this SEA. The section reserved for the No Action Alternative was used to present the proposed action; thus, the comparison is between the approved action and the Thurston proposed modification. In the evaluation of Environmental Consequences (Ch. 4), each section begins with a discussion of the effects under the approved action, followed by the differences under the proposed action, followed by the cumulative effects analysis and mitigation measures, respectively. Where there was no substantive change, the section was left blank and denoted by IBR. Mitigation measures and associated best management practices were compiled and presented in appendix B, Conservation Measures. We hope that this leads to a better understanding of the impacts associated with the modified proposal and a more clear understanding of the effects to the human environment.

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APPENDICES

Appendix A Final Environmental Assessment & Biological Assessment for Thurston Energy, LLC Proposed Ouray National Wildlife Refuge 2-Well Development Program in Uintah County, Utah (January, 2015)
Appendix B List of Conservation Measures
Appendix C Thurston Energy, LLC's Surface Use Plan of Operations (SUPO)
Appendix D Response to Comments received during Public Review
Appendix E Final Conformity Analysis
Appendix F Final Biological Opinion

1.0 INTRODUCTION

The U.S. Fish and Wildlife Service (USFWS) Refuge Planning Division (Service) prepared an Environmental Assessment (EA) and Biological Assessment (BA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations to analyze proposed oil and natural gas development by Thurston Energy, LLC (Thurston) within the Ouray National Wildlife Refuge (NWR or Refuge) boundary. The proposed oil and gas exploration and development project was approved on February 5, 2015. The associated EA and Finding of No Significant Impact (FONSI) disclosed the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and Alternatives, including the No Action Alternative.

A five year special use permit was issued for the project on April 22, 2015 and no action was taken by the project proponent, until August 8, 2018. On that date, Thurston resubmitted their Special Use Permit (SUP) application with modifications to the proposed scope of work. Most noteworthy were an expansion of well pad area to accommodate an on-site tank battery on each pad and use of the Refuge/National Fish Hatchery (NFH) Road to remove produced fluids during the 30 to 40year production phase of operation within the 33 to 43 life of project (LOP) to include reclamation and revegetation. Through coordination with the USFWS Utah Field Office and the FWS Regional Office in Lakewood, CO, it was decided that the proposed modifications warrant preparation of a supplemental EA (SEA) to determine appropriate conservation measures for species listed under the Endangered Species Act. To streamline document preparation, sections of the original, 2015 EA that will not be affected by the proposed modification will be incorporated by reference and the reader is referred to the original document to examine those sections (Appendix A). Only sections or parts of sections altered by the proposed modification will be addressed in this SEA. To ensure document continuity, the original document outline will be retained; chapters and subsections that were not modified will be denoted with Incorporated By Reference (IBR).

The SEA provides evidence for determining whether a new "Finding of No Significant Impact" (FONSI) will be prepared or whether an Environmental Impact Statement (EIS) will be required. The FONSI will briefly present the reasons why implementation of the Proposed Action or an Alternative would not result in "significant" environmental impacts. If the Service decision maker determines that this project has no "significant" impacts following the analysis in the SEA, a Decision Record (DR) and FONSI would be prepared that approve the selected alternative or combination of alternatives. If the project is found to have "significant" impacts, Thurston would have the option of either pursuing the original stipulations outlined in the 2015 EA/FONSI or an EIS would be prepared.

1.1 Ouray National Wildlife Refuge

IBR

1.2 Background

The Service is evaluating proposal modifications submitted by Thurston on August 8, 2018 to drill and operate two exploratory oil and natural gas wells, construct associated well pads, pipelines and access roads, and upgrade and maintain existing access roads within Ouray NWR. The project is located approximately 32 miles southwest of Vernal in northeastern Utah. The Project Area consists of approximately 3,684 acres on federal lands administered by the Service. Mineral rights for the proposed project underlying Refuge lands are owned by the State of Utah, which is administered by the School and Institutional Trust Land Administration (SITLA).

The federal government owns or leases the surface estate of the Refuge (including all surface and subsurface natural resources not considered to be minerals), and it is administered by the Service as part of the National Wildlife Refuge System (NWRS) pursuant to the NWRS Administration Act (NWRSAA) of 1997, and other applicable laws and regulations. As the surface owner, the Service has a responsibility to protect the surface estate of the Refuge and its associated resources. The Service policy (612 FW 2.7(c), USFWS 2012a) requires that the Refuge is protected from all unnecessary damage resulting from oil and gas activities. Thus, the Service has the responsibility to require protective measures to ensure that the surface estate (including all surface and subsurface natural resources not considered to be minerals) of the Refuge and associated cultural, socioeconomic, and aesthetic resources are not unreasonably impacted by Thurston's proposed activities.

Table 1-1. Proposed Well Locations and Mineral Leases

Well	Surface Location	Mineral Lease	Lease Stipulations
Thurston 11-31-7-21	LOT 7 SEC 31,T7S, R21E 2295' FSL, 1722' FWL	52016 (state)	Standard terms and conditions
Thurston 12-31-7-21	LOT 8 SEC 31, T7S, R21E 1995' FSL, 639' FWL	52016 (state)	Standard terms and conditions

1.3 Purpose and Need

The purpose of the Proposed Action is to provide Thurston access to and allow for the exploration of leased mineral rights and commence construction and operations to ascertain whether sufficient oil and gas resources exist to commence commercial production of those resources; and if so, to proceed with production. The need for the Proposed Action allows Thurston to exercise its rights under 50 CFR 29 Subpart D Management of Non-Federal Oil and Gas Rights, to explore non-federally owned minerals underlying federal lands.. The Service is required to respond to the Proposed Action and develop a range of "reasonable alternatives" and/or conservation measures that would meet the Service's requirements for environmental protection under NEPA and the Ouray NWR Comprehensive Conservation Plan (CCP) (USFWS 2000a), while at the same time recognizing a mineral owner's vested right to access and explore the oil and gas mineral estate.

1.4 Decision Framework

This SEA has been prepared to comply with NEPA, the Council on Environmental Quality (CEQ) regulations 40 CFR 1500-1508. This SEA discloses the potential environmental consequences associated with Thurston's proposed modification to their plan to drill and operate up to two oil and natural gas wells and construct associated infrastructure on federal surface and state mineral leases in the Ouray NWR. This SEA has been prepared for a 30-day public review and comment period.

1.5 Relation to Statutes, Regulations, and Other Plans

IBR

1.6 Public Scoping

IBR

2.0 PROPOSED ACTION AND ALTERNATIVES

In the 2015 EA, Alternative A was Thurston's Proposed Action for oil and gas development. The Service identified Alternative A as the agency preferred alternative because it best addressed issues raised in scoping about potential impacts to resources while meeting the purpose and need for the Project. Alternative A also incorporated additional conservation measures to protect Refuge resources. Because it was approved in 2015, the approved action (Alternative A) essentially becomes the no action alternative for this SEA. Thus, in this analysis, we will only examine the modifications to the Approved Action in the August 8, 2018 SUP application submitted by Thurston.

Seven additional action alternatives were initially identified. However, after preliminary screening, all seven were eliminated from further consideration because they clearly were incapable of meeting the needs of the proposed project.

- Alternative C – 4-Well Development
- Alternative D – Alternate Pipeline Route 1
- Alternative E – Alternative Pipeline Route 2
- Alternative F – Directional Drilling.
- Alternative G – Seasonal Restrictions Alternative
- Alternative H – Land Exchange Alternative
- Alternative I – Lease Buyout Alternative

Because the original EA evaluated the No Action, the proposed action, and the preceding action alternatives eliminated from further analysis, the following SEA will only consider modifications to the approved action. For clarity, the elements of the approved action will remain in the text of this SEA (the original EA and agreed upon conservation measures will be included as Appendices A and B, respectively); however, throughout the remainder of the document, an attempt will be made to remove redundant information and provide the reader with a concise description of the effects associated with Thurston's, proposed changes.

2.1 Alternative A – Approved Action (No Action Alternative)

Thurston proposes to drill, complete, produce, and reclaim two oil and gas wells located within the Ouray NWR. The proposed wells would target the Green River and Wasatch formations and would require construction and maintenance of associated access roads and crude oil, natural gas and produced water pipelines. Thurston understands that access to Refuge lands will be contingent upon the Service's issuance of a SUP, subject to approval of Service terms and conditions (i.e., approval of Plan of Operations, mitigation plans, road maintenance agreement, etc.). A copy of Thurston's Surface Use Plan of Operations (SUPO) is provided in **Appendix C.**

Specifically, Thurston's Approved Action includes the following primary components:

- Construction of two (2) well pads, each averaging approximately 1.66 acres in size in a total disturbed area of 4.32 acres;
- Construction of approximately 513.1 feet of new access road to the wells and 84.5 feet of new access road to the produced fluid treatment and tank battery pad;
- Well-testing to evaluate the development potential of the lease; and if determined to be of commercial value install long-term production facilities

- Installation of 7,131 feet of bundled, 8-inch outside diameter, surface, high density polyethylene (HDPE), heat-traced pipeline for the transport of mixed natural gas, crude oil, and produced water (3-phase service) from the wells to the proposed produced fluid treatment and tank battery pad on top of the bluff within the Ouray NWR;

- Construction of a produced fluid treatment and tank battery pad approximately 1.38 acres in size within a disturbed area of 1.81 acres on top of the bluff within the Ouray NWR near its western boundary;

- Installation of approximately 85 feet of 3-inch outside diameter HDPE pipeline for transport of natural gas from the separator and dehydrator on the produced fluid treatment and tank battery pad to the connection point on nearest gas gathering pipeline system on top of the bluff within the Ouray NWR; and

- Construction of approximately 9,768 feet of overhead electric power lines.

Figure 2-1 depicts the proposed locations of the wells and infrastructure associated with the proposed project. The proposed wells would be drilled vertically to total depths of approximately 7,000 feet. Although actual operations are subject to change as conditions warrant, Thurston plans to drill the two wells over a oneyear period. The anticipated life of an individual well is 30 to 40 years, and the anticipated time needed for field abandonment and final reclamation is three years. Therefore, the anticipated life of the project (LOP) under the Surface Use Plan of Operations (SUPO) would be 33 to 43 years.

The timeframe for annual construction, drilling, and completion activities would depend on permit approval and compliance with relevant seasonal restrictions.

Included in the Proposed Action are a range of Best Management Practices (BMPs) and conservation measures that would be implemented to avoid, minimize, or offset potential adverse impacts to surface and subsurface resources (see **Section 2.1.10**).

The proposed location of the new well pads reflects the results of an onsite visit conducted by Thurston and representatives from the Service on September 17, 2013. The primary purpose of the onsite inspection was to assess potential resource impacts associated with the construction of the well pads, access roads, and pipeline corridor(s).

Figure 2-2 identifies project activities, components of the Proposed Action including well pads, access roads, surface pipeline routes, power lines, the completed cactus surveys delineated and identified by date, and habitat locations for cacti, Yellow-billed cuckoo, and two of the Colorado River Fish species.

Proposed surface locations depicted in **Figure 2-1** were chosen with consideration of factors such as topography, subsurface geologic conditions, sensitive wildlife and vegetation habitat, and other site-specific conditions. Surface disturbance anticipated under the Approved Action is shown in **Table 2-1**. Short-term surface disturbance would occur during and immediately after the construction, drilling, completion, and testing activities. Prior to interim reclamation, short-term surface disturbance for well pads and new access roads would equal approximately 4.74 acres. Surface disturbance would also occur during and immediately after the construction of the produced fluid treatment and tank battery pad and new access road affecting approximately 1.88 acres. Those portions of the well pads and access road ROWs not needed for production operations would be reclaimed within one to two growing seasons. The remaining surface disturbance excluding the surface pipeline would be long-term disturbance of approximately 4.79 acres for the 33 to 43

year LOP. Long-term disturbance from the well pads and new access roads equates to approximately 0.13 percent of the total acreage within the Project Area.

Figure 2-1. Thurston 2-Well Development Approved Action

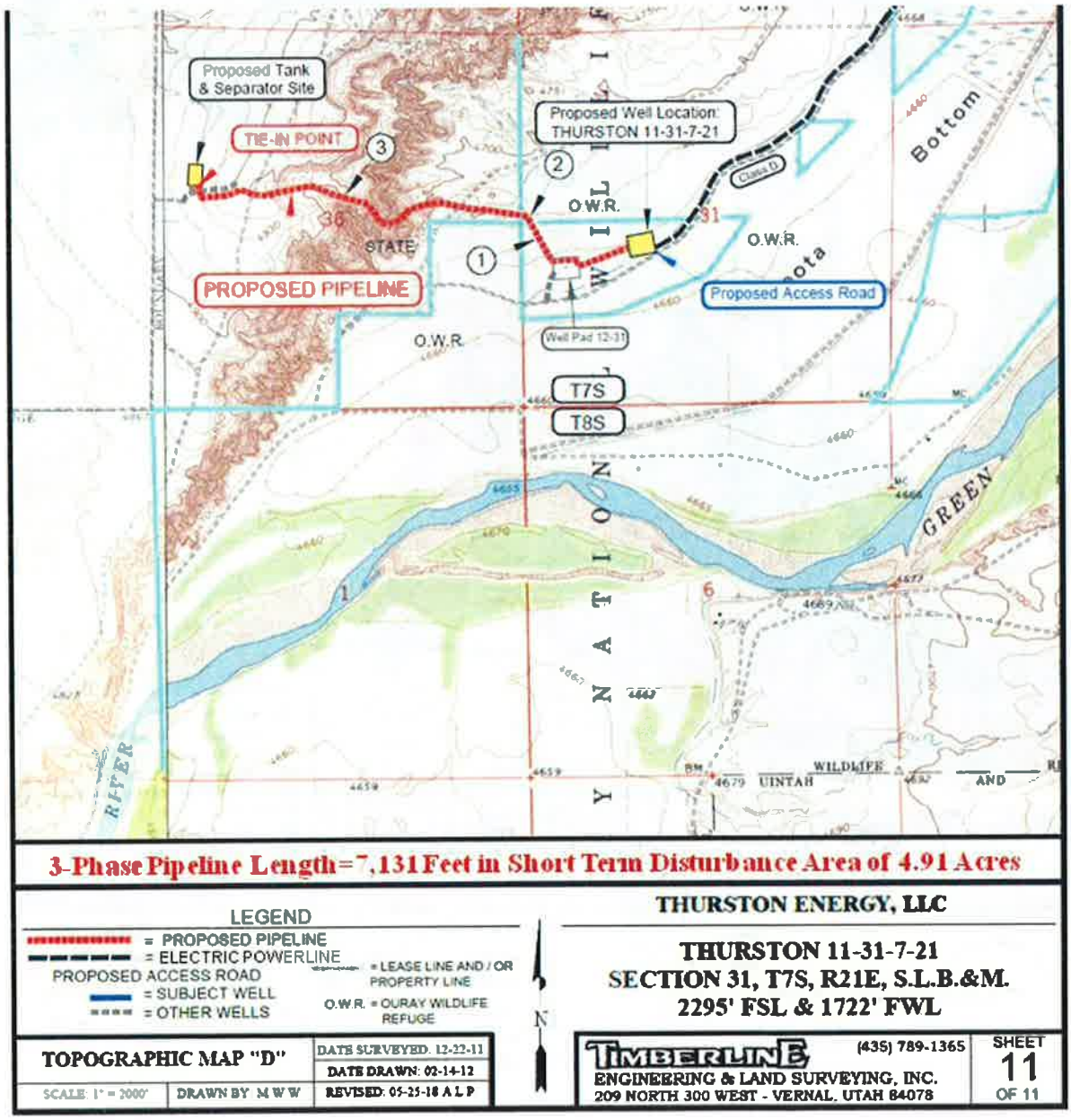


Figure 2-2. Critical Habitat Map

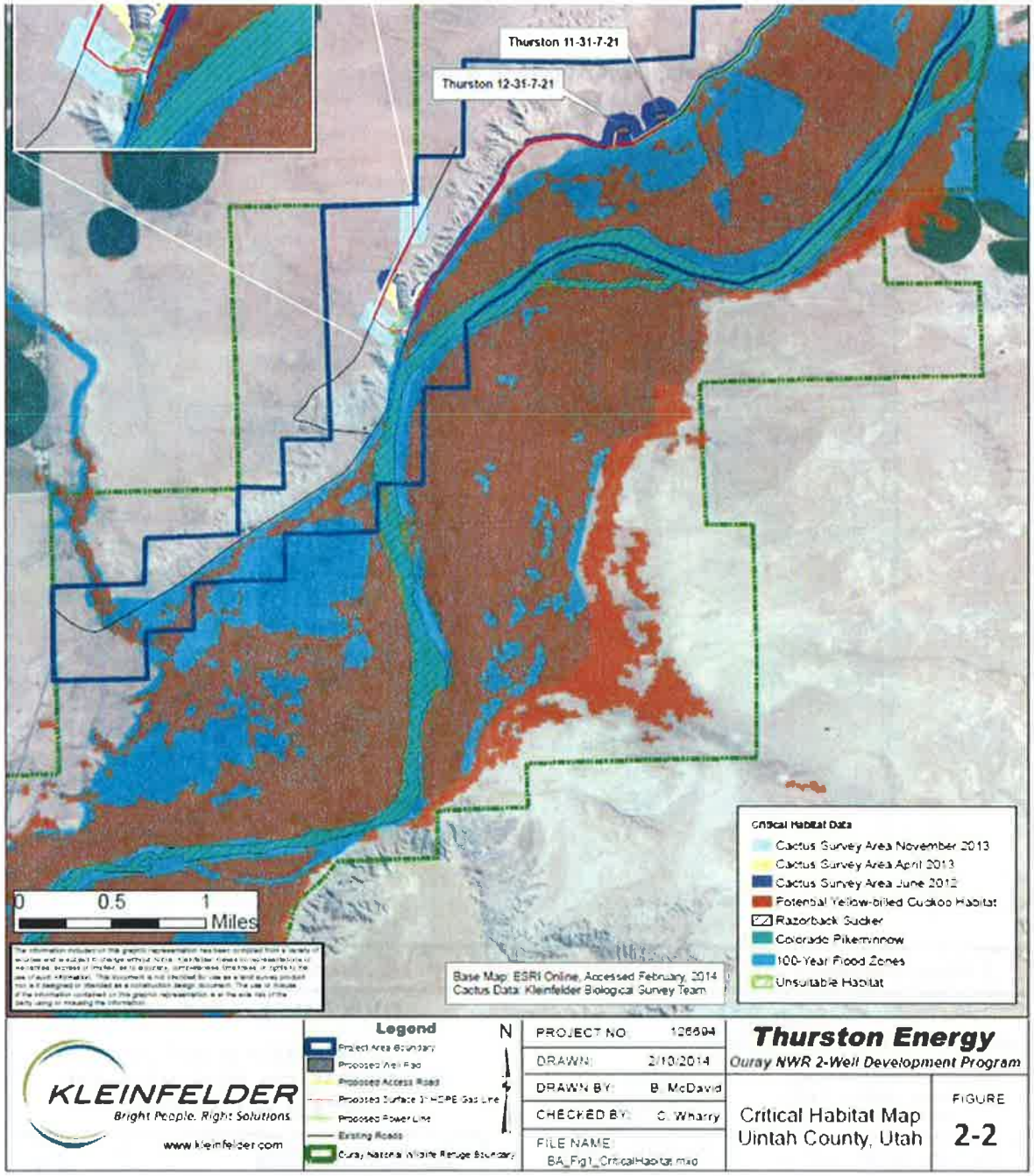


Table 2-1. Estimated Disturbance of Project Facilities under the Approved Action

Project Feature	Quantity or Feet	Short-term (disturbance width[feet] or acres/facility)	Short-term Surface Disturbance (acres)	Long-term (disturbance width[feet] or acres/facility)	Long-term Surface Disturbance (acres)
Well Pads					
Thurston 11-31-7-21	1	1.66 acres	2.32	1	1.62
Thurston 12-31-7-21	1	1.66 acres	2.0	1	1.11
Subtotal	***2***	***3.32 acres***	***4.32***	***2***	***2.73***
Access Roads					
New Roads to Wells	513.1 feet	36 feet	0.42	18 feet	0.21
New Road to Tank Pad	84.5 feet	36 feet	0.07	18 feet	0.04
Subtotal	***597.6 feet***	--	***0.49***	--	***0.25***
Pipelines					
8-inch Surface HDPE 3-Phase Pipeline	7,131 feet	30 feet	4.91	10 feet	1.64
3-inch Surface HDPE Natural Gas Sales Line	85	30 feet	.06	10 feet	.02
Subtotal	***7,216 feet***	--	***4.97***	--	***1.66***
Support Facility					
Treatment/Tank Pad	1	1.38 acres	1.81	1	1.81
Subtotal	***1***	***1.38 acres***	***1.81***	***1***	***1.81***
Power Line					
Overhead Electric Power Line	9,768 feet	--	--	--	--
Subtotal	9,768 feet	--	--	--	--
Total New Disturbance	--	--	**11.59**	--	**6.45**

Assumptions: The working area for installation of a surface pipeline of similar diameter is typically 30' in width and permanent ROW width of 30'. The access roads for the well sites and tank pad are typically designed with a finished running surface 18' in width in a total disturbed width of 36' and permanent ROW width of 30'.

The life cycle of an individual well and its associated facilities/required infrastructure (e.g., roads and pipelines) is composed of six primary phases: (1) construction, (2) well drilling, (3) well completion and testing, (4) interim reclamation, (5) production and maintenance, and (6) final reclamation and abandonment. Specific details of these six primary phases are described in the following sections.

2.1.1 Construction Activities

Construction activities would follow procedures specified by the Service, as well as other applicable industry standards and governmental guidelines, such as the BLM/U.S. Forest Service (USFS) publication, Surface Operating Standards for Oil and Gas Exploration and Development, the "Gold Book" (USDI-USDA 2007 as revised). Well construction would be designed based on these Gold Book standards, which are implemented to support well integrity and reduce future unforeseeable releases. All surface disturbing activities would be supervised by a qualified Thurston representative who is familiar with the conservation

measures defined in the SUPO and Decision Record (DR) for this EA, Application for the state permit to drill (APD), and right-of-way (ROW) permit with the Service Realty Division. The Service could implement additional site-specific conservation measures as necessary.

2.1.1.1 Well Pads

Prior to well pad construction or surface disturbing activities, Thurston would obtain approval of an APD by the appropriate Utah Division of Oil, Gas and Mining (UDOGM) Authorized Officer (AO) for the lease. The APD would contain site-specific Conditions of Approval (COA) that would apply to construction and well operations.

Well pad construction would typically begin with stripping and stockpiling topsoil. The top 4 to 6 inches of topsoil material suitable for plant growth would be removed from areas to be disturbed and stockpiled for eventual use in reclamation. Vegetation removed from the disturbed area would be re-spread to provide protection, nutrient recycling, and a seed source for reclamation.

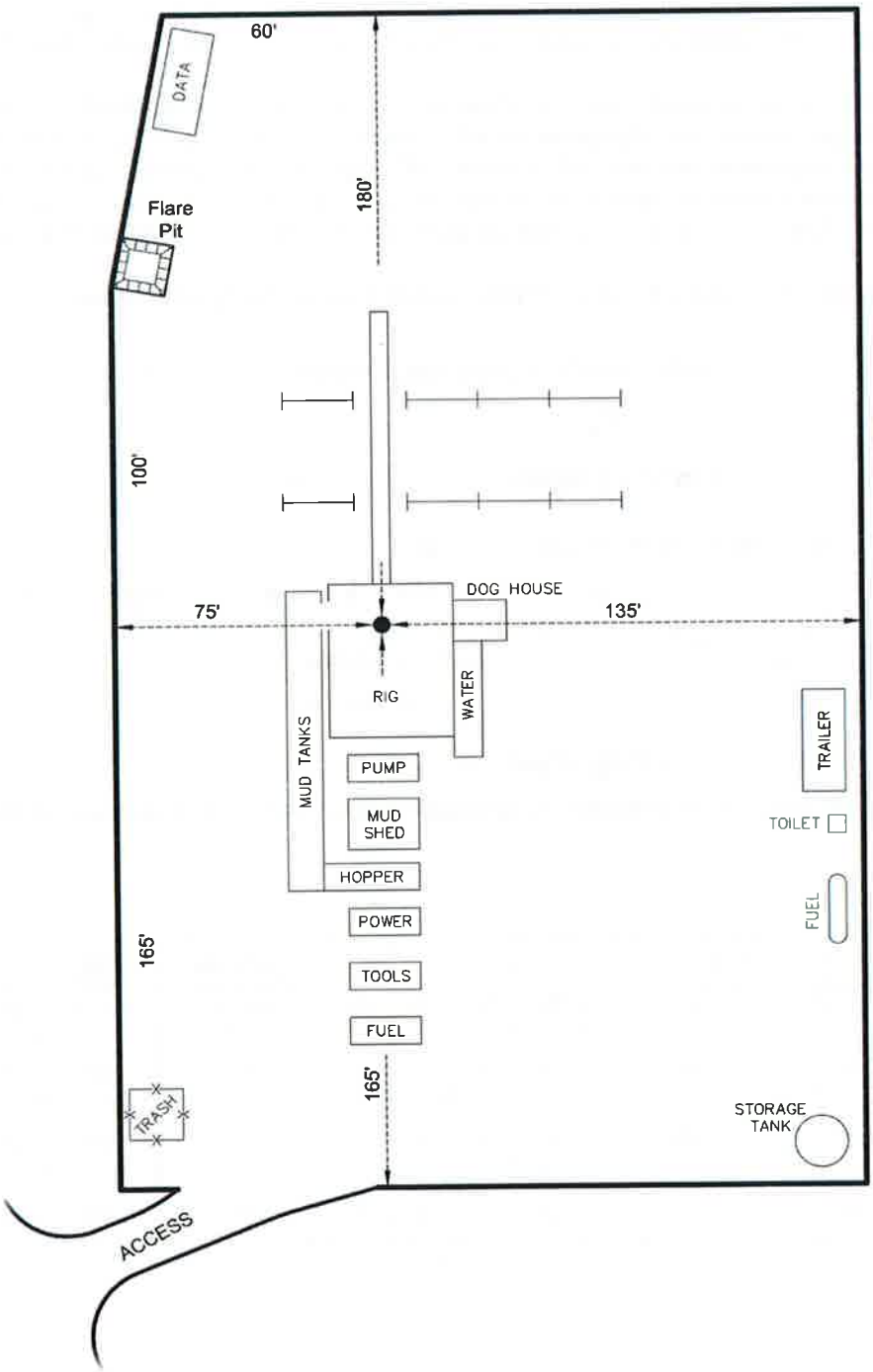
Following vegetation and topsoil removal, each well pad would be constructed using standard cut-and-fill techniques to create a level pad for the drill rig and graded surface for the support equipment. Thurston would employ the use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps, and broad-based drainage dips or low water crossings as necessary and appropriate to minimize erosion and surface runoff during pad construction and operation activities. Earthen berms approximately 12 inches in height would be constructed using excess material from pad construction around each well pad. Each berm would be lined with an impermeable liner. Runoff from undisturbed areas around the well pad would be directed into ditches and energy dissipaters (if needed) around the site and then released to grade, which is consistent with Utah Division of Water Quality (UDWQ) BMPs for stormwater. Stormwater management efforts may include additional engineering measures such as the installation of culverts to divert water flow away as needed. With associated cut-and-fill slopes, each well pad would be constructed to average dimensions of approximately 210 x 345 feet (1.66 acres in size).

Once the pad has been leveled and graded, it would be compacted to establish a level and solid foundation for the drilling rig. Completing the site preparation process will require approximately 3 to 4 days on average.

Primary surface equipment to be installed at each well pad would include a drilling rig, mud tank, dog house flare pit, pipe racks, pump house, trailers, water storage tanks, cuttings storage bins, and generators. The typical layout for a single well pad for the development phase is illustrated in **Figure 2-3**. If the well is productive, interim reclamation would occur within 90 days of completion of the last well drilled on the well pad. Topsoil reserved for interim reclamation and previously stockpiled along the edges of the well pad would be re-spread across the disturbed area. The area would then be seeded with a seed mixture prescribed by the Service. Interim reclamation would result in an estimated 40-60 percent reduction in well pad size to about 1.2 acres over the productive life of the wells (approximately 30 to 40 years).

The two proposed wells to be drilled would use a closed-loop mud and drill cuttings system that would eliminate the need for a reserve pit. Drill cutting and fluids will be temporarily stored in tanks and then removed from the Refuge.

Figure 2-3. Typical Approved Action Development Phase Well Pad Layout

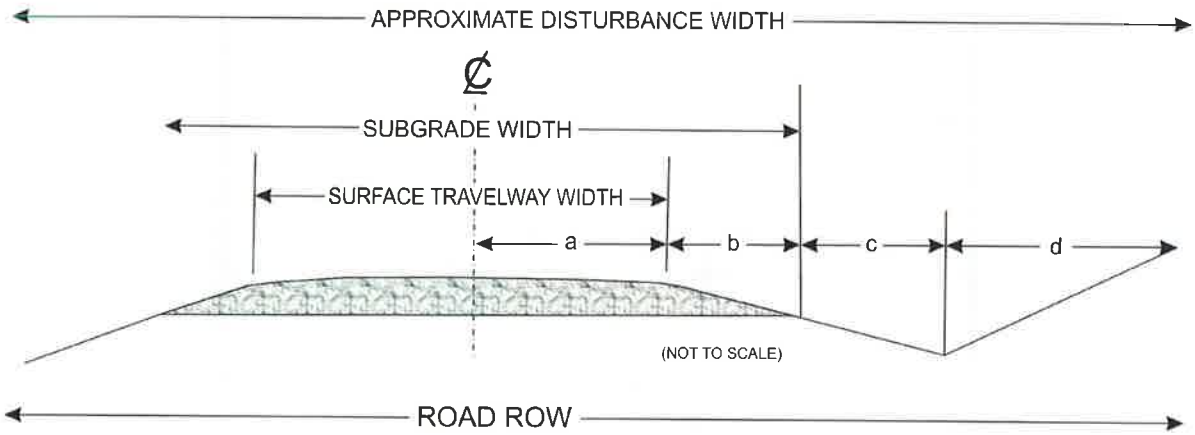


2.1.1.2 Access Roads

A network of roads already exists within the Project Area. These roads would be used as-is or upgraded where acceptable for access to well pads. New roads would be constructed only where necessary because they have been sited and designed to minimize disturbances and maximize transportation efficiency. New roads would be built and maintained to provide year-round access, as needed. Bulldozers, graders, and other types of heavy equipment would be used to construct and maintain the access road and the refuge/NFH road.

All new access roads would be constructed out of native material and to the standards outlined in the "*Gold Book.*." This publication provides practices and standards to guide compliance with all applicable agency policies, operating guidelines, and BMPs. After APD approval, standard cut-and-fill construction methods and construction equipment (such as crawler tractors, graders, and scrapers) would be used to construct new roads. A typical roadway cross-section with width specifications is shown in **Figure 2-4.**

Figure 2-4. Typical Roadway Cross-section with Width Specifications



a: half-width of surface travel-way b: shoulder c: drainage ditch foreslope d: drainage ditch backslope

	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft.)	a (ft.)	b (ft.)	c (ft.)	d (ft.)	Approximate Disturbance Width (ft.)	Total ROW Width (ft.)	Design Speed (mph)
Resource Road	16	12	6	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

The standard methodology for building new roads involves the use of a crawler tractor or track hoe to clear vegetation and topsoil materials from the road surface. Both materials would be windrowed for future redistribution during reclamation. All roads would be constructed with appropriate and adequate drainage and erosion control features where appropriate (e.g., cut-and-fill slope and drainage ditch stabilization, relief and drainage culverts, wing ditches, and rip-rap). Where needed, road base or gravel would be placed on upgraded and newly-constructed roads to provide a stable travel-way surface. Aggregate for road surfacing would be obtained from existing permitted sources. Aggregate would be weed free and of sufficient size, type, and amount to allow all weather access and to help minimize fugitive dust.

Safety, sight distance, grade, topography, anticipated traffic flow, and visual resource management concerns would be considered in determining the optimal road width of specific road segments. Roads would be crowned (two to three percent), ditched, and constructed to meet the anticipated traffic flow and provide a well-constructed and safe travel-way surface in all weather conditions. New roads would be constructed to a width of 36 feet including a finished 18-foot running surface.

Revegetation of road edges, drainage ditches, and cut-and-fill slopes would help stabilize exposed soil and reduce sediment loss, growth of noxious weeds, and maintenance costs while minimizing impacts to scenic quality, water quality, and wildlife forage and cover. To ensure successful growth of seeded plants, topsoil would be stripped and stockpiled during road construction and re-spread on cut slopes, fill slopes, and borrow ditches prior to seeding.

Under the Proposed Action, approximately 513 feet of new road would be constructed to provide access to the proposed well pads, which would result in a short-term surface disturbance of about 0.42 acre, and approximately 85 feet of new road would be built to provide access to the proposed produced fluid treatment and tank battery pad which would result in a short-term surface disturbance of about 0.07 acre.

Existing roads would be upgraded as necessary to accommodate anticipated traffic loads and all-weather road requirements. Thurston would enter into a Road Maintenance Agreement with the Service to upgrade and maintain existing roads that would be used for project access. Upgrading would include ditching, drainage, graveling, crowning, and capping of the roadbed as necessary.

2.1.1.3 Power Lines

Under the Approved Action, Thurston would install electricity to provide power for pumpjacks on the two proposed well pads to reduce the level of noise for both wildlife and visitors. Approximately 9,768 feet of overhead distribution lines would be installed along a 15 foot wide power line ROW corridor and extended to the well pads. The electric distribution lines would be built on single wood utility poles approximately 65 feet in height. The span between poles would be approximately 200 feet and poles would be installed in the same 15 foot-wide ROW corridor that is used for the existing Refuge and Ouray National Fish Hatchery (NFH) road (see **Figure 2-1**). The bundled, 8-inch, surface, HDPE, heat-traced, 3-phase pipeline and the overhead power line would share the 30-foot-wide ROW corridor that falls between the well pads. Therefore, no additional surface disturbance would be anticipated from installation of the electric distribution line. The proposed distribution line would tie into an existing power source at the NFH. Construction of the power line to the associated infrastructure would be in compliance with raptor protection requirements. Thurston would agree to meet APLIC standards for the new overhead power line as discussed in **Section 2.1.10**.

2.1.1.4 Pipelines

Natural gas would be transported from the well head through the proposed bundled, 8-inch, surface, HDPE, heat-traced, 3-phase (gas, oil, and water) production pipeline to the proposed produced fluid treatment and tank battery pad on top of the bluff where the gas would be separated, dehydrated, and metered into a short, 3-inch surface, HDPE, natural gas sales pipeline connected with an existing Bainbridge Uinta LLC gas gathering pipeline on the Ouray NWR serving the Three Rivers field. Natural gas gathering pipelines are typically installed parallel and immediately adjacent to the proposed well access roads, but the proposed bundled, 8-inch, surface, HDPE, heat-traced, 3-phase production pipeline requires the shortest possible overland route to the proposed produced fluid treatment and tank battery pad to be operationally viable. Installing the production and gas sales pipelines aboveground would be necessary to reduce surface disturbance. One of the two proposed well pads and the proposed produced fluid treatment and tank battery pad would be used as staging areas for pipeline assembly. The amount of surface required to install the pipelines is based upon a temporary use width of 15 feet, which corresponds to the width of land required by pipeline installation equipment and personnel.

From the well pads, the proposed bundled, 8-inch, 3-phase production pipeline route would follow an overland or "cross-country" route west where it would be oriented uphill and over the bluffs to the proposed produced fluid treatment and tank battery pad and an adjacent connection via a short 3-inch HDPE natural gas sales pipeline segment with an existing gas gathering lateral pipeline near the west boundary of the Ouray NWR (see **Figure 2-1**). The bundled, 8-inch, 3-phase production pipeline would be approximately 7,131 feet in length and the 3-inch, HDPE, natural gas sales pipeline would be approximately 85 feet in length. Both pipelines would be laid by hand on the surface.

All pipeline installation would occur within a 30-foot wide ROW. Construction of the "cross country" segment of the bundled, 8-inch, surface, HDPE, heat-traced, 3-phase production pipeline would begin on top of the bluff at the proposed produced fluid treatment and tank battery pad near the gas sales tie-in point and proceed east to the proposed well pads. The proposed 3-inch, HDPE, natural gas sales pipeline would also be laid on the surface by hand from the produced fluid treatment and tank battery pad to the nearest Bainbridge Uinta LLC gas gathering pipeline. Each segment of HDPE pipe will be joined together and tested prior to completion of construction. Upon installation, portions of the "cross-country" surface pipeline would be anchored in place to prevent lateral movement and subsequent disturbance to soils on steeper slopes.

Pipelines would be constructed of HDPE natural gas pipe (black) and would meet all applicable American Petroleum Institute (API) and industry standards. Each proposed pipeline would be pressure tested with air to locate any leaks for 100 percent Maximum Allowable Working Pressure (MAWP). After testing, site-specific stabilization barriers, water bars, silt fences or other erosion control devices would be installed in the disturbed areas. Erosion blankets and hand seeding may also be used in these areas.

Surface disturbances resulting from pipeline installation under the Proposed Action would primarily be limited to the crushing of vegetation and minor soil disturbances related to assembly and placement of the pipeline. Thus, no appreciable surface disturbance associated with installation of the surface pipeline is expected. .

Standard construction techniques for a hand laid surface pipeline would be used along the pipeline route, which typically involves the following sequential operations: (1) preconstruction survey, (2) vegetation preparation, (3) pipe alignment and joining, (4) anchoring, (5) testing, and (6) cleanup and restoration. Construction of the pipeline would begin after all required federal, state, and local approvals have been

obtained. Company personnel, construction contractors, and the Service AO would discuss procedures and permit approvals prior to construction.

Prior to pipeline construction, a preconstruction survey would be conducted to delineate the centerline and outside ROW boundaries of the pipeline corridor. The limits of disturbance would be clearly marked/staked prior to construction including the construction ROW and temporary use areas. Any sensitive areas to be protected from disturbance or that require monitoring would also be marked. Flagging, signs, and other markings identifying the limits of disturbance would be maintained through all phases of pipeline construction. Erosion and sediment control would be installed as outlined in the approved SUPO.

Construction activity would be limited to approved-staked areas. Brush would generally be cut by hand as needed and would be cut as close to the ground as possible. Vegetative material would typically be shredded and scattered back across the surface to increase roughness, facilitate seeding establishment, and protect the construction ROW.

The surface disturbance associated with installation of the proposed bundled, 8-inch, surface, HDPE, heat-traced, 3-phase production pipeline assumes that the portions of the 30-foot wide ROW would be disturbed for the pipeline construction but ultimately when in service will not require a corridor wider than 10 feet in width. Thus, the short-term surface disturbance associated with installation of the new, bundled, 8-inch, surface HDPE, heat-traced, 3-phase production pipeline would be approximately 4.91 acres and long-term surface disturbance would be 1.64 acres. The 3-inch, HDPE, natural gas sales pipeline would require surface disturbance of portions of its 30-foot wide ROW of up to .06 acre and the long-term surface disturbance would be .02 acre.

Individual joints of pipe would be aligned, joined together, and laid by hand on the surface. All joints would be visually inspected and tested by a qualified inspector. Non-destructive radiographic inspection methods would be conducted in accordance with current requirements. A specialized contractor would be employed to perform this work. Any joint defects would be repaired or cut out as required under the specified regulations and standards.

Cleanup and restoration would occur after the pipeline is installed completed. Cleanup of the surface along the construction ROW would include removal of construction debris. Permanent erosion control measures would be installed and seeding would occur in accordance with Service requirements.

2.1.1.5 Rights-of-Way

In accordance with Service Policy Part 340: Real Property Management, a ROW covers "uses that will encumber real property by granting a right to use and alter the landscape through construction of a facility such as a road, pipeline, power line, or building. Generally, such uses are for a relatively long period of time (i.e., 10 years or longer)" (USFWS 1993). Thurston would apply for a ROW permit with the Service Realty Division for proposed access roads, well pads, and pipelines in the proposed SUPO and would acquire a SUP for any activities that would result in temporary disturbance or land use.

2.1.2 Well Drilling

Once construction of a well pad is complete, drilling equipment would be moved on-site. All drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable rules and regulations, and COA applied by UDOGM. The proposed wells would target the Green River and Wasatch formations, which contain known productive zones between approximately 5,000 feet and 7,000 feet below the ground surface. No abnormal pressures, temperatures, or other hazards are anticipated.

Wells previously drilled in the vicinity of the Proposed Action have not encountered over-pressured zones or hydrogen sulfide gas. Each well would require approximately 10 days to drill and 15 days for completion and production testing operations. Drilling activities typically occur around the clock, 24 hours per day, 7 days per week.

The drilling operation would be conducted in three primary phases using three specialized drilling rigs for each wellbore. In the first phase, a light-weight mobile drill rig (bucket rig) would drill the conductor borehole, rat and mouse holes and set and cement the conductor pipe to a depth of 80 feet. In the second phase, a conventional mechanically-powered mobile drilling rig mounted on a crane carrier (preset rig) would be driven to the well site and erected on the well pad to drill the surface hole and run and cement surface casing to a depth of 1,050 feet. The well would be initially drilled with air and/or freshwater to approximately 3,000 feet below ground surface and below the base of any freshwater aquifers encountered. Beyond approximately 3,000 feet, drilling fluids would consist of a water and gel (bentonite) mixture, with water being the main constituent. Non-toxic chemicals such as a potassium chloride substitute and commercial clay stabilizer may be added to the mud to maintain borehole stability, minimize possible damage to the formations, provide adequate viscosity to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses. Prior to drilling the production hole, the surface hole would be cased with steel casing and cemented in place entirely from the total depth of the surface hole up to ground level. The surface casing and its design would provide protection for freshwater aquifers and contain pressure that may be encountered while drilling the production hole. UDOGM would be notified in advance of running surface casing and cement to observe these operations at its discretion. This part of the drilling operation would normally take two to three days to complete.

Prior to drilling below the surface casing, a Blowout Preventer (BOP) would be installed on the surface casing and a flow control manifold consisting of manual and hydraulically operated valves would be installed below the rig floor. Both the BOP and surface casing would be tested for pressure integrity in order to meet the minimum standards of BLM *Onshore Oil and Gas Order No. 2, Drilling Operations.* UDOGM would be notified in advance of all pressure tests in order to be present and witness the tests at its discretion. The BOP would be mechanically checked daily during drilling operations. During this phase the drill rig mud pumps would pump fresh water as a circulating fluid to drive the mud motor, cool the drill bit, and remove cuttings from the wellbore. To achieve borehole stability and minimize possible damage to the hydrocarbon producing formations, a potassium chloride substitute and commercial clay stabilizer may be added to the drilling fluid. From time to time, other materials may be added to the fluid system, such as sawdust, natural fibers, or cellophane flakes, to reduce downhole fluid loss.

The final stage of drilling would be accomplished by a multi-component drill rig (big rig) transported to the well pad and erected over the BOP. Its tasks include drilling the production or long-string hole and running and assisting in the cementing of the production casing. Prior to setting production casing, well logs would be run to evaluate a well's potential. If the evaluation concludes that sufficient hydrocarbons are present and recoverable, then steel production casing would be run and cemented in place in accordance with the well design, as specified in the APD and COA. Cementing the production casing back to the bottom of the surface casing would prevent damage to the wellbore from the targeted formation pressure, retard corrosion, and prohibit pressure communication or fluid migration between productive zones. After drilling operations are completed, the drilling rig would be dismantled and demobilized from the location.

Freshwater used for drilling would be contained in above ground storage tanks (ASTs) located on site. Additional ASTs would be used during drilling and testing operations to hold non-flammable materials such as cuttings, salt, drilling fluids, chemicals, produced fluids, etc. All drilling fluids used for each well would be recycled using a closed-loop drilling system, thereby eliminating the need for a reserve pit. The closed-loop drilling method involves removing and treating drilled soils from the system and collecting

solid and liquid waste in modified steel catch tanks rather than open reserve pits. The method includes a mud de-watering system that separates the soils from the liquids. The soils (natural rock cuttings) would be processed to remove excess drilling fluids and stored on location in segregated piles or within a cutting storage area. The recovered drilling fluid would be stored in ASTs to be re-used at the next drilling site or removed and disposed of at an approved offsite disposal facility.

Any additives to the mud system would conform to *Subtitle C of the Resource Conservation and Recovery Act* (RCRA) of 1976 as amended 1996. Material Safety and Data Sheets (MSDS) would be located onsite and readily available at all times. Drill cuttings from each wellbore (consisting of mainly shale, sand, and miscellaneous rock materials) would be transported to an approved offsite disposal facility.

2.1.3 Well Completion and Testing

If drilled wells indicate economic productivity, completion operations would commence after drilling is complete. After the production casing has been cemented in place, completion equipment would be mobilized into the well pad location. Well completion would consist of running a cement bond log to evaluate the casing cement integrity, perforating the casing across the hydrocarbon-bearing zones, and stimulating the formation to enhance the production of oil and gas. The typical method used for stimulation consists of hydraulic fracture treatment of the reservoir, in which water with relatively small concentrations of sand and stimulation fluids are pumped down the well through perforations in the casing and into the formation. Pumping pressures would be increased to the point at which fractures occur in the rock formations and radiate outward from the perforations into the target formation. The slurry flows into the fractures and the sand in the slurry mix serves as a proppant to keep the created fracture open after the fracture treatment, thereby allowing reservoir fluids to move more readily into the well.

Post-stimulation flow tests would allow for recovery of stimulation fluids and evaluation of well productivity. The duration of flow testing would vary according to individual well performance and would typically be conducted only long enough for fluid rates to drop to a level to ensure safe operation of permanent production equipment. During completion operations, gas may be vented to the atmosphere from the flowback tank prior to installing production equipment; however, Thurston does not anticipate the need to flare gas.

Depending on the concentration of water and proppant in the flow from the well and the availability of a gas transportation pipeline, "test" gas would be vented, flared, or sold down the pipeline.

Typical equipment and vehicles used during completion activities would include: sand transport trucks; water trucks; oil service trucks to transport pumps and equipment for hydraulic fracturing; flat beds and gin trucks to move water tanks, rigs, tubing and hydraulic fracturing chemicals; logging trucks (cased hole wireline trucks); and pickup trucks to haul personnel and miscellaneous small materials.

Completion activities on individual wells would occur 24-hours per day, 7-days per week, and would generally take approximately three weeks, depending on conditions at the individual well.

2.1.4 Interim Reclamation

Upon well completion, the well locations and surrounding area(s) would be cleared of all unused tubing, materials, trash, and debris not required for production. All pits, cellars, rat holes, and other bore holes unnecessary for further well operations would be promptly backfilled. In accordance with UDOGM

regulations, drilling fluids and cuttings contained within the closed system tank would be hauled from the site and disposed of at an approved facility.

In accordance with BLM *Oil and Gas Onshore Order Number 1, Approval of Operations*, after completion activities have been finalized for all planned wells, Thurston would reduce the size of the well pad to the minimum surface area needed for production facilities and adequate room for trucks to turn around, while providing for reshaping and stabilization of cut-and-fill slopes. Interim reclamation would be accomplished by grading, leveling, and seeding, as required by the Service, and would reduce the disturbed area at each of the well pads to approximately 1.2 acres or less. Interim reclamation of areas disturbed along portions of the access road cuts and shoulders would also be conducted.

Initial reclamation would establish a vegetative cover sufficient to maintain a biologically active soil, control erosion, and minimize habitat and forage loss during production operations. Reclamation activities would commence within 90 days of well completion, weather permitting per the Reclamation Plan included in **Appendix F**. Earthwork would be completed within six months of well completion.

Under the SUPO, approximately 5.14 acres of short-term disturbance associated with construction of proposed well pads, pipeline corridors, and access road ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the SUPO to approximately 5.14 acres.

Thurston would monitor interim reclamation operations on an annual basis to ensure timely achievement of its reclamation goals by documenting the progress of reclamation and weed control to baseline data collected prior to commencing operations. Thurston would modify its reclamation procedures as necessary to achieve the reclamation outcomes mutually agreed-upon with the Service AO.

2.1.5 Production and Maintenance Operations

Well production facilities, including the bundled 3-phase and gas gathering pipelines, would be installed after drilling and completion operations. Facilities on each well pad would include a well head, valves and piping, and meter that would either be housed in a small building or enclosed by a fence. The bundled, 8-inch, surface, HDPE, heat-traced, 3-phase pipeline would be anchored down as necessary between the well pads and along the cross-country route to the produced fluid treatment and tank battery pad. Similarly, the 3-inch surface HDPE natural gas connector pipeline would be anchored down as necessary from the produced fluid treatment and tank battery pad to the connection with the Bainbridge Uinta LLC trunk line. Wells would likely be fitted with a pumpjack, Roto-flex unit, or gas lift to assist liquid production in liquid volumes and/or as low formation pressures require it. Plunger lift systems do not require outside sources of energy; however, a pumpjack or Roto-flex unit would require the installation of electrical service to run the electric motors following test production with natural gas-powered engines.

The produced fluid treatment and tank battery pad would be equipped with up to 6 500-barrel tanks for storing oil and produced water. The tanks would be approximately 15.5-feet in diameter and 16-feet high. They would be surrounded by a secondary containment berm of sufficient capacity to contain 110 percent storage capacity of the largest tank and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank battery or would use catch basins to contain spills. Thurston would maintain the integrity of the dike throughout the production lifetime of the wells.

All measurement facilities would conform to American Petroleum Institute (American Gas Association) standards for gas and liquid hydrocarbon measurement. Thurston would adhere to all site security guidelines and regulation identified in 43 CFR 3126.7. A gas meter would be initially calibrated and tested periodically

thereafter with measurement results provided to the UDOGM as required. If feasible, telemetry equipment would also be installed at the well pad location to remotely monitor well conditions and reduce traffic to and from the well pad.

All permanent (onsite for six months or longer) structures either constructed or installed would be painted a flat, non-reflective, earth-tone color using one of the standard environmental colors, as determined by the Service AO. All facilities would be painted within six months of installation.

Periodically, a workover or recompletion on a well may be required to ensure that efficient production is maintained. Workovers can include repairs to the well bore equipment (casing, tubing, rods, or pump), the wellhead, or the production facilities. These repairs would usually be completed in seven days per well, during daylight hours. The frequency for this type of work cannot be accurately projected because workovers vary by well; however, an average work time may be one workover per well per year after about five years of production. In the case of a recompletion, where the wellbore casing is worked on or valves and fittings are replaced to stimulate production, all byproducts would be stored in tanks and hauled from the location. For workover operations, it may be necessary to rework the surface location to accommodate equipment. Thurston would notify the Refuge staff prior to any workover activities. At the completion of the work, the surface location would be re-graded and reclaimed to pre-existing conditions.

2.1.6 Final Reclamation and Abandonment

Thurston would perform final reclamation of the well pads and access roads, not including the existing Wildlife Refuge and NFH county roads, consistent with the Reclamation Plan and well-specific COA. Prior to abandonment of any well location, Thurston would file a Notice of Intent (NOI) to abandon with UDOGM, detailing the proposed procedures. During plugging and abandonment, all other surface equipment, including tanks, pumping unit, three-phase separator, and aboveground flow lines, gas system pipelines, and water pipelines, would be removed from the site. The 8-inch 3-phase and 3-inch surface HDPE gas pipelines would be removed by hand. Wellbores would be plugged with cement per UDOGM approved procedures to prevent fluid or pressure migration and to protect mineral and water resources. Wellheads would be removed, both the surface casing and production casing would be cut off below ground level, and an appropriate surface or subsurface dry hole marker would be set in compliance with UDOGM regulations and wishes of the Ouray NWR manager.

A monitoring plan would be implemented to provide quantifiable data to assess interim reclamation operations, including annual site visits to ensure timely achievement of reclamation goals and weed control. Thurston would modify reclamation procedures as necessary to achieve reclamation success as determined by the Service. For more information regarding the monitoring strategy and success criteria, refer to the Reclamation Plan included in **Appendix F** of the 2015 EA.

Thurston would restore the pads and access roads to approximately their original contours. During reclamation of these sites, fill material would be pushed into cuts and up over the back slope. No depressions would be left that would trap water or form ponds. Upon completion of backfilling, leveling, and recontouring, the remaining topsoil would be evenly spread over the reclaimed areas. All disturbed surfaces would be reseeded with a seed mixture prescribed by the Service. The seedbed would then be prepared by disking and roller packing following the natural contours. Seed would be drilled on contours at an appropriate depth depending on soil condition and plant requirements. In areas that cannot be drilled, seed would be broadcast at double the seeding rate and harrowed into the soil. Seeding should occur within 24 hours following completion of final seedbed preparation to reduce the potential for establishment of weeds and before crusting of the soil, which can impede germination. If the seeding is unsuccessful, Thurston would be required to conduct reseeding in subsequent years.

Thurston would monitor final reclamation operations on an annual basis to ensure timely achievement of its reclamation goals by documenting the progress of reclamation and weed control against baseline data collected prior to commencing operations. Thurston would modify its reclamation procedures as necessary to achieve the reclamation outcomes mutually agreed-upon with the Service AO. Unreclaimed areas or reclaimed areas that do not meet the objective of three to four years of sustained progress toward reclamation success (known as "operator complete") would undergo the reclamation retreatment measures described in the SUPO (see **Appendix A**), which is referenced with each APD. Thurston would also be required to meet the UDOGM bonding requirements of at least $30,000 for each well (UDOGM 2005 R649-3-1-5.3).

2.1.7 Water Use and Supply

Drilling and formation stimulation/completion operations would be responsible for most of the water consumed during the project. Water for use during drilling and stimulation/completion operations would be obtained from existing permitted water supply sources, including but not necessarily limited to, J.D. Field Services (State Water Right No. 49-2307) and RNI (State Water Right No. 49-2367), or a local irrigation company.

No water would be used or taken from Refuge impoundments or from the Green River inside the Refuge boundary. The Refuge's water right will not be used for any of this project. Approximately 0.5 acre-feet (3,879 barrels, or 162,925 gallons) of water would be needed for the drilling of each well, using mud as the circulation medium. Thus, a maximum of one acre-foot of water would be required to drill the two proposed wells. Approximately 2.3 acre-feet (18,000 barrels, or 756,000 gallons) of additional water would be used per well for formation stimulation/completion purposes, for a total of approximately 4.6 acre-feet of water for the two proposed wells. Approximately 0.1 acre-feet of water would be used on Wildlife Refuge and NFH roads for dust control. The total amount of water required for drilling, completion, and dust control operations is anticipated to be approximately 5.7 acre-feet over the LOP. Water used for completion and dust control purposes would be obtained from the Vernal City municipal water supply or a local irrigation company and transported to the well pads by truck. Water would be transported to the well pad by licensed haulers, and the appropriate water permits would be filed by the licensed haulers. An estimated 182-273 truck round trips (assuming the truck volumes will be between 80 barrels [3,360 gallons] and 120 barrels [5,040 gallons]) would be required for drilling and stimulation/completion operations per well.

2.1.8 Hazardous Materials and Solid Waste

A variety of chemicals (i.e., lubricants, paints, and additives) is used to drill, complete, and operate a well. Some of these substances may contain constituents that are hazardous. Hazardous materials can include some greases or lubricants, solvents, acids, paint, and herbicides, among others. Even though these materials would not be stored at well locations, they may be kept in limited quantities on drilling sites and at production facilities for short periods of time. Eventually these hazardous substances would need to be stored, transported, and disposed of according to applicable requirements.

None of the chemicals that would be used during drilling, completion, or production operations meet the criteria for being an acutely hazardous material/substance or meet the quantities criteria per the BLM *Instruction Memorandum No. 93-344*. Wastes that would be generated at project locations are excluded from regulation by the RCRA under the exploration and production exemption in Subtitle C (40 CFR 261.4[b][5]) and are considered to be solid wastes. These wastes include those generated at the wellhead, through the production stream, and through the inlet of the gas plant. Exempt wastes include produced

water, production fluids such as drilling mud or well stimulation flowback, and crude oil impacted soils. During drilling operations, Thurston could potentially store and use diesel fuel, sand (silica), described as hazardous substances in 40 CFR Part 302, Section 302.4, in quantities exceeding 10,000 pounds. In addition, small quantities of retail products (i.e., paint, spray paint, solvents [e.g., WD-40], and lubrication oil containing non-reportable volumes of hazardous substances) may be stored and used on site at any time.

Any release of oil, gas, saltwater, or other such fluids would be cleaned up and removed to an approved disposal site. The spills would be reported to the Service AO and other appropriate authorities. In accordance with U.S. Environmental Protection Agency (EPA) regulation, Thurston would prepare and implement a site-specific Spill Prevention, Control and Countermeasure (SPCC) Plan within six months of commencing operations (40 CFR Part 112.3.3[b]). A Draft SPCC Plan is provided in the 2015 **Appendix G**. An approved SPCC plan will be reviewed and certified by a licensed Professional Engineer when the final SUP and APD are approved. The SPCC plan describes spill prevention, control, reporting, and cleanup procedures to help prevent impacts to surface waters and subsurface waters and to address potential threats to Colorado River endangered fish species and designated critical habitat. A copy of the drilling company's SPCC plan will be kept on site during drilling operations. In addition, Thurston has provided a spill response plan supplement in the 2015 **Appendix G** that includes information about spill avoidance and management.

All produced liquid hydrocarbons would be stored in tanks surrounded by a secondary containment berm of sufficient capacity to contain 110 percent of the total capacity of the largest tank within the tank battery and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank or would use catchment basins to contain spills. The tanks would be emptied as necessary to prevent overflow, and the liquids transported to market through trucks and/or pipelines.

Portable toilets and trash containers would be located on active construction sites throughout the Project Area. A commercial supplier would install and maintain portable toilets and equipment and would be responsible for removing sanitary waste. Sanitary waste facilities (i.e., toilet holding tanks) would be regularly pumped and their contents disposed of at approved sewage disposal facilities in Uintah County, in accordance with applicable rules and regulations regarding sewage treatment and disposal.

Accumulated trash and nonflammable waste materials would be hauled to an approved landfill once a week or as often as necessary. All debris and waste materials not contained in the trash containers would be cleaned up, removed from the construction ROW or well pad, and disposed of at an approved landfill. Sanitary waste equipment and trash bins would be removed from the Project Area upon completion of the construction of well pads, access roads, and other surface facilities, and following drilling and completion operations at well pads.

2.1.9 Workforce Requirements and Schedule

Drilling of each well would commence following issuance of a SUP from the Service and APD approval from the UDOGM. Personnel would commute to the Project Area from Vernal or the surrounding area.

Construction of access roads and well pads would be completed by local contractors during daylight hours and would require approximately seven days. Construction crews would be made up of two to six individuals who would access the project location using an average of three light trucks. During construction, two to three pieces of heavy equipment (i.e., bulldozers and motor graders) would be used to perform earth moving operations.

When drilling commences, the operation would become a continuous 24-hour operation until the well is drilled to total projected depth. Following road and pad construction, the following personnel would be on site for any given shift: rig hands, well pusher, mud logger, and a Thurston representative. The rig crew would work one 12-hour shift per 24-hour day. Drilling and completion crews would be allowed access to the project location outside of normal refuge hours through use of a lockbox at the Refuge entrance. Overnight personnel would be restricted to the drilling site and ingress and egress roads during Refuge off-hours. Approximately 40 truckloads of equipment would be required to transport the drilling rig and associated equipment to a location for assembly. During drilling operations, up to 10 light trucks would transport one to four crew members, service personnel, materials and equipment. Approximately five trailers would remain on location for the duration of drilling operations for staff use and equipment storage.

Completion and testing operations would require approximately 15 days for each well. During completion operations, fracture stimulation would be required and approximately 15 large trucks would access each well location twice. Trucks would also be required to deliver water to each location and remove fracturing fluids to an approved disposal facility. Up to 10 pickup trucks transporting a total of 7 to 10 crew members as well as other service personnel, materials, and equipment would access the drilling location daily.

2.2 Alternative B – Proposed Action

Similar to the approved action, Thurston proposes to drill, complete, produce, and reclaim two oil and gas wells located within the Ouray NWR. The proposed wells would target the Green River and Wasatch formations and would require construction and maintenance of associated access roads and natural gas pipelines. The majority of action elements have already been approved in the 2015 EA and FONSI; therefore, we will only focus on modifications to the approved action in this section. Specifically, Thurston's Proposed Action includes the following modifications to the Approved Action (AA):

- Construction of two (2) well pads, each 2.55 acres in size within an average disturbed area of 3.2 acres (versus two (2) well pads, each 1.66 acres in size within an average disturbed area of 2.2 acres plus a produced fluid treatment and tank battery pad of 1.38 acres within a disturbed area of 1.81 acres on top of the bluff within the Ouray NWR under AA). Increased size of well pads to accommodate tank batteries, produced fluid treatment equipment, and turn around for tanker trucks;
- Construction of approximately 420 feet of new access road (versus 597.6 feet under AA);
- Installation of 7,216 feet of 3-inch surface, high-density polyethylene (HDPE) natural gas pipeline laid by hand from the nearest gas gathering trunk line on top of the bluff within the Ouray NWR to the well pads (versus 7,131 feet of bundled, 8-inch, surface, HDPE, heat-traced, 3-phase [mixed oil, gas, and water] production pipeline under AA). Change mandated by lack of sufficient margin of safety for the long-term use of the bundled, 8-inch, heat traced, HDPE pipe product operated at its maximum allowable manufacturer-rated pressure for crude oil service due to the elevation difference between the wells and the produced fluid treatment and tank battery pad on top of the bluff;
- Elimination of approximately 9,768 feet of overhead electric power lines under AA;
- Tank Batteries and produced fluid treatment equipment would be placed on the well pads in accordance with Best Management Practices for the Three Rivers field (versus located on a separate produced fluid treatment and tank battery pad on top of the bluff within the Ouray NWR under AA);
- Approximately 1-4 tanker trucks on Refuge/NFH roadway daily during 30-40 year production phase generally declining with time (versus no tanker traffic following construction and development under AA).

Figure 2-1 depicts the proposed locations of the wells and infrastructure associated with the proposed project. The proposed wells would be drilled vertically to total depths of approximately 7,000 feet. Although actual operations are subject to change as conditions warrant, Thurston plans to drill the two wells over a one-year period. The anticipated life of an individual well is 30 to 40 years, and the anticipated time needed for field abandonment and final reclamation is three years. Therefore, the anticipated life of the project (LOP) under the SUPO would be 33 to 43 years.

The timeframe for annual construction, drilling, and completion activities would depend on permit approval and compliance with relevant seasonal restrictions.

Included in the Proposed Action are a range of Best Management Practices (BMPs) and conservation measures that would be implemented to avoid, minimize, or offset potential adverse impacts to surface and subsurface resources (see **Section 2.1.10**).

The proposed location of the new well pads reflects the results of onsite visits conducted by Thurston and representatives from the Service on September 17, 2013 and November 27, 2018. The primary purpose of the onsite inspections was to assess potential resource impacts associated with the construction of the well pads, access roads, and pipeline corridor(s).

Figure 2-4 identifies project activities, components of the Proposed Action including well pads, access roads, surface pipeline routes, power lines, the completed cactus surveys delineated and identified by date, and habitat locations for cacti, Yellow-billed cuckoo, and two of the Colorado River Fish species.

Proposed surface locations depicted in **Figure 2-4** were chosen with consideration of factors such as topography, subsurface geologic conditions, sensitive wildlife and vegetation habitat, and other site-specific conditions. Surface disturbance anticipated under the Proposed Action is shown in **Table 2-2**. Short-term surface disturbance would occur during and immediately after the construction, drilling, completion, and testing activities. Prior to interim reclamation, short-term surface disturbance area for the two well pads and new access roads would equal approximately 6.65 acres. Those portions of the well pads and access road ROWs not needed for production operations would be reclaimed within one to two growing seasons. The remaining surface disturbance would be long-term disturbance of approximately 4.22 acres for the 33 to 43 year LOP. Long-term disturbance from the well pads and new access roads equates to approximately 0.11 percent of the total acreage within the Project Area.

Figure 2-4. Proposed Action for Thurston 2-Well Development

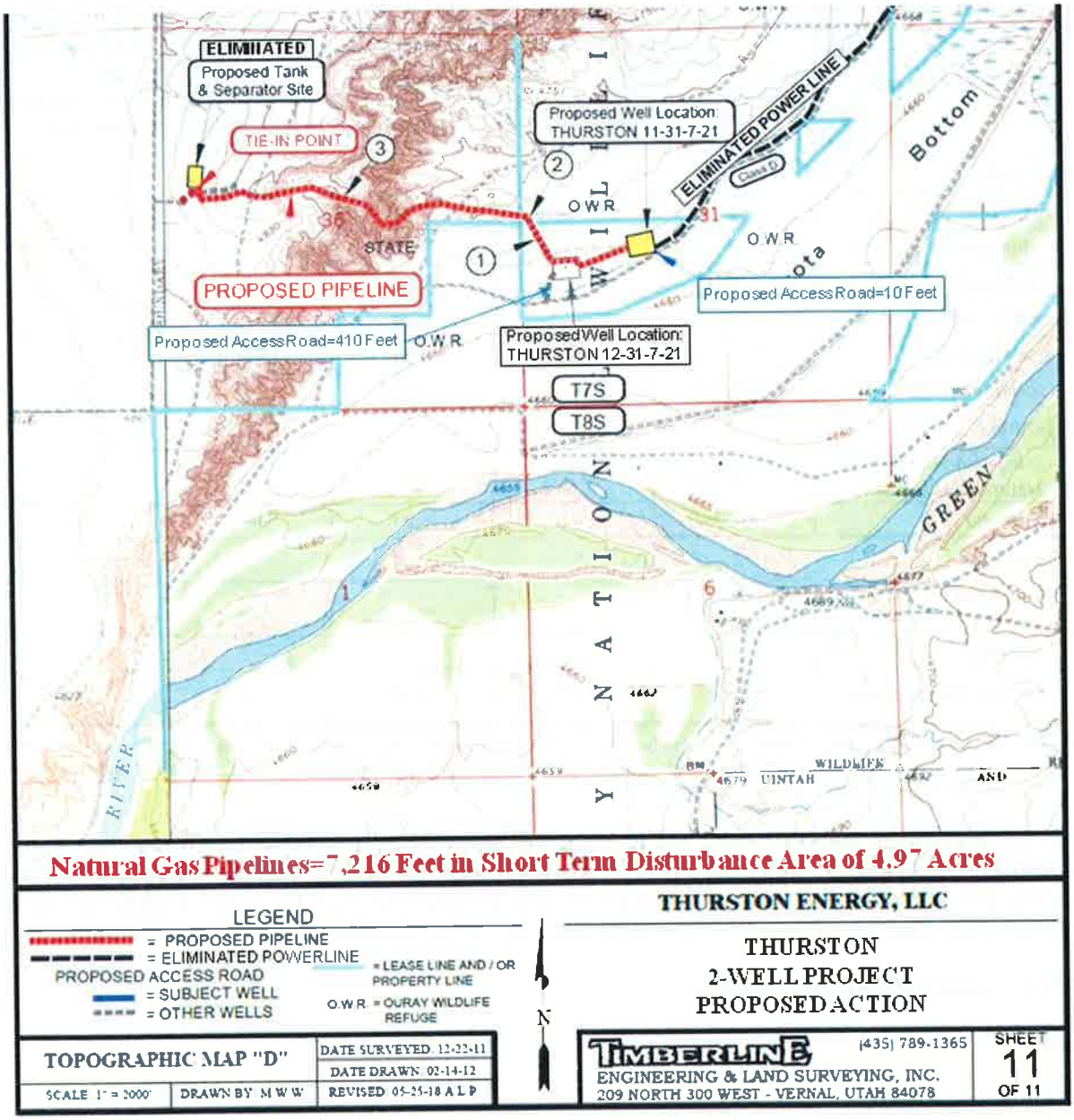


Table 2-2. Estimated Disturbance of Project Facilities under the Proposed Action

Project Feature	Quantity or Feet	Short-term (disturbance width[feet] or acres/facility)	Short-term Surface Disturbance (acres)	Long-term (disturbance width[feet] or acres/facility)	Long-term Surface Disturbance (acres)
Well Pads					
Thurston 11-31-7-21	1	2.55 acres	3.15	1	2.03
Thurston 12-31-7-21	1	2.55 acres	3.21	1	2.02
Subtotal	***2***	***5.1 acres***	***6.36***	***2***	***4.05***
Access Roads					
New Roads	420 feet	36 feet	0.35	18 feet	0.17
Subtotal	***420 feet***	--	***0.35***	--	***0.17***
Pipelines					
3-inch Surface HDPE Natural Gas Pipeline	7,216 feet	30 feet	4.97	10 feet	1.66
Subtotal	***7,216 feet***	--	***4.97***	--	***1.66***
Power Line					
Overhead Electric Power Line	0	--	--	--	--
Subtotal	0	--	--	--	--
Total New Disturbance	--	--	**11.68**	--	**5.88**

Assumptions: The working area for installation of a surface pipeline of similar diameter is typically 30' in width and permanent ROW width of 10'. The access roads for the well sites are typically designed with a finished running surface 18' in width in a total disturbed width of 36'.

The life cycle of an individual well and its associated facilities/required infrastructure (e.g., roads and pipelines) is composed of six primary phases: (1) construction, (2) well drilling, (3) well completion and testing, (4) interim reclamation, (5) production and maintenance, and (6) final reclamation and abandonment. Specific details of these six primary phases are described in the following sections.

2.1.1 Construction Activities

IBR

2.1.1.1 Well Pads

Prior to well pad construction or surface disturbing activities, Thurston would obtain approval of an APD by the appropriate UDOGM Authorized Officer (AO) for the lease. The APD would contain site-specific COA that would apply to construction and well operations.

Well pad construction would typically begin with stripping and stockpiling topsoil. The top 4 to 6 inches of topsoil material suitable for plant growth would be removed from areas to be disturbed and stockpiled for eventual use in reclamation. Vegetation removed from the disturbed area would be re-spread to provide protection, nutrient recycling, and a seed source for reclamation.

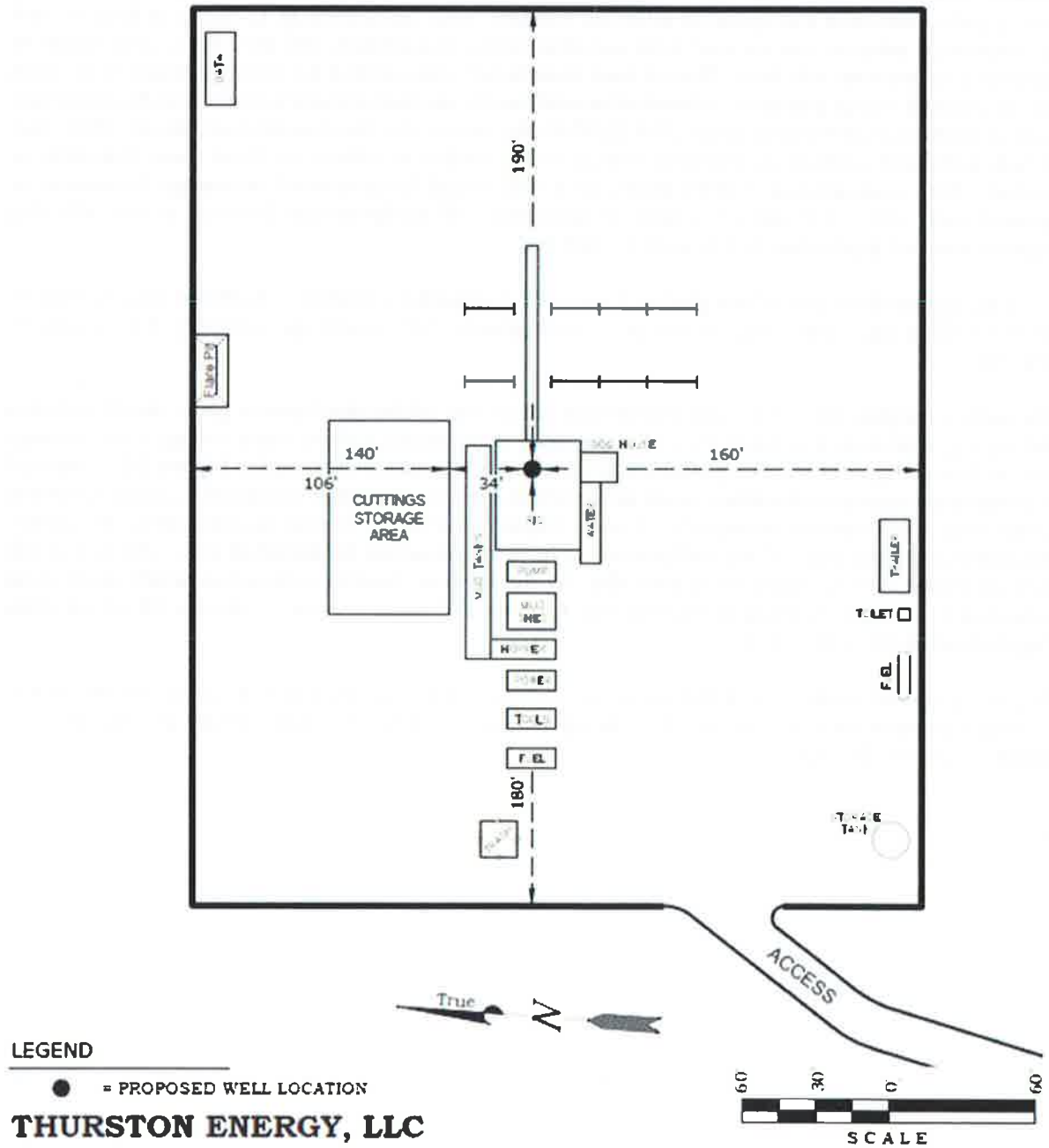
Following vegetation and topsoil removal, each well pad would be constructed using standard cut-and-fill techniques to create a level pad for the drill rig and graded surface for the support equipment. Thurston would employ the use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps, and broad-based drainage dips or low water crossings as necessary and appropriate to minimize erosion and surface runoff during pad construction and operation activities. Earthen berms approximately 12-inches in height would be constructed using excess material from pad construction around each well pad. Each berm would be lined with an impermeable liner. Runoff from undisturbed areas around the well pad would be directed into ditches and energy dissipaters (if needed) around the site and then released to grade, which is consistent with Utah Division of Water Quality (UDWQ) BMPs for stormwater. Stormwater management efforts may include additional engineering measures such as the installation of culverts to divert water flow away as needed. With associated cut-and-fill slopes, each well would be constructed to average dimensions of approximately 300 x 370 feet (2.55 acres in size) with soil stockpiles and diversion ditches affecting adjacent areas of approximately 0.62 acre for each pad.

Once the pad has been leveled and graded, it would be compacted to establish a level and solid foundation for the drilling rig. Completing the site preparation process will require approximately 3 to 4 days on average.

The surface equipment to be utilized at each well pad for the drilling development phase would include a drilling rig, mud tank, dog house flare pit, pipe racks, pump house, trailers, water storage tanks, cuttings storage bins and generators. The typical layout for a single well pad is illustrated in **Figure 2-5**. If the well is productive, interim reclamation would occur within the next allowable construction period following completion and production testing of each well. Topsoil reserved for interim reclamation and previously stockpiled along the edges of the well pad would be re-spread across the disturbed area. The area would then be seeded with a seed mixture prescribed by the Service. Interim reclamation would result in an estimated 21 percent reduction in well pad size to about 2.02 acres over the productive life of the wells (approximately 30 to 40 years).

The two proposed wells to be drilled would use a closed-loop mud and drill cuttings system that would eliminate the need for a reserve pit. Drill cutting and fluids will be temporarily stored in tanks and then removed from the Refuge.

Figure 2-5. Typical Well Pad Layout During Development Phase.



2.1.1.2 Access Roads

Under the Proposed Action, approximately 420 feet of new road would be constructed to provide access to the proposed well pads, which would result in a short-term surface disturbance of about 0.35 acres.

Existing roads would be upgraded as necessary to accommodate anticipated traffic loads and all-weather road requirements. Thurston would enter into a Road Maintenance Agreement with the Service to upgrade and maintain existing roads that would be used for project access. Upgrading would include ditching, drainage, graveling, crowning, and capping of the roadbed as necessary.

2.1.1.3 Power Lines

Under the Proposed Action, Thurston would not install electricity to provide power for the pumpjacks.

2.1.1.4 Pipelines

Under the proposed action, only natural gas would be transported from the well heads through a 3-inch surface HDPE natural gas pipeline to an existing Bainbridge Uinta LLC gas gathering pipeline on top of the bluff near the west boundary of the Ouray NWR. The pipeline would be constructed of approximately 7,216 feet of 3-inch, black, HDPE natural gas pipe and laid by hand on a cross-country route from the gathering line tie-in point on top of the bluff to the well pads. Portions of the 3-inch, surface, HDPE, natural gas pipeline would be co-located with existing roads or proposed access roads where possible.

2.1.1.5 Rights-of-Way

IBR

2.1.2 Well Drilling

IBR

2.1.3 Well Completion and Testing

IBR

2.1.4 Interim Reclamation

Upon well completion, the well locations and surrounding area(s) would be cleared of all unused tubing, materials, trash, and debris not required for production. All pits, cellars, rat holes, and other bore holes unnecessary for further well operations would be promptly backfilled. In accordance with UDOGM regulations, drilling fluids and cuttings contained within the closed system tank would be hauled from the site and disposed of at an approved facility.

In accordance with BLM *Oil and Gas Onshore Order Number 1, Approval of Operations*, after completion activities have been finalized for all planned wells, Thurston would reduce the size of the well pad to the minimum surface area needed for production facilities and adequate room for trucks to turn around, while providing for reshaping and stabilization of cut-and-fill slopes. Interim reclamation would be accomplished

by grading, leveling, and seeding, as required by the Service, and would reduce the disturbed area at each of the well pads to approximately 2.02 acres or less.

Under the SUPO, approximately 5.8 acres of short-term disturbance associated with construction of proposed well pads, pipeline corridors, and access road ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the SUPO to approximately 5.88 acres.

2.1.5 Production and Maintenance Operations

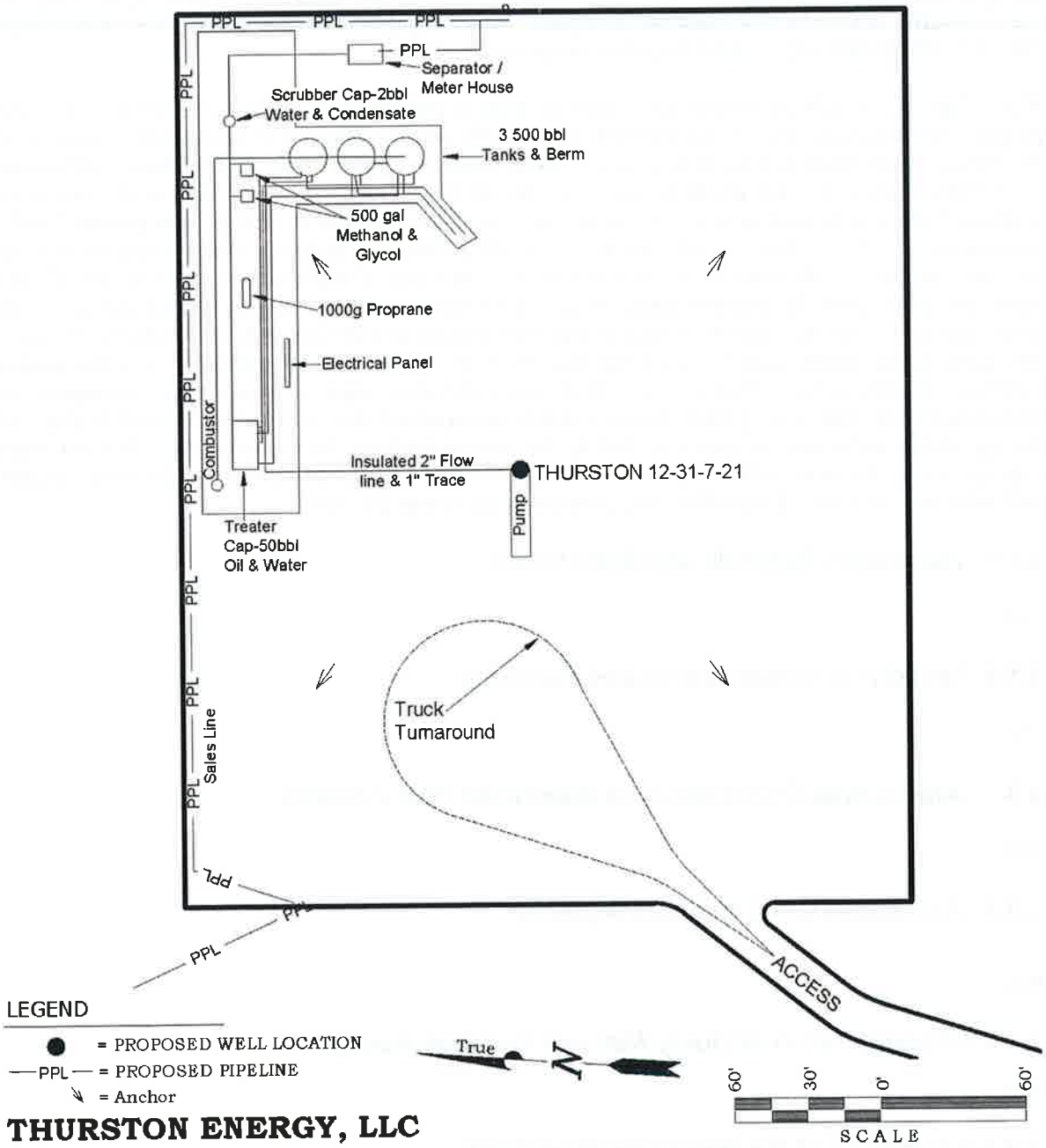
Well production facilities, including gas gathering lines, would be installed after drilling and completion operations. Facilities on each well pad would include a well head, valves and piping, separator, dehydrator, and meter that would either be housed in a small building or enclosed by a fence. Figure 2-6 illustrates the production phase plan for a typical well pad. The 3-inch surface HDPE natural gas pipeline would be anchored down as necessary from the well head to the connection point with the Bainbridge Uinta LLC natural gas gathering pipeline. Wells would likely be fitted with a pumpjack or Roto-flex unit to assist liquid production as formation pressure depletion requires. The pumpjack or Roto-flex unit would require the installation of natural gas engines.

Each location would use two 500-barrel tanks for storing heated crude oil and one additional 500 barrel tank for produced water storage. The tanks would be approximately 15.5-feet in diameter and 16-feet high. They would be surrounded by a secondary containment berm of sufficient capacity to contain 110 percent storage capacity of the largest tank and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank battery or would use catch basins to contain spills. Thurston would maintain the integrity of the dike throughout the production lifetime of the well.

All measurement facilities would conform to American Petroleum Institute (American Gas Association) standards for gas and liquid hydrocarbon measurement. Thurston would adhere to all site security guidelines and regulation identified in 43 CFR 3126.7. A gas meter would be initially calibrated and tested periodically thereafter with measurement results provided to the UDOGM as required. If feasible, telemetry equipment would also be installed at the well pad location to remotely monitor well conditions and reduce traffic to and from the well pad.

All permanent (onsite for six months or longer) structures either constructed or installed would be painted a flat, non-reflective, earth-tone color using one of the standard environmental colors, as determined by the Service AO. All facilities would be painted within six months of installation.

Figure 2-6. Typical Well Pad Layout During Production Phase Following Partial Reclamation.



2.1.6 Final Reclamation and Abandonment

IBR

2.1.7 Water Use and Supply

Drilling operations would be responsible for most of the water consumed during the project. Water for use during drilling operations would be obtained from existing permitted water supply sources, including but not necessarily limited to, J.D. Field Services (State Water Right No. 49-2307), RNI (State Water Right No. 49-2367), Vernal City, or local irrigation company.

The Refuge water delivery infrastructure may be used to deliver Ouray Park Irrigation System water purchased by Thurston. This would minimize truck traffic on the Refuge/NFH road during development. The Refuge's water right will not be used for any of this project. Approximately 0.5 acre-feet (3,879 barrels, or 162,925 gallons) of water would be needed for the drilling of each well, using mud as the circulation medium. Thus, a maximum of one acre-foot of water would be required to drill the two proposed wells. Approximately 2.3 acre-feet (18,000 barrels, or 756,000 gallons) of additional water would be used per well for completion and formation stimulation purposes, for a total of approximately 4.6 acre-feet of water for the two proposed wells. Approximately 0.1 acre-feet of water would be used on Refuge and NFH roads for dust control. The total amount of water required for drilling, completion, and dust control operations is anticipated to be approximately 5.7 acre-feet over the LOP. Water used for completion and dust control purposes would be obtained from the Vernal City municipal water supply or local irrigation company and transported to the well pads by truck. Water would be transported to the well pad by licensed haulers, and the appropriate water permits would be filed by the licensed haulers. An estimated 182-273 truck round trips (assuming the truck volumes will be between 80 barrels [3,360 gallons] and 120 barrels [5,040] gallons) would be required for drilling and completion operations per well.

2.1.8 Hazardous Materials and Solid Waste

IBR

2.1.9 Workforce Requirements and Schedule

IBR

2.3 Alternatives Considered but Dismissed from Analysis

IBR

2.3.1 Alternative C – 4-Well Development

IBR

2.3.1.1 Consideration of Ouray National Fish Hatchery (NFH)

IBR

2.3.1.2 Summary of the Ouray NFH Well Field

IBR

2.3.1.3 Risk Factors

IBR

2.3.1.4 Rationale for Eliminating Alternative C from Further Consideration

IBR

2.3.2 Alternative D – Alternative Pipeline Route 1

IBR

2.3.3 Alternative E – Alternative Pipeline Route 2

IBR

2.3.4 Alternative F – Directional Drilling Alternative

IBR

2.3.5 Alternative G – Seasonal Restrictions Alternative

IBR

2.3.6 Alternative H – Land Exchange Alternative

IBR

2.3.7 Alternative I – Lease Buyout Alternative

IBR

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing human environment including biological, physical, and social resources that may be affected by the Approved Action or the Proposed Action as described in **Chapter 2**. Resources and resource values analyzed in the EA were identified as issues by the Service and/or public during the public scoping process. Where no measurable effects are anticipated, resource descriptions are limited in order to focus the analysis on the principle issues to be considered in the decision making process. Where appropriate, descriptions that did not change substantially from the 2014 EA were incorporated by reference (IBR). The reader is referred to Appendix A for a more thorough discussion of the affected environment.

The following resources/elements are not present in the Project Area or would not be affected. Therefore, they were dismissed from further analysis for the reasons identified below.

- **Geology/Minerals:** Compliance with existing Service and UDOGM oil and gas guidelines and regulations would make the possibility of project-initiated landslides, other mass movement, or flooding unlikely. In addition, current state-of-the-art drilling and well completion techniques and UDOGM siting and spacing regulations would make the possibility of adverse degradation to energy resources (i.e., oil, natural gas, tar sand, oil shale, etc.) or mineral deposits negligible.

- **Socioeconomics:** The Proposed Action would have negligible impact on socioeconomic conditions within and adjacent to the Project Area.
- **Livestock/Range Management:** The Project Area does not contain rangeland or designated livestock grazing allotments.
- **Wilderness:** There are no designated Wilderness or Wilderness Study Areas within or adjacent to the Project Area.
- **Noise/Light:** The Project Area and surrounding region is in a remote setting with no areas nearby where dwellings or other fixed developed sites would be subject to significant levels of noise and light as a result of the proposed project.

Resources Brought Forward for Analysis

The resources that were considered for analysis in the EA include environmental elements identified by the Service that could potentially be affected by the Proposed Action and Alternatives. These resources are discussed further below with respect to their status in the Project Area.

- Air Quality including Greenhouse Gas Emissions and Climate Change
- Soils
- Water Resources including Surface Water, Groundwater, Floodplains, Wetlands, and Waters of the U.S.
- Biological Resources including Vegetation, Invasive and Noxious Weeds, Fish and Wildlife and their Habitat, and Special Status Plant and Animal Species and their Habitat
- Paleontological Resources
- Cultural Resources
- Transportation
- Recreation
- Visual Resources

3.1 Air Quality Including Greenhouse Gas Emissions and Climate Change

3.1.1 Air Quality

IBR

3.1.2 Greenhouse Gas Emissions and Climate Change

IBR

3.2 Soils

IBR

3.2.1 Erosion and Restoration Potential of Project Area Soils

IBR

3.2.1.1 Erosion Potential

IBR

3.2.1.2 Restoration Potential

IBR

3.3 Water Resources Including Floodplains, Wetlands, and Waters of the U.S.

3.3.1 Regional Overview

IBR

3.3.2 Surface Water

IBR

3.3.2.1 Stream Classification

IBR

3.3.2.2 Stream Flow

IBR

3.3.2.3 Surface Water Quality

IBR

3.3.3 Groundwater

IBR

3.3.3.1 Groundwater Quality

IBR

3.3.4 Floodplains, Wetlands, and Waters of the U.S.

3.3.4.1 Floodplains

IBR

3.3.4.2 Wetlands and Waters of the U.S.

IBR

3.4 Biological Resources

3.4.1 General Vegetation

IBR

3.4.1.1 Scrub/Shrub

IBR

3.4.1.2 Grasslands/Herbaceous

IBR

3.4.1.3 Riparian

IBR

3.4.1.4 Barren Lands

IBR

3.4.1.5 Altered or Disturbed Land

IBR

3.4.2 Invasive and Noxious Weeds

IBR

3.4.3 Fish and Wildlife

3.4.3.1 Wildlife Habitats

IBR

3.4.3.2 General Wildlife

IBR

3.4.3.3 Big Game

IBR

3.4.3.4 Upland Game

IBR

3.4.3.5 Waterfowl

IBR

3.4.3.6 Migratory Birds

IBR

3.4.3.7 Raptors

IBR

3.4.3.8 Fish

IBR

3.4.3.9 Ouray National Fish Hatchery (NFH)

IBR

3.4.4 Special Status Plant and Animal Species

IBR

3.4.4.1 Federally Threatened, Endangered, or Proposed Species

IBR

3.4.4.2 Utah Natural Heritage Program Species of Concern

IBR

3.5 Paleontological Resources

IBR

3.5.1 Regulatory Setting

IBR

3.5.2 Known Paleontological Resources within the Project Area

IBR

3.6 Cultural Resources

IBR

3.6.1 Regulatory Setting

IBR

3.6.2 Historical Background

3.6.2.1 Prehistoric Period

IBR

3.6.2.2 Historical Period

IBR

3.6.3 Known Cultural Resources within the Project Area

IBR

3.6.4 Section 106 Consultation

IBR

3.7 Transportation

IBR

An existing network of gravel roads is maintained by the Service within the Ouray NWR. The Refuge/NFH Road provides access to the Refuge and the Ouray NFH from SH 88 and will be the primary transportation route used within the Project Area. The current transportation network within the Refuge is used by USFWS employees for Refuge management and maintenance, Ouray NFH employees, and visitors for various recreation uses.

3.8 Recreation

IBR

3.9 Visual Resources

IBR

4.0 ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes and analyzes the potential impacts or environmental consequences that would result from implementation of Alternative A – Approved Action, and Alternative B – Proposed Action. The impact analysis describes the effects of implementing the alternatives on the physical, biological, and the human environment that were discussed in **Chapter 3**. The resource-specific effects of the alternatives are evaluated both quantitatively and qualitatively, depending on available data and the nature of the resources analyzed. Conservation measures and long-term impacts are discussed, where appropriate, to further minimize impacts.

Cumulative impact analysis is presented for each resource following the direct and indirect effects discussion and provides a framework for forecasting and evaluating future environmental changes that may affect the quality and extent of the natural and human environment. Although the Ouray NWR boundary may be considered a generalized cumulative impact assessment area (CIAA), cumulative impacts in this EA were analyzed using CIAAs with spatial boundaries that vary by resource. **Table 4-1** defines the CIAA for each resource examined in this EA and provides rationale for selecting each CIAA boundary. Only elements modified in the proposed action will be considered in this analysis; all other unchanged analysis will be incorporated by reference (IBR).

Table 4-1. Cumulative Impact Assessment Areas

Resource	Cumulative Impact Assessment Areas	Assessment Area Rationale	Factors Evaluated in this Supplemental Assessment.
Air Quality	Uinta Basin	Construction, development, and production activities from implementation of the Proposed Action would cumulatively contribute to changes in air quality occurring immediately adjacent to the Project Area and within the greater Uinta Basin.	Change from electrical power to produced natural gas fuel power for 2 pumpjacks
Soils	Ouray NWR Boundary	Project activities impacting soils would only affect soil types present within the Ouray NWR boundary and its adjacent lands and would not cause additive effects to those occurring elsewhere.	Increased compaction on pads, access roads, Refuge and NFH roads.
Water Resources[1]	Ouray NWR Boundary	Project activities impacting water resources would only affect those present within the Ouray NWR boundary and its adjacent lands and would not cause additive effects to those occurring elsewhere.	Spill potential along the Refuge and NFH roads.

Resource	Cumulative Impact Assessment Areas	Assessment Area Rationale	Factors Evaluated in this Supplemental Assessment.
Biological Resources[2]	Ouray NWR Boundary	Project activities impacting biological resources would only affect those present within the Ouray NWR boundary and its adjacent, neighboring lands. Furthermore, proposed conservation measures would reduce impacts to special status plant and animal species and their potential habitat within the Ouray NWR.	Increased truck traffic during production. Increased noise from change from electric power to produced natural gas fuel power for two pumpjacks.
Paleontological Resources	Project Area Boundary	Project activities impacting paleontological resources would only affect those present in the Project Area and would not cause additive effects to those occurring elsewhere.	No Change.
Cultural Resources	Project Area Boundary	Construction activities impacting cultural resources would only affect those present in the Project Area and would not cause additive effects to those occurring elsewhere.	No Change.
Transportation	Project Area Boundary and primary access roads to the area	Impacts to transportation would be most pronounced within the Project Area; however, less noticeable impacts may be realized on primary, public transportation corridors (i.e., US 40 and SH 88) leading to the Refuge.	Increased truck traffic on Refuge and NFH roads. Potential conflicts with visitors and staff.
Recreation	Ouray NWR Boundary	Project activities impacting recreation would be limited to the Ouray NWR boundary and its adjacent lands and would not cause additive effects elsewhere.	Disturbance and visitor conflict related to increased truck traffic on Refuge and NFH roads.
Visual Resources	Ouray NWR Boundary	Project activities impacting visual resources would only affect those present within the Ouray NWR boundary and its adjacent lands and would not cause additive effects elsewhere.	Moving tank batteries and produced fluid treatment equipment to well pads adjacent to Leota Bottom. Increased truck traffic on Refuge and NFH roads.

[1] Includes Floodplains, Wetlands, and Waters of the U.S.
[2] Includes Vegetation, Invasive and Noxious Weeds, Fish and Wildlife, and Special-Status Plant and Animal Species

As stated previously, cumulative impacts are derived from past, present, and reasonably foreseeable future actions. Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals, or which are highly probable and based on known opportunities or trends. For purposes of assessment in this EA, it is reasonably assumed that energy-related actions would have the greatest effect within the previously defined CIAAs. All other actions that could affect the CIAAs are assumed to remain at current trends, with only minor deviations.

The following discussion for present and reasonably foreseeable energy development (RFD) is based on UDOGM data and pending NEPA documents with the Service within the Ouray NWR boundary. As of

April 2013, there are seven well pads, six active wells, and two pending APDs on State-owned lands within the Refuge boundary, 48 planned wells on SITLA lands and 9 wells proposed for development under an ongoing EA with the Service. **Table 4-2** provides the estimated surface disturbance for the past, present, and reasonably foreseeable future energy development within the Ouray NWR.

Table 4-2. Estimated Maximum Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Energy Development within Ouray NWR

	No. of Wells [2]	No. of Well Pads[2]	Estimated Surface Disturbance[1]			
			Well Pads (acres)	Access Roads, Pipelines, and/or Power Lines (acres)	Other Supporting Infrastructure (acres)	Total (acres)
Past	--	--	--	--	--	--
Present	6	7	14.7	10.5	--	25.2
RFD: Ultra 9-Well EA	9	5	11.8	18.1	--	29.9
Bainbridge Uinta LLC Development in Section 2, T8S, R20E	21	4-11[4]	15.8	--	--	15.8
Bainbridge Uinta LLC Development in Section 36, T7S, R20E	27	5-14[4]	20.3	--	--	20.3
Approved Action[3**]	2	2	4.32	5.46	1.81	11.59
Proposed Action	same	same	6.36	5.32[5]	0	11.68
Total	**65**	**23-39**	**66.92**	**34.06**	**0**	**102.79[6]**

[1] Surface disturbance is the short-term disturbance value for each of the defined project components. (Note: Projects without a designated surface disturbance rate were assigned a total equivalent of 3.6 total acres per well pad [BLM 2012c]).
[2] Number of proposed wells for each project was compiled from NEPA documents and UDOGM data.
[3] Estimated short-term surface disturbance set out in the Approved Action, **Section 2.1.1**.
[4] Well pads within these developments would be collocated on pads with up to six wells with as few as two wells. As a result, it is assumed the average disturbance area for each well pad would be 0.75 acres.
[5] Includes access road and pipeline acreage, eliminates above ground (overhead) electric power line footprint.
[6] This figure is for the Approved Action, the proposed action would be 102.88 acres with elimination of the power pole footprint.
** Includes 9,768.1 feet of proposed above ground (overhead) electric power line.

As shown in **Table 4-2,** surface disturbance associated with implementation of the Proposed Action, when added to past, present, and other reasonably foreseeable actions, would incrementally increase the total cumulative disturbance within the Ouray NWR to 102.88 acres, or 0.9-percent of the 11,987 acreage total within the Refuge.

4.1 Air Quality and Greenhouse Gas Emissions

4.1.1 Alternative A – Approved Action

Emissions under the Approved Action are considered to be a minor source under the CAA. The Approved Action would result in different types of emission sources associated with two project phases: well development and well production. Under the Approved Action the pumpjack engines would be powered by commercial electricity rather than natural gas fuel from the wells. This will reduce emissions of NO_x, CO, and GHG. Annual estimated emissions from the Approved Action are summarized in **Table 4-3.** A more detailed overview of emissions calculations is presented in **Appendix E.**

Table 4-3. Estimate of Annual Emissions *(tons per year)*[1] for Well Development and Production under the Approved Action

Pollutant	Development	Production	Total
Criteria Pollutants			
NO_X	2.99	2.75	6.06
CO	1.42	0.91	2.33
VOC	0.51	11.56	12.07
SO_2	0.058	0.0027	0.058
PM_{10}	0.90	19.16	20.06
$PM_{2.5}$	0.22	2.06	2.28
Greenhouse Gases			
Carbon Dioxide (CO_2)	260.4	457.9	718.3
Methane (CH_4)	0.20	6.61	6.81
Nitrous Oxide (N_2O)	0.0020	0.0048	0.0068
Global Warming Potential (GWP)[2]	265.2	598.2	863.4
Hazardous Air Pollutants			
Benzene	0.0012	0.39	0.39
Toluene	0.00049	0.68	0.68
Ethylbenzene	0.00067	0.027	0.027
Xylene	0.0019	0.39	0.39
n-Hexane	0.0019	0.31	0.31
Formaldehyde	0.00034	---	0.00034

[1] Emissions include development and production from 2 wells and associated operations traffic during the year in which the project is developed.

[2] Global Warming Potential (GWP) = $CO_2 + 21 \times CH_4 + 310 \times N_2O$

Well Development includes NO_X, SO_2, and CO tailpipe emissions from earth-moving equipment, vehicle traffic, drilling, and completion activities. Fugitive dust emissions would occur from vehicle traffic on unpaved roads and from wind erosion where soils are disturbed. Drill rig and fracturing pump engine operations would result mainly in NO_X and CO emissions, with lesser amounts of SO_2 and $PM_{2.5}$. These

emissions would be short-term during the drilling and completion phases and would not be expected to cause or contribute to an exceedance of the NAAQS.

Drilling operations are a substantial but short-term contributor to well development emissions as shown in **Table 4-4**. These emissions are summarized from **Appendix E** and are calculated based on the average time needed for the drilling of a single well multiplied by the total number of wells (two) assuming Tier 2 drill rig engines are used although Tier 4 or natural gas engines may be available on some drill rigs that could be employed.

Table 4-4. Estimate of Annual Emissions *(Tons per Year)* [1] for Well Development under the Approved Action

Pollutant	Construction	Drilling	Well Completion	Interim Reclamation	Wind Erosion	Total Well Development Emissions
NO_X	0.49	1.70	0.79	0.0026	---	2.99
CO	0.16	0.94	0.32	0.0029	---	1.42
VOC	0.041	0.35	0.12	0.00021	---	0.51
SO_2	0.0000024	0.033	0.025	0.0000024	---	0.058
PM_{10}	0.17	0.43	0.16	0.11	0.027	0.90
$PM_{2.5}$	0.052	0.09	0.062	0.011	0.0041	0.22

[1] Emissions include construction, drilling, and well completion from two wells and associated operations traffic during the year in which the project is developed. Summations may not precisely add due to round off differences.

During well production, continuous NO_X, CO, VOC, and HAP emissions (plus relatively small amounts of SO_2, PM_{10}, and $PM_{2.5}$) will be produced from the produced fluid treatment and tank battery pad separator and dehydration units, boiler for 3-phase pipeline heat tracing and crude oil storage tanks and integrated heaters with emission control combustion units, pneumatics, and tailpipe and fugitive dust emissions from operations traffic. Well production emissions are summarized in **Table 4-5.**

Table 4-5. Estimate of Annual Emissions *(Tons per Year)* [1] for Well Production under the Approved Action

Pollutant	Stock Tanks	Truck Loading	Separator & Dehydrator Units, Boiler & Tank Heaters	Operations Vehicle Export Trucking from CIAA[2]	Pneumatics	Total Well Production Emissions
NO_X	---	---	0.20	2.55	---	2.75
CO	---	---	0.17	0.74	---	0.91
VOC	8.49	0.37	2.49	0.082	0.13	11.56
SO_2	---	---	0.0012	0.0015	---	0.0027
PM_{10}	---	---	0.015	19.14	---	19.16
$PM_{2.5}$	---	---	0.015	2.04	---	2.06

[1] Emissions include production and operation of two wells using commercial electricity for pumpjack power rather than produced natural gas fuel combustion.
[2] Produced water export round trip of 32 miles and crude oil export round trip of 224 miles within Uinta Basin airshed during peak (first) year of production from two best case wells would require export of 342 loads of crude oil and 534 loads of produced water (Note that over a projected 38.33-year period the average annual production from two best case wells would require export of 58 loads of crude oil and 92 loads of produced water each year.)
Summations may not precisely add due to round off differences.

Potential impacts of oil and gas well development and production emissions in the region have been extensively analyzed in the Greater Natural Buttes Final Environmental Impact Statement (FEIS) (BLM 2012b). The Greater Natural Buttes (GNB) Project was approved for a total of 3,675 producing wells, with 336 wells developed per year. Despite the fact that the GNB Project has a substantially greater number of wells, the GNB analysis found that the annual NAAQS for criteria pollutants would not be exceeded as a result of implementation of the GNB Project. Therefore, development of the Approved Action would not cause an exceedance of the annual NAAQS.

Potential 1-hour, 3-hour, 8-hour, and 24-hour impacts are not based on the total number of wells being developed or operated, but rather are a function of a single or small number of wells. The GNB FEIS analyzed a worst-case scenario where four wells were drilled simultaneously at the four corners of a square 400 meters on a side (i.e., the wells were 400 meters apart). All of the short-term and annual potential impacts were evaluated, including the 1-hour NO_2 and 1-hour SO_2 standards. For the 1-hour NO_2 standard, the GNB analysis used the Plume Volume Molar Ratio Method (PVMRM) to account for NO to NO_2 conversion, assuming initial in-stack NO_2 was 10 percent of the total NO_X emissions, Tier 2 drill rig engines, and the AERMOD dispersion model. The GNB analysis also accounted for seasonal and diurnal variation in ozone concentrations (since ozone is needed for the conversion of NO to NO_2). The GNB FEIS found that the 1-hour NO_2 standard would not be exceeded even at receptors located as close as 100 meters to the drill rig engines. The GNB analysis assumed at a minimum that Tier 2 drill rig engines (4.8 grams per brake hp hour [g/bhp-hr]) be used. Therefore, Tier 2 engines are recommended as a conservation measure for potential air quality impacts associated with the Proposed Action. Since the GNB FEIS indicated that none of the NAAQS would be exceeded with the four drill rig scenario, the Proposed Action would also not result in an exceedance of the NAAQS since only one drill rig will be operating at a time. While Tier 4 engines are not being evaluated in this analysis, emissions would be decreased if Tier 4 engines were used instead of Tier 2.

The GNB 1-hour NO_2 analysis was conducted prior to the EPA issuing extended guidance on how to conduct such analyses. However, although the analysis does not precisely match the guidance, it is similar to the most recent guidance. For example, the EPA guidance suggests a default in-stack NO to NO_2 ratio of 0.5 if no project-specific stack testing data are available. Although the GNB analysis did not have project specific stack testing data available, the 10 percent assumption is consistent with stack testing data that are available for large diesel-fueled engines as presented by the EPA on its In Stack Ratio (ISR) database of actual stack test results, available at www.epa.gov/scram001/no2_isr_database.htm. This database was designed specifically to address the default ISR problem. As the EPA states on the web site for the ISR database:

> " *... the recommended default ISR may still be too conservative for many applications such that there remains a significant need for a widely available and well-documented database of ISRs, which is the impetus for the current data collection effort.*"

The database supports use of the 10 percent ISR used in the GNB analysis. In addition, the use of PVMRM for atmospheric conversion of NO to NO2 is what is specified in the EPA guidance. Therefore, as long as

the 10 percent assumption made by GNB is valid, the GNB analysis should yield a reasonable assessment of potential 1-hour NO2 impacts. Because the GNB FEIS indicated that none of the NAAQS would be exceeded with the four drill rig scenario, the Proposed Action would also not result in an exceedance of the NAAQS because only one drill rig will be operating at a time.

Under the Approved Action, total emissions of NO_X and VOC ozone precursors, from both well development and well production are estimated at 5.74 tons per year for NO_X, and 12.07 tons per year for VOCs (summed from **Tables 4-4 and 4-5**). It should be noted that these are extremely small amounts of ozone precursor emissions. For example, the GNB Project alone has NO_X emissions on the order of 2,000 tons per year and VOC emissions on the order of 7,000 tons per year with total emissions in the region reaching a magnitude of 12,000 tons per year for NO_X and 200,000 tons per year for VOCs. **Section 4.1.3** discusses the potential ozone formation.

The primary sources of HAPs from the Approved Action are from crude oil storage tanks and dehydration units, with smaller amounts from other production equipment. The wells considered by the GNB Project will produce natural gas, condensate and crude oil from the lower Wasatch and Mesaverde formations which are substantially richer in condensate than the Green River and upper Wasatch formations targeted by the wells considered under the Approved Action. Small amounts of HAPs are emitted by construction equipment. These emissions are extremely small compared to emissions from other projects in the surrounding region, especially the GNB Project. The GNB FEIS found that the GNB Project (3,675 wells) would not cause an adverse health effect as the result of HAPs emissions. Consequently, implementation of the Approved Action will not likewise cause adverse health impacts.

Amendments to the CAA stipulate requirements to prevent significant deterioration of air quality and, in particular, to preserve air quality in national parks, national wilderness areas, national monuments and national seashores (42 U.S.C. 7470). These amendments also established Class I, II and III areas, where emissions of particulate matter and sulfur dioxide are to be restricted. The restrictions are most severe in Class I areas and are progressively more lenient in Class II and III areas. In addition to the CAA classifications, the Federal Land Managers have established sensitive Class II areas that also require additional AQRV evaluation as part of the NEPA process. The Service has determined that the Ouray NWR is a sensitive Class II area.

Because the Approved Action would occur within a sensitive Class II area, potential impacts on visual air quality have to be analyzed near the emission source. The VISCREEN model used for visibility impact screening analyses calculates the contrast of a potential plume of pollutants against terrain and sky backgrounds. As a default criterion, a value of 2 for the color difference, Delta-E, is used as the threshold for a plume being "just noticeable".

Maximum emissions from a single drill rig were input into the VISCREEN model along with the default hypothetical worst case meteorological conditions for dispersion. For an observer standing near the drill rig emission source, the plume may be visible out to approximately 3 km. However, this impact has been determined not to be an issue according to Service guidance. **Appendix E** contains the VISCREEN model input and output tables.

Additionally, the GNB FEIS analyzed the potential impact of the GNB Project on visual air quality and acid deposition at distant Class I and sensitive Class II areas. The GNB FEIS analysis was conducted consistent with the Federal Land Managers Air Quality Related Work Group Phase I Report dated December 2000 (FLAG 2000). Potential visual air quality impacts were analyzed with both Method 2 and Method 6 using the CALPUFF set of dispersion models and post-processors, but Method 2 is no longer used. Although Method 6 is consistent with the EPA's final regional haze rule, for purposes of evaluating

impacts at Class I and sensitive Class II areas, it has recently been replaced by the Federal Land Managers with Method 8 (FLAG 2010). The main difference between Method 8 and Method 6 is that Method 8 treats small sulfate, nitrate, and organic carbon particles differently from larger particles. This generally results in a slightly more conservative (i.e., larger) regional haze impact. For example, at 70 percent relative humidity and a sulfate concentration of 0.4 ug/m^3, Method 8 yields a 13 percent greater sulfate light extinction than Method 6. However, the changes are not linear and are a function of both the particle concentrations and relative humidity.

The GNB FEIS compared modeled impacts to both 0.5 deciview (dV) and 1.0 dV 98th percentile change in light extinction evaluation criteria. The 0.5 dV change criteria is defined as the threshold for concern by the Federal Land Managers (FLAG 2010) and is used by the EPA as a threshold for a source contributing to regional haze impairment, while the 1.0 dV change is used by EPA as a threshold for a source causing regional haze impairment. The FEIS found that the GNB Project alone would not cause a change greater than 0.5 dV at any of the Class I and sensitive Class II areas. The GNB FEIS also found that the Project would not cause adverse acid deposition. However, the GNB analysis only used one year of meteorological data for its analysis, while FLAG 2010 recommends a minimum of three years and five years preferred. Nevertheless, considering that emissions from implementation of the Proposed Action are so much smaller than the 3,675-well GNB Project, the Proposed Action alone is also not anticipated to cause a significant impact on visual air quality, nor acid deposition.

Social cost of carbon" estimates are one approach that an agency can take to examine climate consequences from greenhouse gas emissions resulting from a proposed action. However, leasing action Environmental Assessments provide no quantitative monetary estimates of any benefits or costs. The National Environmental Policy Act (NEPA) does not require an economic cost-benefit analysis (40 C.F.R. § 1502.23), although NEPA does require consideration of "effects" that include "economic" and "social" effects (40 C.F.R. 1508.8(b)). Quantifying only the costs of oil and gas development by using the social cost of carbon metrics but not the benefits (as measured by the economic value of the proposed oil and gas development and production generally equaling the price of oil and gas minus the cost of producing, processing, and transporting the minerals) would yield information that is both inaccurate and not useful for the decision-maker, especially given that there are no current criteria or thresholds that determine a level of significance for social cost of carbon monetary values.

The assessment of GHG emissions and climate change remains in its earliest stages of formulation. The lack of scientific models that predict climate change on a regional or local level prohibits the project-specific quantification of potential future impacts on climate change. Potential GHG impacts are global and cumulative in nature only and are discussed in **Section 4.1.3**.

4.1.2 Alternative B – Proposed Action

Under the Approved Action Alternative, the two proposed oil wells would be drilled and equipped with pumpjacks powered with electric motors and 3-phase production meters on the well pads. The crude oil, natural gas and water production from the wells would be transported via 7,131 feet of bundled, 8-inch, surface, HDPE, heat-traced, 3-phase pipeline to a separate produced fluid treatment and tank battery pad located near the west boundary of the Ouray NWR on top of the bluff in SWNW Section 36, T. 7 S., R. 20 E., S.L.B.&M. The produced fluid treatment and tank battery pad would be equipped with 3-phase fluid separator, natural gas dehydrator, boiler for 3-phase pipeline and pad plumbing heat tracing, crude oil storage tanks equipped with integrated emission control combustion heaters, flow control electric and pneumatic devices, and natural gas sales meter. Crude oil and produced water stored on the pad would be offloaded and exported by tanker trucks over the private and county road network within and west of the Ouray NWR to SH 88. The dehydrated natural gas production net of the volumes consumed in the production treatment and storage equipment would be exported via 85 feet of 3-inch, surface, HDPE natural gas pipeline.

Under the Proposed Action Alternative an incremental increase in emissions within the airshed would be generated by two pumpjack engines fueled with produced natural gas. The emissions release points for all of the equipment that was to be sited on the produced fluid treatment and tank battery pad under the Approved Action previously described would be moved to the well pads. In addition, the tanker truck traffic to export crude oil and produced water would occur on the Refuge/NFH road to connect with SH 88 over the 30 to 40 year productive life of the wells. Effects on ambient air quality would continue near present levels from existing oil and gas development in the region and other emission producing sources. Since the Approved Action does not cause nor contribute to a significant ambient air quality impact, then the Proposed Action alternative would not change the significance of potential air quality impacts either.

Annual estimated emissions from the Proposed Action are summarized in **Table 4-6.** A more detailed overview of emissions calculations is presented in **Appendix E.** No revisions of any kind were made to the estimate of annual emissions for well development operations previously listed in **Table 4-4** under the Approved Action alternative. In contrast, **Table 4-5** was revised to include the emissions from two pumpjack engines to be fueled with produced natural gas. The revised estimate of annual emissions for well production from two wells is presented in **Table 4-7**.

Table 4-6. Estimate of Annual Emissions *(tons per year)*[1] for Well Development and Production under the Proposed Action

Pollutant	Development	Production	Total
Criteria Pollutants			
NO_X	2.99	2.95	6.06
CO	1.42	1.08	2.33
VOC	0.51	11.57	12.07
SO_2	0.058	0.0039	0.058
PM_{10}	0.90	19.31	20.06
$PM_{2.5}$	0.22	2.07	2.28
Greenhouse Gases			

Pollutant	Development	Production	Total
Carbon Dioxide (CO_2)	260.4	697.9	958.3
Methane (CH_4)	0.20	6.62	6.82
Nitrous Oxide (N_2O)	0.0020	0.0092	0.011
Global Warming Potential (GWP)[2]	265.2	839.7	1104.9
Hazardous Air Pollutants			
Benzene	0.0012	0.39	0.39
Toluene	0.00049	0.68	0.68
Ethylbenzene	0.00067	0.027	0.027
Xylene	0.0019	0.39	0.39
n-Hexane	0.0019	0.31	0.31
Formaldehyde	0.00034	---	0.00034

[1] Emissions include development and production from 2 wells and associated operations traffic during the year in which the project is developed.
[2] Global Warming Potential (GWP) = $CO_2 + 21 \times CH_4 + 310 \times N_2O$

The Proposed Action required a revision of the estimate of annual emissions for well production over the 30 to 40-year life of the wells to include the use of two pumpjack engines that would use produced natural gas (or propane as a backup) for fuel. Under the Approved Action the rest of the production equipment and storage tank heaters that were to be placed on the produced fluid treatment and tank battery pad on top of the bluff near the west boundary of the Ouray NWR would have been fueled with produced natural gas and did not contribute to the revisions in any way, The revisions for the Proposed Action well production period as presented in **Table 4-7** are slight due to the substantial background of estimated emissions produced by crude oil and produced water export trucking using the most productive year from the two proposed wells and best case crude oil and water production from the wells.

Table 4-7. Estimate of Annual Emissions *(Tons per Year)* [1] for Well Production under the Proposed Action

Pollutant	Stock Tanks	Truck Loading	Separator & Dehydrator Units, Boiler, Tank Heaters & Pumpjack Engines	Operations Vehicle Export Trucking from CIAA[2]	Pneumatics	Total Well Production Emissions
NO_X	---	---	0.40	2.55	---	2.95
CO	---	---	0.34	0.74	---	1.08
VOC	8.49	0.37	2.50	0.082	0.13	11.57
SO_2	---	---	0.0024	0.0015	---	0.0039
PM_{10}	---	---	0.03	19.14	---	19.31

Pollutant	Stock Tanks	Truck Loading	Separator & Dehydrator Units, Boiler, Tank Heaters & Pumpjack Engines	Operations Vehicle Export Trucking from CIAA[2]	Pneumatics	Total Well Production Emissions
$PM_{2.5}$	---	---	0.03	2.04	---	2.07

[1] Emissions include production and operation of two wells using produced natural gas for pumpjack power rather than electrical service.

[2] Produced water export round trip of 32 miles and crude oil export round trip of 224 miles within Uinta Basin airshed during peak (first) year of production from two best case wells would require export of 342 loads of crude oil and 534 loads of produced water (Note that over a projected 38.33-year period the average annual production from two best case wells would require export of 58 loads of crude oil and 92 loads of produced water each year.)

Summations may not precisely add due to round off differences.

4.1.3 Cumulative Impacts

Table 4-6 presents the annual emissions of pollutants in tons per year from development and production under the Proposed Action including contributions detailed in **Table 4-7** due to the changes proposed between the Approved Action and Proposed Action. As noted in the first footnote to **Table 4-7** the production emissions estimate was made on the first year of production and the projected annual emissions maximum expected over the 30 to 40-year life of the project. Since the resource production declines exponentially, the production emissions, primarily due to trucking, also decline similarly. Thurston submitted a production traffic projection as an attachment to the application for a surface use permit from the Service which was based upon the actual composite production from two wells in oil fields adjacent to the Refuge.

Emissions from the production facilities and the production trucking are positively linked. The production traffic projection included variances in oil and water production with time plus the effect of a future well workover which yielded data over a 38-year period. By calculating the percentage decline in production and resultant projected emissions decline from the first year for each subsequent year it was estimated that cumulative production emissions and grand totals including the development phase emissions estimates from **Table 4-6** are:

Production Phase (Tons)		Production plus Development Grand Total (Tons)	
NOx	19.55	NOx	22.24
CO	7.04	CO	8.46
VOC	75.44	VOC	75.95
SO2	0.025	SO2	0.61
PM10	125.91	PM10	126.81
PM2.5	13.50	PM2.5	13.72
CO2	4550.69	CO2	4811.09
CH4	43.17	CH4	43.37
N2O	0.06	N2O	0.62
GWP	5475.30	GWP	5740.50
Benzene	2.54	Benzene	2.54
Toluene	4.43	Toluene	4.44
Ethylbenzene	1.76	Ethylbenzene	1.76
Xylene	2.54	Xylene	2.54

n-Hexane	2.02	n-Hexane	2.02
Formaldehyde	0.00	Formaldehyde	0.00034

By comparison with multiple-year projections of the annual data presented in **Table 4-8** it can be seen that the cumulative contribution of the estimated emissions from the Proposed Action while measurable is not significant. A detailed discussion of the annual emissions data and estimates is presented for further consideration of the impact on air quality from the Proposed Action.

The CIAA for air quality resources is the Uinta Basin. The GNB FEIS summarized past, present, and reasonably foreseeable development in the Uinta Basin. While, the Ouray NWR 2-Well Development Project was not explicitly listed in the GNB FEIS as one of the anticipated future projects, emissions under the Proposed Action are included in the scaling factors used by the GNB FEIS to estimate reasonably foreseeable development in the region. **Table 4-8** shows the total emissions projected in the GNB FEIS compared to those under the Proposed Action. In **Table 4-8**, "2006 Baseline" represents existing emissions, "2018 Projected" represents the total of existing emissions plus reasonably foreseeable future development, and "2017 GNB Project" is the additional emissions as the result of the GNB Project (i.e., the GNB Proposed Action). As shown in **Table 4-8**, the Proposed Action comprises a very small percentage of the total annual emissions in the Uinta Basin.

Table 4-8. Uinta Basin Oil and Gas Operations Emissions Summary (2006)

Emissions Category	NO_X (tons/year)	CO (tons/year)	SO_X (tons/year)	PM_{10} (tons/year)	VOC (tons/year)
2006 Baseline	10,754	7,800	391	592	70,226
2018 Projected	10,138	9,732	30	565	184,262
2017 GNB Project	2,213	1,300	25	1,011	6,617
Uinta Basin Future Total (i.e., 2018 Projected plus GNB Project)	**12,351**	**11,032**	**55**	**1,576**	**190,879**
Ouray NWR 2-Well Development Project (Proposed Action)	6.06	2.33	0.058	20.06	12.07

The GNB FEIS explicitly analyzed cumulative impacts with respect to NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, ozone, HAPs, visual air quality, and acid deposition at sensitive Class I and II areas. The FEIS found that the cumulative impacts of NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions would not cause an exceedance of the NAAQS in the region. Therefore, it is assumed that implementation of the Proposed Action will also not contribute to an exceedance.

The GNB FEIS analyzed the potential impact of cumulative emissions of ozone precursors on regional ozone concentrations. The GNB FEIS regional ozone modeling did not show an exceedance of the ozone NAAQS caused by the cumulative emissions in the region. As discussed in **Chapter 3**, although the current photochemical models do show the effect of ozone precursor emissions on summer time ozone concentrations, they have not yet been developed to represent winter time ozone formation in detail. Emissions of ozone precursors from the Proposed Action are less than 0.01 percent of the regional total assessed in the GNB analysis (i.e., sum of the Proposed Action NO_x and VOC compared to the sum of the Uinta Basin future total NO_x and VOC).

Based on the magnitude of the projected increase in ozone precursors in the Uinta Basin, whether or not the proposed project is built, and the contribution that would be emitted from implementation of the Proposed Action, a precise numerical analysis of potential ozone impacts from the action alternatives is not feasible. Any cumulative ozone impacts from implementation of the Proposed Action would be indistinguishable from, and insignificant in comparison to, the margin of uncertainty associated with the regional cumulative VOC and NO_X emission inventory and ozone impact modeling methodology. Whether or not emissions from the Proposed Action were included in any regional ozone modeling, there would be no difference in the results.

On the other hand, photochemical models have demonstrated that reductions in NOx and VOC emissions will reduce the potential for ozone exceedances. Considering the fact that the entire Uinta Basin region with elevations lower than 6,500 feet was declared a nonattainment area by USEPA on April 30, 2018, violations of 2015 ozone NAAQS have been observed during winter months from the Ouray monitor (8.6 miles southwest of the proposed wells), and oil and gas operations are the only major source of emissions in the region, the possible contribution of the Proposed Action to potential ozone formation cannot be ignored and a reduction in emissions will result in a reduced potential for visibility impairment, even if not detectable, quantifiable, or measurable.

The State of Utah participates in the USEPA Ozone Advance Program that encourages the reduction of ozone precursor emissions and participants may receive preferred status when applying for federal grants and/or receive a State Implementation Plan (SIP) credit for reduction measures undertaken as part of the program. Thurston will comply with the objectives of the Ozone Advance Program in the future and will participate in the BLM Adaptive Management Program for ozone precursor emission reductions. Thurston will comply with all applicable air emission regulations, including a future SIP, that are designed to ensure that ozone level exceedances of the 2015 NAAQS of 70 ppb within the Uinta Basin nonattainment area during problematic winter months are minimized.

The GNB FEIS also modeled potential visual air quality and acid deposition impacts at distant Class I and sensitive Class II areas. The GNB FEIS found that cumulative emissions in the Uinta Basin would not have a significant impact on acid deposition. As discussed in **Section 4.1.1**, the GNB FEIS found that the 3,675-well GNB Project alone would not cause an exceedance of the 0.5 dV threshold. On the other hand, the GNB FEIS found that cumulative emissions from all current and future development could cause an exceedance of the 1.0 dV threshold on 223 to 365 days per year at several of the Class I areas. The lowest value, 223 days per year, was for Canyonlands National Park. Similar results were found for the sensitive Class II areas, with the lowest number of days (206) being at the Browns Park NWR. The GNB FEIS analysis used Method 6 to assess visual air quality impacts. Recent guidance uses Method 8, and thus the cumulative visual air quality impacts with Method 8 could be different than reported in the GNB FEIS.

However, as in the case of ozone, the emissions that could potentially affect visual air quality from implementation of the Proposed Action are less than 0.02 percent of the future total. Any cumulative visual air quality impacts from implementation of the action alternatives would be indistinguishable from, and insignificant in comparison to, the margin of uncertainty associated with the regional cumulative emissions related to potential visual air quality impacts. Whether or not emissions from the Proposed Action were included in the cumulative visual air quality impact modeling, regardless of the method used to perform the analysis (i.e., Method 2, 6, or 8), there would be no difference in the results. But as noted above, a reduction in emissions will result in a reduced potential for visibility impairment, even if not detectable, quantifiable, or measurable. Under the Proposed Action, implementation of conservation measures would also reduce impacts to air quality by minimizing fugitive dust.

Under the Approved Action Alternative, there would be no significant contribution to cumulative emissions in the region. However, the potential impacts of the cumulative emissions would not essentially change because the Proposed Action emissions are such a small portion of the total. As a result, there would be no detectable or observable change in cumulative impacts whether or not the Proposed Action or Approved Action Alternative is implemented.

In addition to both the direct annual and cumulative emissions attributable to the Proposed Action, either the Approved Action or the Proposed Action can be expected to produce significant crude oil and natural gas resources that will be processed and consumed to produce indirect annual and cumulative emissions impacts. However, it must be noted that for the most part, the combustion of the oil and gas resources or their conversion to petrochemicals will not occur within the Uinta Basin airshed and is not under the control of FWS.

It is within reason to expect that most of the oil and gas resources from the Proposed Action will be consumed by combustion somewhere in the western U.S producing indirect emissions. The EPA website contains a page entitled *Green House Gas Equivalencies Calculator-Calculations and References* which provides formulas to estimate the GHG emissions in metric tons of CO2 (equivalent) from burning natural gas and crude oil. There is significant uncertainty in this estimation method due to the lack of information on combustion devices or degree of conversion to nonfuel products. It is based upon the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories, Volume 2 (Energy) estimation formulas which account for 100% oxidation of carbon in the fossil fuel to CO2 regardless if the carbon atom is part of a CO2, CH4 or other hydrocarbon molecule. The IPCC GHG estimations are produced in metric tons of CO2 equivalent based upon natural gas yield of 0.0551 per Mcf and crude oil yield of 0.43 per barrel (Bbl).

The Proposed Action could produce up to 400,000 Bbls of crude oil and 300,000 Mcf natural gas over a 35-year period, with roughly 50% of those volumes coming from each well, for a grand total of 188,530 metric tons of CO2 equivalent. The average annual yield would be 5,386.6 metric tons of CO2 equivalent per year from both wells combined. However, in reality the first years of the impact would be the greatest declining exponentially with time along with the oil and gas resource production as discussed with the truck traffic estimates. Analysis of these estimates of CO2 equivalent yield indicate that they are not significant in comparison with the direct and indirect emissions related to the resource production from the thousands of wells that are currently in production and will continue to produce crude oil and natural gas in the Uinta Basin for the next several decades.

Another comparison on a broader scale, can be drawn with the most recent estimate of the total gross GHG emissions from the entire state of Utah for the year 2020 produced by the Center for Climate Strategies (CCS) in the *Utah Greenhouse Gas Inventory and Reference Case Projections, 1990-2020* prepared in Spring 2007 for the Utah Department of Environmental Quality (UDEQ). The CCS estimated 96.1 million metric tons of CO2 equivalent for the calendar year 2020. The CCS 2020 GHG projections for that single year include in millions of metric tons of CO2 equivalent:

79.9 from electricity production gross (36.6 electricity consumption-based net);
22.4 from the transportation sector;
16.3 from residential/commercial/industrial fuel use;
5.8 from industrial processes;
5.8 from agriculture;
4.7 from waste management; and
4.6 from the fossil fuel industry.

The estimated average indirect annual contribution of GHG emissions from the Proposed Action of 5,386.6 metric tons of CO2 equivalent would be 0.0056% of the CCS year 2020 projection total for Utah and 0.117% of the CCS 2020 estimation total projected from the fossil fuel industry in the state.

4.1.4 Mitigation

The following conservation measures would be applied to reduce impacts to air quality under the Proposed Action:

- Thurston will secure all required permits and approvals from the Service, State of Utah, and Uintah County prior to construction. Thurston will adhere to all applicable federal, state, county, regulations while performing all operations associated with the Proposed Action.
- Thurston will instruct its employees and contractors: (1) not to exceed speeds on the Refuge/NFH road that will produce dust depending upon conditions; (2) under no circumstances to exceed 10 miles per hour traveling from the main Refuge/NFH road to the well pads; and (3) under no circumstances to exceed 25 miles per hour on the main Refuge/NFH road during construction, drilling/completion, or normal daily activities to discourage the generation of fugitive dust.
- During drilling and completion operations, Thurston will perform dust abatement measures on proposed access roads and/or well pads as necessary. Dust control measures will be performed on access roads as needed during normal daily operations.
- Noise abatement methods (e.g., acoustic barriers and mufflers) will be implemented to reduce noise impacts of natural gas pumpjack engines to levels at or below noise levels of an electrified system. Thurston will monitor noise levels from the installed equipment to insure that the noise level from the equipment does not exceed 60 dB at 50 feet. The specific noise abatement methods may include but are not limited to best available technology for natural gas engine exhaust noise muffling and/or cancellation and must be provided to the USFWS for concurrence prior to initiation of drilling activities.
- Thurston will provide a detailed description of all BMPs that will be used during any aspect of the proposed exploration project.
- Dust levels on regularly traveled access routes must be kept to a minimum. The Operator must have a water truck and operator(s) readily available to perform dust abatement as needed, or as directed by the Refuge Manager or the Service AO. Magnesium water or an approved equivalent may be used as needed with prior approval from the Refuge Manager, the Service AO, and the Uintah County Road Department Manager. Dust control measures must be implemented throughout the traveled areas of the Project Area.
- To reduce potential impacts to air quality, all equipment associated with drilling and completion activities, as well as, service equipment used for fracing and cementing, would be with Tier 2 or better off-road engines.

4.2 Soils

As previously described in **Section 3.2 of Appendix A of the 2015 EA,** soils in the Project Area are generally rated low in reclamation potential. Impacts to soils are typically described in terms of short-term and long-term impacts. In disturbed areas where interim reclamation is implemented, ground cover by herbaceous species could potentially re-establish within 5 to 7 years following seeding of native plant species and diligent weed control efforts, thereby reducing soil erosion. These reclaimed areas have often been referred to as short-term disturbance.

However, it is important to note that all surface disturbances could remain as long-term (or even permanent) impacts on the landscape if reclamation efforts are not successful.

4.2.1 Alternative A – Approved Action

Construction and operation of the Approved Action would result in short- and long-term impacts to soils within the Project Area. Impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and the redistribution of soils during construction and reclamation activities that are associated with pads, access roads, and pipelines.

Implementation of the Proposed Action would result in the direct disturbance of approximately 11.68 acres of soils within the Project Area. Following construction, approximately 5.8 acres of short-term disturbance (28 percent) associated with construction of proposed pads and portions of the access roads and pipeline ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action to approximately 5.88 acres. **Table 4-7** provides a summary of short-term and long-term surface disturbance associated with each soil mapping unit within the Project Area.

Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut-and-fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. The mixing of physical characteristics of the soils, including structure, texture, and rock content could potentially lead to a loss of soil productivity and reduced reclamation potential. Topsoil and subsoil would be stockpiled separately along the sides of the pads and access roads.

4.2.1.1 Erosion and Sedimentation

IBR

4.2.1.2 Soil Contamination

Sources of potential soil contamination include leaks or spills of crude oil and natural gas condensate liquids from wellheads, natural gas and water lines, produced water sumps, and crude oil storage tanks. To reduce the potential for hydrocarbon contamination of soils, natural gas lines, and water lines would be designed to minimize the potential for spills and leaks. Storage tanks would be located above the 100-year flood plain of the Green River, separated from the Leota Bottom wetlands by the NFH road, and surrounded by berms capable of holding at least 110 percent of the largest single tank volume plus precipitation. Leaks or spills of saline water, hydraulic fracturing chemicals, fuels, and lubricants could also result in soil contamination. Depending on the size and type of spill, the effect on soils would primarily consist of the potential loss of soil productivity. The Project would minimize the risk of such spills by providing safeguards against spills and making sure that detailed reporting and cleanup measures are performed in the event of a spill. Thus, the potential for impacts to soils from spills would be considered minor.

Implementation of conservation measures listed in **Section 2.1.10** would further minimize the direct and indirect impacts to soils assessed under the Approved Action (see **Section 4.2.1**). Construction of containment structures and use of catch pans or other liner systems to capture any and all leaked substances from storage tanks and/or production facilities would further minimize risks to the soil resources from possible contamination. In the event of an accidental spill or discharge, Thurston would be required to remove contaminated soils for proper disposal off-site and replace them with the same soil type or one specified and approved by the Refuge Manager or Service AO. To further protect soils from contamination, Thurston or a Service-approved laboratory will be required to test the soils at the Project site to determine

levels of heavy metals, chemical pollutants, or other contaminants prior to rig-up operations and before completion or at abandonment. Ground disturbance activities will be limited during periods of high precipitation to minimize impacts to soils. Greater care and maintenance of topsoil would enhance reclamation success on soils having poor reclamation potential. This includes separating, stockpiling, covering, and documenting topsoil stockpiles on-site in accordance with Refuge protection measures.

4.2.2 Alternative B – Proposed Action

Under the Proposed Action, there are five notable modifications to the Approved Action to consider: 1) well pad size would be increased from 3.32 to 5.1 acres with short-term disturbance areas including access roads increased from 4.74 to 6.71 acres: 2) the production treatment equipment and tank batteries would be moved from the produced fluid treatment and tank battery pad on top of the bluff to the well pads eliminating that support facility pad of 1.38 acres and short-term disturbance area including access road of 1.88 acres; 3) 7,131 feet of bundled, 8-inch, surface, HDPE, heat-traced, 3-phase pipeline would be eliminated and replaced with 3-inch, surface, HDPE, natural gas pipeline with a less intensive footprint; 4) 9,768 feet of overhead electric power line and possible interference with NFH electric power delivery would be eliminated and 5) there would be from 2-4 tanker trucks traveling the Refuge/NFH road daily during the first year of production from both wells, 1-3 tanker trucks daily during the second year, 1-2 trucks daily during the third and fourth years, 2-3 trucks per week from the fifth year on, and 1-2 trucks per week from the tenth year on until the end of the 30-40 year productive life of the wells.

Besides the increased surface disturbance due to well pad enlargement, increased truck traffic would result in additional soil compaction on the Refuge and NFH roads, well pad access roads, and the well pads themselves. Under the approved action, the production equipment and tank batteries were moved to a location on top of the bluff near the west boundary of the Ouray NWR to minimize the potential for soil contamination. While elimination of the 3-phase, surface pipeline to transfer produced fluids to the produced fluid treatment and tank battery pad would eliminate the potential for pipeline rupture and overland spill, the tanker truck traffic would increase the potential for spill at the well pad sites, well pad access roads, and the Refuge/NFH road.

4.2.3 Cumulative Impacts

The CIAA for soil resources is defined as the Ouray NWR boundary and adjacent lands. Any surface disturbing activity that removes native vegetation and topsoil from land within the Refuge may cumulatively and incrementally affect soil resources by increasing erosion and sediment yield, thereby reducing soil productivity and stability as measured by the amounts and types of vegetative cover and forage. Past, present, and reasonably foreseeable actions that could result in increased erosion and sediment yield within the CIAA include: prescribed burns; habitat enhancement projects; road, trail, and various other travel-way development; and oil and gas exploration and production. Of these actions, impacts related to road construction are the highest concern. As active roadways and trails would not be reclaimed for the long term, it is assumed sediment yield from existing and proposed road and trail construction (including those roads used for oil and gas development) would continue at rates two to three times above background rates into the indefinite future, as compared to other authorized actions.

As previously shown in **Table 4-2**, surface disturbance associated with the Approved Action, when added to past, present, and other reasonably foreseeable actions, would cumulatively and incrementally result in minor negative cumulative impacts to soil resources within the CIAA. Approximately 91.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities on the Refuge. Under the Proposed Action, the proposed Ouray NWR 2-Well Development Project would

incrementally increase the total cumulative soil disturbance in Ouray NWR to 102.88 acres. Throughout the CIAA, disturbed soil acreage and reduced soil productivity would last for the lifetime of oil and gas development or until final reclamation is deemed successful.

4.2.4 Mitigation

1) No new mitigation actions would be necessary under the proposed action. Impacts would be slightly greater than under the approved action and required conservation measures are adequate.

4.3 Water Resources Including Floodplains, Wetlands, and Waters of the U.S.

4.3.1 Alternative A – Approved Action

Construction and operation of the approved project could potentially result in direct and indirect impacts to water resources. The principal impacts to water resources associated with the Approved Action include: (1) increased sediment loading to the Green River, potentially increasing salinity levels in the Colorado River system; (2) depletion of stream flows in the Green River from the removal of water for drilling activities; (3) increased runoff; (4) impacts to water quality (i.e., potential contamination of surface water resources and shallow groundwater with drilling fluids or other wastes generated by oil and gas well drilling and production activities); and (5) direct and indirect impacts to floodplains.

4.3.1.1 Surface Water

The magnitude of potential project-related impacts to surface water resources would depend on a number of factors, including the proximity of surface disturbances to the Green River; slope aspect and gradient; soil type; the duration and timing of the construction activity; and the success or failure of reclamation and erosion control measures. The potential for adverse impacts to surface water resources would be greatest during project construction activities and would likely decrease in time due to natural stabilization of disturbed surfaces, the reduction in the amount of surface disturbance from interim and final reclamation, and successful revegetation efforts.

Water Quality

Contamination of surface water can occur in oil and gas fields. Sources of potential contamination include leaks of fuels, petroleum products, and produced water from wellheads, conveyance pipelines, storage tanks, and tanker trucks; leaching of contaminants from impacted soils near these facilities; and accidental spills. A spill of natural gas condensate that enters the adjacent floodplain or the Green River would have the greatest potential environmental impact on surface water. Potential effects from a spill of natural gas condensate could include an increase in biological oxygen demand (BOD) that results in the depletion of oxygen in the water and sediments during the short-term. This depletion of oxygen could have deleterious effects on aquatic organisms.

Produced water would be stored in steel tanks at each well pad. The contents of the tanks would be pumped out as needed and transported by tanker truck to licensed disposal sites. A spill of produced water into the adjacent floodplain or Green River could also result in negative impacts, including an increase of sodium, chloride, and other constituents, and aquatic organism mortality. In addition, significant leaks of produced water from routine loading operations on the well pads could potentially enter and impact surface water.

The Approved Action has been designed to minimize the potential for spills. Should well logs determine that a well is economically viable, steel production casing would be run from the bottom of the wellbore

through the surface casing to the wellhead. The steel production casing would be cemented in place with sufficient cement to overlap the surface casing. Cementing the production casing would prevent damage to the wellbore that could potentially occur from targeted formation pressure, retard corrosion, and prohibit pressure communication or fluid migration between productive and nonproductive zones. This would establish protection of freshwater aquifers within the Project Area. Prior to drilling below the surface casing, a BOP would be installed on the surface casing and a flow control manifold consisting of manual and hydraulically operated valves would be installed below the rig floor. Both the BOP and the steel casing would be pressure tested to verify well integrity and to comply with *BLM Onshore Oil and Gas Order No. 2, Drilling Operations*. Additionally, a cement bond log would be run as part of completion operations to ensure that the production casing is properly protected from non-target formations and that the cement overlaps the surface casing. All drilling fluids used for each well would be contained within a closed-loop drilling system and no reserve pits would be constructed or used. All crude oil and water tanks would be surrounded by a dike of sufficient capacity to contain 110 percent of the storage capacity of the largest tank in the battery and sufficient freeboard to contain precipitation.

4.3.1.2 Groundwater

IBR

4.3.1.3 Floodplains and Wetlands and Waters of the U.S.

IBR

4.3.2 Alternative B – Proposed Action

Water Quality

Under the Proposed Action, tanker trucks would be using the Refuge/NFH road to access and export oil and produced water following development. There would be from 2-4 tanker trucks traveling the Refuge/NFH road daily during the first year of production from both wells, 1-3 tanker trucks daily during the second year, 1-2 trucks daily during the third and fourth years, 2-5 trucks per week from the fifth year on, and 1-2 trucks per week from the tenth year on until the end of the 30 to 40-year productive life of the wells with possible increases due to water production. The highest trucking traffic levels would occur during initial stages of production and decline exponentially over the production period tempered by a typical increase then levelling to variable water production in the final 20 years of operation. This trucking activity has been estimated to last 30-40 years after development, which would slightly increase the possibility of oil and produced water spilling into the Green River. All other impacts are the same as under the Approved Action.

4.3.3 Cumulative Impacts

Same as Approved Action except that soils compacted on existing roads over the 30-40 years of oil production would contribute to slightly higher runoff than at undisturbed sites. The increased runoff could lead to slightly higher peak flows in the CIAA drainage system, potentially increasing erosion of the channel banks. Such increased erosion, when combined with increased erosion from other authorized actions, could have negative impacts on aquatic habitat within affected drainages and on the proper functioning condition of floodplains. These impacts include increased turbidity and salinity; the covering of stream substrates with fine sediment and clogging of the interstitial pores of the substrate; increased transport of pollutants, including trace metals, herbicides, and petroleum constituents, and increased down-cutting of channel and

bank destabilization. The construction and operation of each well would also incrementally increase the potential for leaks or spills of saline water, hydraulic fracturing chemicals, fuels, and lubricants within the CIAA. Spills of this nature could contaminate surface water or shallow alluvial groundwater within the Refuge.

4.3.4 Mitigation

The following conservation measures would be applied to reduce impacts to water resources under the Proposed Action:

IBR with the following additions:

- Tanker trucks would be limited to traveling at dustless speeds depending upon road conditions or no more than 10 mph which would result in less impact to road surfaces while minimizing dust transport to adjacent wetland habitat.
- A 430-foot long Jersey barrier would be installed where the Refuge/NFH road meets the Green River to minimize the potential for vehicles and produced fluids entering the river.

4.4 Biological Resources

4.4.1 General Vegetation

4.4.1.1 Alternative A – Approved Action

Construction and operation under the Approved Action would result in direct and indirect impacts to vegetation communities within the Project Area. Direct effects to vegetation (i.e., modification of structure, species composition, and extent of cover types) would occur from disturbance or removal of vegetation associated with construction of well pad sites, access roads or improvements to Refuge/NFH road. Indirect effects may include the short-term and long-term increased potential for noxious weed invasion, exposure of soils to accelerated erosion, soil compaction, and shifts in species composition and/or changes in plant density.

The duration of impacts to vegetation would depend, in part, on the success of mitigation and revegetation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Following interim reclamation, ground cover would likely begin to re-establish within 2 to 3 years following seeding using native plant species. An estimated 7 to 10 years would be needed for shrub species to successfully re-vegetate the disturbed portions of the Project Area. Long-term disturbance would remain for the estimated 33 to 43 year LOP or until such time as the abandoned well pads and roads would be restored to near existing conditions.

Interim reclamation for portions of the well pads and access roads not needed for production facilities/operations would be completed following completion of the last well planned and beginning in the next allowable construction period. Seeding of temporarily disturbed areas along roads and pipelines would be completed within 30 days following completion of construction.

Implementation of the Proposed Action also would increase the potential for the occurrence of indirect effects. Additional construction related impacts could include soil compaction, an increased potential for wind and water erosion of disturbed surfaces prior to reclamation, and the potential for shifts in species composition and/or changes in plant density.

Conservation measures would further reduce environmental impacts through greater care and maintenance of topsoil to enhance reclamation success (see **Section 2.1.10**). In addition, actions would be taken to limit the spread and introduction of noxious weeds through decontamination of vehicles and equipment prior to entering the Refuge.

4.4.1.2 Alternative B – Proposed Action

Under the Proposed Action, the two proposed well pads have been expanded in size from 3.32 to 5.1 acres with accompanied short-term surface disturbance increased from 4.32 to 6.36 acres which results in an additional 1.78 acres of direct vegetation removal if topsoil is retained in place under the adjacent topsoil stockpiles. Associated access roads would be reduced in length and trenching of produced fluid transport lines would not occur resulting in less direct impact to vegetation resources. Existing conditions for vegetation and wetlands resulting from recreation use and maintenance of Refuge resources would continue at current levels.

4.4.1.3 Cumulative Impacts

IBR

4.4.1.4 Mitigation

No additional mitigation beyond what is proposed in **Appendix B** is recommended for general vegetation under the Proposed Action or other alternatives.

4.4.2 Invasive and Noxious Weeds

4.4.2.1 Alternative A – Approved Action

Disturbances from construction would increase the potential for the establishment and spread of noxious weeds. Noxious weeds tend to be aggressive colonizers of disturbed areas where the native vegetation has been removed. Therefore, disturbances associated with construction of well pad sites, access roads, and other project facilities would provide opportunities for invasive and noxious weeds to become established. Once established, weeds could contribute to a reduction in the overall visual character of the area and add to the reduction or elimination of native plant species, wildlife habitat, and/or habitat for special status plant species.

In order to minimize the potential for adverse effects from invasive and noxious weed establishment, monitoring for invasive and noxious weeds would be necessary and if found, control and eradication measures would be implemented as outlined in the Conditions of Approval (COA) for the SUP for the Project. The implementation of these measures along with conservation measures listed in **Appendix B** would minimize the potential for adverse impacts from noxious weeds. Under the Approved Action, the applicant and/or its contractors would be required to decontaminate all construction vehicles and equipment, prior to entering the Refuge. Any materials brought into the Refuge for the construction or reclamation of well pads must be authorized by the Refuge Manager, and no topsoil from outside the refuge would be allowed. In addition, Thurston will also be required to have a Reclamation Plan that includes weed management to monitor affected and reclaimed lands for noxious weed infestations.

4.4.2.2 Alternative B – Proposed Action

Under the Proposed Action, increased activity to remove and transport produced fluids over the Refuge/NFH road would occur. The estimated 1-4 tanker trucks accessing the well pads daily during the first year but declining substantially throughout the 30 to 40 year life of the wells would increase the chance for spread of noxious weeds from off-site production facilities. The Approved Action required decontamination of trucks accessing the refuge and the same would be required of transport trucks through the LOP.

4.4.2.3 Cumulative Impacts

IBR

4.4.2.4 Mitigation

No additional mitigation beyond what is proposed in **Section 2.1.10** is recommended for invasive and noxious weeds under the Proposed Action or other alternatives.

4.4.3 Wildlife and Wildlife Habitats

4.4.3.1 Alternative A – Approved Action

Under the Approved Action, construction and operation of the proposed project would result in direct and indirect impacts to wildlife and wildlife habitat. The principal impacts to terrestrial wildlife associated with implementation of the Proposed Action would likely include: (1) the loss of certain wildlife habitats due to construction activities such as earth-moving associated with proposed well pads, access roads, and 3-inch, surface, HDPE natural gas pipeline; (2) habitat fragmentation; (3) vehicle-related mortality; (4) displacement of some wildlife species; and (5) an increased potential for illegal take and harassment of wildlife. The magnitude of impacts to wildlife and wildlife habitats would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and implementation of recommended and required conservation measures.

4.4.3.2 Alternative B – Proposed Action

The effects to wildlife under the Approved Action were comprehensively evaluated in the 2015 EA and FONSI and rather than repeat the information in this section, we will incorporate the analysis by reference and focus on impacts associated with the Proposed Action only. The most significant changes under the Proposed Action in respect to wildlife are:

- Expansion of the well pads and associated construction activity during development (increase to 2.02 acres each after preliminary reclamation). The change in size is not anticipated to have any appreciable effects to wildlife and habitats beyond the Approved Action
- The elimination of 7,131 feet of bundled 8-inch pipeline and replacement with 3-inch pipeline
- The elimination of 9,768 feet of overhead electric power line.
- The addition of 1-4 tanker trucks per day declining to 1-2 per week over the 30 to 40 year productive life of the wells.
- The relocation of the tank batteries to the well pads adjacent to Leota Bottom.

4.4.3.2.1. Big Game

Mule Deer, Pronghorn, and Elk

IBR – There would be a possibility of tanker truck collision or displacement of big game species associated with tanker truck travel. The dustless or maximum 10 mph speed limit and the 1:00 – 4:00 p.m. travel window should minimize this possibility.

4.4.3.2.2. Upland Game

IBR – There is a slight possibility that raptors could use perches on top of the tank batteries, thus increasing the potential for upland nest predation in the immediate area of the well pads. The elimination of two miles of overhead power lines should more than offset the slight detriment to upland game and the slight benefit to raptors.

4.4.3.2.3. Waterfowl and Migratory Birds

IBR – Same as upland game. On the positive side, elimination of 9,768 feet of powerline removes the potential for line strikes by all waterfowl species, but in particular, sandhill cranes. Conservation measures listed in Appendix B should be adequate to compensate for anticipated impacts.

4.4.3.2.4. Raptors

IBR – Same as previous discussion.

4.4.3.2.5. Fisheries

IBR

Under the Proposed Action, habitat for native and/or recreational fish species inhabiting the Green River within and adjacent to the Project Area may be degraded by increased erosion, sediment yield, and the potential for exposure to hazardous substances in the case of an accidental spill that would result in crude oil and other hydrocarbon material entering the Green River. This risk is increased under the proposed action due to tanker truck travel along the Refuge/NFH road during the 30 to 40 year life of the wells.

4.4.3.3 Cumulative Impacts

IBR

4.4.3.4 Mitigation

Recommended conservation measures to prevent impacts to wildlife and fisheries are included in Appendix B. The following additional conservation measures would be added:

- Tanker trucks would be limited to dustless speed or 10 mph maximum and would only be allowed to access facilities from 1:00 to 4:00 p.m..
- A 430-foot long Jersey barrier would be installed along the Refuge/NFH road to minimize spill potential into the Green River.

4.4.4 Special Status Plant and Animal Species

The effects to special status species under the approved action were comprehensively evaluated in the 2015 EA and FONSI and rather than repeat the information in this section, we will incorporate the analysis by reference and focus on impacts associated with the Proposed Action only. The most significant changes under the Proposed Action in respect to wildlife are:

- Expansion of the well pads and associated construction activity during development (increase to 2.02 acres each after preliminary reclamation). The change in size is not anticipated to have any appreciable effects to special status plant and animal species beyond the Approved Action.
- The elimination of 7,131 feet of bundled 8-inch pipeline and replacement with 3-inch pipeline.
- The elimination of 9,768 feet of overhead electric power line.
- The addition of 1-4 tanker trucks per day declining to 1-2 per week over the 30 to 40 year life of the wells.
- The relocation of the tank batteries to the well pads adjacent to Leota Bottom.

4.4.4.1 Alternative B – Proposed Action

Species Listed as Federally Threatened, Endangered, or Proposed

The following section describes the anticipated effects of various project components and activities associated with the Proposed Action on federally listed, proposed, and candidate species carried forward for evaluation. The magnitude and nature of effects of the Proposed Action is assessed for the species relative to existing conditions in terms of whether these effects are adverse. (See **Appendix F.**)

Yellow-Billed Cuckoo

The yellow-billed cuckoo is known to use riparian habitat that occurs north, east, and south, but outside, of the disturbance footprint for the Project along the Green River. Therefore, the Proposed Action would not have direct impacts to this habitat. Potential effects of the Proposed Action on the western yellow-billed cuckoo would likely be in the form of direct noise disturbance or lighting. Noise and/or lighting may arise from construction, drilling, and production activities, as well as traffic associated with the proposed project, which could affect cuckoos, if present in the immediate vicinity of these activities.

To compensate for this impact, Thurston would not conduct construction, drilling, and completion activities during the yellow-billed cuckoo nesting season (June 15th to August 31st); therefore, intensive noise, light, and human related impacts to nesting cuckoos during these project phases as well as the production phase and associated traffic are not anticipated. Because the tank batteries have been moved adjacent to Leota Bottom, approximately 1-4 trucks would initially access well pads from the Refuge/NFH road daily declining to 1-2 trucks per week during the 30 to 40 yr life of the wells. Thurston has agreed to afternoon access to the well pads between 1 p.m. and 4 p.m. This will minimize truck noise impacts to yellow billed cuckoo's during the breeding season by avoiding sensitive activity periods during the morning and evening

The yellow-billed cuckoo is known to occur and nest within the Ouray NWR; however, they are considered as uncommon to rare summer residents within the Refuge. Given the potential project footprint and proposed conservation measures, the Service feels that the Proposed Action ***may affect, but would not likely jeopardize this species.***

Colorado River Fish Species

Based on the similarity of their affected habitats within the Green River and potential impacts associated with the proposed alternatives, impact analyses for the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker (collectively known as the Colorado River fish) are discussed together within this EA.

Total water needed for the proposed project would be approximately 5.7 acre-feet (see **Section 2.1.7**). The estimated total freshwater needed for the proposed project (5.7 acre-feet) could result in depletion to the Green River, thus directly affecting the Colorado River fish and their habitat. Implementation of the Proposed Action could also degrade USFWS-designated critical habitat for the Colorado River fish species in major tributaries and floodplains of Green River by increasing erosion, sediment yield, and the potential for exposure to hazardous substances in the case of an accidental spill that would result in condensate and hydrocarbon material to enter the Green River. This magnitude of potential impact has increased over the approved action due to tanker truck traffic on the Refuge/NFH road for the 30 to 40 year life of the wells (approximately 1–4 trucks daily initially, declining to 1-2 trucks per week).

As discussed in **Section 4.3.1.1**, the use of water for drilling under the Proposed Action will result in a small depletion to the Green River, 0.0001 percent. While this amount may be minor to the flow of the Green River, any loss of water from the Upper Colorado River Basin represents a measurable loss of habitat for fish species; therefore, implementation of the Proposed Action ***may affect, is likely to adversely affect*** the Colorado River fish and their USFWS-designated critical habitats in the Green River. This determination can be attributed to the anticipated 5.7 acre-feet depletion of water from the Green River Basin and the potential for the Colorado River fish and their designated critical habitat to be exposed to hazardous substances originating from an accidental spill, which could result in the release or discharge of condensate or hydrocarbon materials into the Green River and its associated 100-year floodplain.

Uinta Basin Hookless Cactus

While the well pads have increased in size, the location of the pads and access roads occur on soils that typically do not support Uinta Basin hookless cactus. The pipeline route, which does cross suitable habitat, has been reduced in length 15,710 feet to 7,216 feet. Although this constitutes a reduction in impacted habitat, Thurston will still be required to conduct a formal survey to determine if Uinta Basin hookless cactus has moved into areas where it did not occur when evaluating the approved action in 2015.

The largest remaining threat is fugitive dust transport which will increase over time with tanker traffic accessing well pads via the Refuge/NFH road. While tanker traffic adjacent to the Refuge boundary to access the produced fluid treatment and tank battery pad under the Approved Action would be reduced, there would be the possibility of increased fugitive dust creation due to increased traffic on the Refuge. To mitigate this effect, tanker trucks would be limited to dustless speed or 10 mph to access the well pads.

Although these measures will minimize the impacts of the action to *Sclerocactus spp.*, larger landscape-level changes such as increased habitat fragmentation and habitat loss, pollinator disturbance, changes in erosion and water runoff, and increased weed invasion cannot be entirely negated. These disturbances will continue to negatively impact the Uinta Basin hookless cactus throughout the Project Area. Therefore, the Proposed Action ***may affect, is not likely to adversely affect*** the Uinta Basin hookless cactus.

Ute ladies'-tresses

IBR

Utah Natural Heritage Program Species of Concern

IBR

Bald and Golden Eagle

IBR

Ferruginous Hawk

IBR

Northern Goshawk

IBR

Burrowing Owl

IBR

Short-eared Owl

IBR

American White Pelican

IBR

Long-billed Curlew

IBR

Lewis's Woodpecker

IBR

Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub

IBR

Smooth Green Snake

IBR

4.4.4.3 Cumulative Impacts

The CIAA for special status plant and animal species and their associated habitat is defined as the Ouray NWR boundary and adjacent, neighboring lands. It is assumed that cumulative impacts to special status plant and wildlife species would be similar to those discussed for general vegetation and wildlife (see **Sections 4.4.1.4** and **4.4.3.4**, respectively). However, given ongoing habitat losses, sensitivity to disturbance, and declining overall population numbers, special status plant and wildlife species would likely be more sensitive to impacts related to development within the Refuge than other more common species. Based on these sensitivities, existing and reasonably foreseeable development land uses have reduced and would likely continue to reduce the quality and quantity of habitats within the CIAA for special status species.

On federally administered lands, surveys are required in potential or known habitats of threatened, endangered or otherwise special status species prior to project implementation. These surveys help

determine the presence of any special status plant and wildlife species or extent of their habitat. Furthermore, protective measures such as seasonal and/or spatial and temporal buffers would generally be implemented to avoid or minimize direct disturbance or impacts. As such, the additive impacts of the Proposed Action to past, present, and reasonably foreseeable actions could affect but would not likely adversely affect special status species populations within the Refuge. Given the status of the Uinta Basin hookless cactus and the Colorado River endangered fish, cumulative impacts may be more pronounced than other special status species and they are discussed in more detail below.

Yellow-Billed Cuckoo
IBR

Colorado River Endangered Fish
IBR

Uinta Basin Hookless Cactus
IBR

Ute Ladies'-Tresses
IBR

4.4.4.4 Mitigation

Recommended conservation measures to prevent impacts to wildlife and fisheries are included in Appendix B. The following additional conservation measures would be added:

- Tanker trucks would be limited to dustless speed or 10 mph and would only be allowed to access facilities from 1:00 – 4:00 p.m.
- A 430-foot Jersey barrier would be installed along the Refuge/NFH road to minimize spill potential into the Green River.
- A new Uinta Basin hooklees cactus survey would be conducted by a FWS certified botanist.

4.5 Paleontological Resources

IBR

4.5.1 Alternative A – Approved Action

IBR

4.5.2 Alternative B – Proposed Action

Same as Approved

4.5.3 Cumulative Impacts

IBR

4.5.4 Mitigation

- IBR

4.6 Cultural Resources

4.6.1 Alternative A – Approved Action

IBR

4.6.2 Alternative B – Proposed Action

Same as Approved Action

4.6.3 Cumulative Impacts

IBR

4.6.4 Mitigation

- IBR

4.7 Transportation

4.7.1 Alternative A – Approved Action

Under the Approved Action, short-term increases in the volume of both heavy and light traffic would occur on US 40, SH 88, and along the Refuge/NFH road. Traffic operations may be affected by additional traffic volumes including heavy trucks, tractor trailers, and passenger transport vehicles and may result in temporary traffic delays. Unpaved road surfaces may be degraded due to heavy equipment traffic during the construction and drilling phases of the project, and fugitive dust would be generated in association with travel along these roads.

The largest increase in traffic would occur during the construction, drilling, and completion phases of the project. Construction of the well pads and associated access roads would require three light trucks to transport construction crews for duration of up to seven days. Two to three pieces of heavy equipment, such as bull dozers and motor graders, would also be used to perform earth moving operations. Drilling operations would generate approximately 225 truck trips, and completion operations for the two proposed wells would require approximately 360 vehicle trips. In total, traffic generated during the construction, drilling, and completion phase (107 days) would be an average of from 5 to 6 vehicles per day, although some days would experience higher than average traffic volumes depending on the specific work activity conducted.

Once the wells are complete, the volume of traffic would decrease substantially and would be limited to routine production and maintenance operations. Tanker trucks would remove crude oil and produced water from onsite storage tanks on the well pads at rates ranging from one to four times per day to once or twice per week. The wells may be worked over for rod, tubing and/or pump changes once every third year after about five years of production and recompleted once after about ten years of production that would require approximately three to five truck trips per day for approximately three to five days for each occurrence.

ROW permits for road improvements and access road construction will be required and obtained from the USFWS Realty Division prior to beginning work on any USFWS managed roads.

Per the conservation measures listed in **Appendix B**, the Operator would be required to upgrade and maintain all access routes and roads within the Refuge and must have road maintenance equipment and Operator(s) readily available to perform road repairs and maintenance, as needed, or as directed by the Refuge Manager or Service designee. Vehicles speed limits within the Refuge area boundary would also be set at the discretion of the Refuge Manager and will be strictly enforced.

4.7.2 Alternative B – Proposed Action

Under the Proposed Action, effects would be similar to the Approved Action except that there would be an additional 1-4 tanker trucks per day initially declining to 1-2 per week on U.S. 40, SH 88, and the Refuge/NFH road. While traffic would be anticipated to be light, it would occur beyond the construction phase and daily over the 30 to 40 years that the wells remain in production. While numerous tanker trucks regularly travel on U.S. 40 and SH 88, there are currently no tanker trucks using the Refuge/NFH road. This road is narrow, provides limited sight distance, and comes close to the Green River in one area. If travel occurs during heavy visitation periods (e.g., hunting season) there could be some impact to visitors and staff from both a safety and aesthetic perspective.

4.7.3 Cumulative Impacts

The analysis area for cumulative effects to transportation includes the US 40 corridor between Vernal and Roosevelt, SH 88 between US 40 and the Town of Ouray, the Refuge/NFH road, and the existing transportation infrastructure within the Project Area. Past, present, and reasonably foreseeable development activities that contribute to transportation-related impacts include oil and gas development, agriculture, recreation, and upgrades to the existing transportation infrastructure within the region.

Implementation of the Proposed Action would result in minor cumulative impacts to the transportation analysis area. Adverse cumulative impacts primarily would consist of small incremental increases in traffic delays, increased traffic volumes, potential road closures, and road damage associated with construction, drilling, and production of the proposed wells. Traffic volumes generated by the project would incrementally add to existing and future background traffic volumes from residential, recreation, and industrial uses. A potential benefit associated with implementation of the Proposal Action would include a better maintained road network in the southern portion of the Refuge that could cater to recreational use and Refuge management activities.

4.7.4 Mitigation

The original conservation measures listed under the approved action would still apply and:

- Tanker trucks would be limited to accessing tank batteries between 1:00 and 4:00 p.m. Additionally, tanker trucks would be required to yield to Refuge staff and visitor traffic by pulling over and allowing traffic to pass if accessing during hours open to the public.
- Tanker trucks would be limited to dustless speed or 10 mph while traveling on the Refuge/NFH road. This speed limit would minimize damage to the road, substantially limit dust transport to sensitive habitats, and improve safety for staff traveling on the Refuge/NFH road after hours:
- A 430-foot long Jersey barrier would be installed on the Refuge/NFH road where it comes close to a steep embankment on the Green River. This would minimize the potential for fluid spills into the river from vehicles and improve safety for tanker truck drivers and Refuge staff when they meet at this narrow constriction.
- Brushy areas along the Refuge/NFH road would be maintained at Thurston's expense to improve sight distance in areas deemed hazardous by the Refuge Manager, Service AO and/or Uintah County Road Department Manager.

4.8 Recreation

4.8.1 Alternative A – Approved Action

The Approved Action is not likely to appreciably impact recreation activities within or adjacent to the Project Area. Except for short periods of time associated with the construction of the proposed well pads, access roads, and/or pipeline installation, most recreational activities on the Refuge would continue uninhibited in the Project Area. Increased traffic, fugitive dust, and noise during construction, drilling, and completion activities would likely discourage hunting and wildlife viewing within the immediate vicinity (i.e., approximately 0.25 miles or less) of the proposed well pads, and possibly diminish the quality of the recreation experience. However, activities associated with well pad and road construction and drilling and completion work are only expected to take approximately four weeks per pad. These activities would not likely interfere with the hunting season, thereby eliminating the majority of impacts to recreational users of the area during the active rifle hunting season.

If the proposed wells are not productive and the disturbed areas are reclaimed, no impacts to recreation will occur in the long-term. If the wells are productive over a typical 30 to 40-year operational life, the presence of the well pads, access roads, and surface pipeline may slightly diminish the quality of the experience of some recreational users. These potential impacts would occur because the relatively undisturbed character of the area would be altered by the presence of industrial facilities. Since most recreational users generally prefer a natural unaltered setting, the attractiveness of the area and its surroundings would be somewhat reduced as a recreational resource. As a result, recreational users who use the Project Area, particularly for wildlife viewing and/or hunting where the proposed well pads, pipeline, and access roads would be located could be displaced to other undisturbed settings within the Refuge or elsewhere.

Per the conservation measures listed in **Appendix B**, the Operator would be required to do the following: 1) fence and provide appropriate signage on all well pads to prevent Refuge visitors from gaining access; 2) provide a Service approved gate guard for after-hour entry to the Refuge during the construction and drilling phase; and 3) modify drilling operations, as necessary, to reduce conflicts with regular Refuge management and public use activities.

4.8.2 Alternative B – Proposed Action

Under the Proposed Action, effects would be similar to the Approved Action during the construction and development phases of the project; however, 14 tanker trucks per day initially declining to 1-2 per week would be accessing well pads during the 30 to 40 year production period. This could result in additional traffic during higher level Refuge visitation periods such as spring observation and photography periods, as well as the fall hunting season. Limiting truck access from 1:00 to 4:00 p.m. would minimize traffic effects to Refuge recreationists by focusing on a lower visitor use period (middle of the afternoon), but movement of the tank battery from the overlook area to the well pads will provide visual impacts to recreationists unused to observing oil field operations occurring in the Leota Bottom.

4.8.3 Cumulative Impacts

The analysis area for cumulative effects to recreation is the entire Ouray NWR boundary and adjacent, neighboring lands. Under the Approved Action and Proposed Actions, the short-term disruption of recreational opportunities and access to the Leota Bottom resulting from the construction of the well pads and associated access roads would contribute to minor, short-term adverse cumulative impacts. In addition, the proposed development may also decrease opportunities for recreationists seeking a more primitive setting or experience. The long-term truck traffic under the proposed action can be mitigated by limiting the time of day tanker trucks are allowed on the Refuge/NFH road. Movement of the tank batteries to the well pads near the Leota Bottom is an irretrievable resource commitment during the 30 to 40 year period of well operation. Impacted areas will be reclaimed following the period of operation within the overall 33 to 43 year LOP window of impact .

4.8.4 Mitigation

The original conservation measures listed under the approved action would still apply and:

- Noise abatement methods (e.g., acoustic barriers and exhaust mufflers with noise cancellation technology) will be implemented to reduce noise impacts from natural gas pumpjack engines to levels at or below noise levels of an electrified system. These specific noise abatement methods must be provided to the UWFWS for concurrence prior to initiation of drilling activities.
- Tanker trucks would be limited to accessing tank batteries between 1:00 and 4:00 p.m. Additionally, tanker trucks would be required to yield to refuge staff and visitor traffic by pulling over and allowing traffic to pass if accessing during hours open to the public.
- The production equipment and associated infrastructure must be painted to blend with the natural landscape background.

4.9 Visual Resources

4.9.1 Alternative A – Approved Action

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4.9.2 Alternative B – Proposed Action

Under the Proposed Action, the tank batteries would be moved to the well pads adjacent to Leota Bottom. This would place additional infrastructure in the viewshed, which could detract from the aesthetic

experience of some visitors. Additionally, there would initially be a daily average of 1–4 tanker trucks declining with time to an average of 1-2 tanker trucks per week traveling on the Refuge/NFH road over the 30 to 40 year well life. Tanker trucks are not currently using the Refuge/NFH road and few conflicts with visitors enjoying wildlife dependent recreational opportunities are possible.

4.9.3 Cumulative Impacts

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4.9.4 Mitigation

Besides the conservation measures identified in Appendix B, the following conservation measures would be added under the Proposed Action:

- Tanker trucks would be allowed to access the refuge only between 1:00 – 4:00 p.m.
- Additional storage tanks would be painted to blend in with the natural background.

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5.0 CONSULTATION AND COORDINATION

5.1 Introduction

The beginning of **Chapter 3** identifies issues/resources that the Service and/or the public during the public scoping process decided to bring forward to analyze in detail in **Chapter 4** and provides rationale for issues that were considered but not analyzed further in the EA. CEQ regulations under NEPA require an "early and open process for determining the scope of issue to be addressed and for identifying significant issues related to a Proposed Action" (40 CFR 1501.7). In order to satisfy this CEQ requirement, announcement of the Proposed Action was posted on the Refuge website (www.ouray.fws.gov), posted on the Refuge's information kiosk, and published weekly in the *Vernal Express* from October 31st through November 21st. The Service resource specialists reviewed Thurston's proposed POD and conferred with the USFWS-ESFO and Refuge personnel to assess the type and magnitude of potential impacts to the natural and human environment from implementation of the proposed project. A 30-day public comment period was established for the EA to allow for public participation and input.

5.2 Persons, Groups, and Agencies Consulted

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5.3 List of Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Rob Bundy	Refuge Manager, Lower Green River NWR Complex	Project Lead
David Allin	Consultant to Thurston Energy Petroleum Consulting/Geologist	Supplemental Analysis, Proposed Action
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6.0 REFERENCES

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