

Paradox Valley Unit of the Colorado River Basin Salinity Control Program

DRAFT

Environmental Impact Statement

Volume 2 – Appendices A-D



**U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Region
Western Colorado Area Office
Grand Junction, Colorado**

December 2019

MISSION STATEMENTS

The mission of the Department of the Interior is to protect and manage the nation's natural resources and cultural heritage; provide scientific and other information about those resources; and honor its trust responsibilities or special commitments to American Indians, Alaska natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

VOLUME 2 – CONTENTS

- Appendix A – Glossary
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Appendix A

Glossary

Appendix A – Glossary

Acre-foot. The amount of water that would cover 1 acre with 1 foot of water. One acre foot is equal to 0.326 million gallons.

Adaptive management. The adaptive management approach referenced in this EIS is described in the Predictive Ecological Risk Assessment, and involves active and passive methods, including barriers (netting and wires), hazing of various types, and providing alternative habitat. These various potential methods are discussed with regard to their applicability to the proposed PVU facility within the context of an adaptive management system (Amec 2016b).

Adverse effects to historic properties. Under Section 106, when an undertaking may directly or indirectly alter characteristics of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association, it is considered an adverse effect.

Air pollutant emission notice (APEN). Colorado submittal requirement for state sources of air pollutant emissions, applications for new permits, or modifications of permits. For example, any business in Colorado that emits air pollution may be required to report its emissions and/or apply for a permit.

Ambient air quality. The state of the atmosphere at ground level as defined by the range of measured and/or predicted ambient concentrations of all significant pollutants for all averaging periods of interest.

Annual average daily traffic (AADT). The total volume of vehicle traffic of a highway or road for a year divided by 365 days.

Anticlines. A ridge-shaped fold of stratified rock in which the strata slope downward from the crest. A typical anticline is convex up in which the hinge or crest is the location where the curvature is greatest, and the limbs are the sides of the fold that dip away from the hinge.

ArcGIS. A geographic information system for working with maps and geographic information.

Artifact. A human-modified object, often appearing on an archaeological site that typically dates to over 45 years in age.

Attainment area. A geographic area in which levels of a criteria air pollutant meet the health-based National Ambient Air Quality Standard for that specific pollutant.

Baseline. The existing conditions as described in the Affected Environment; such conditions are prior to but do not include well closure/decommissioning.

Best management practice (BMP). A technique that guides or may be applied to management actions to aide in achieving desired outcomes.

Bittern. Concentrated salt and magnesium solution that remains after the evaporation and crystallization of salt from brines.

Brine. A high-concentration solution of salt in water.

Cone of depression. A cone-shaped area surrounding each production well where brine is drawn down toward the well for collection

Consumptive use. The amount of water used up by applying that water to beneficial use. Examples are water for drinking and water taken up by growing crops.

Criteria pollutants. The EPA uses six “criteria pollutants” as indicators of air quality, and has established for each of them a maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards. The criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter and lead.

Critical habitat. Specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species and that have been formally described in the *Federal Register*.

Cultural resources. Physical evidence or location of past human activity. A site, object, structure, landscape, or natural feature of significance to a group of people traditionally associated with it. These resources are fragile and non-renewable, and embody characteristics and information specific to the period in which a cultural group lived.

Data Analysis Unit. The areas identified by CPW for a herd or local population as the area necessary to carry out all life functions.

Dowthrown sides. The sinking of rocks on one side of a fault plane; the side of a fault that appears to have moved downward relative to the other side.

Easement. A right, such as a right-of-way, allows a person to make limited use of another’s real property.

Emergent wetland. Wetland type that contains emergent plants (erect, rooted, herbaceous, and water loving) as the tallest life form with at least 30 percent coverage.

Energy demand. The consumption of energy by human activity. Human energy demand influences the total amount of energy used, the location of, and types of fuel used in, the energy system, and the characteristics of the end use technologies that consume energy.

Energy use. The amount of energy or power used. Energy use refers to all of the energy harnessed from every energy source, applied to a particular endeavor.

Environmental Protection Agency. An independent agency of the United States Federal government for environmental protection. The agency is led by its Administrator, who is appointed by the President and approved by Congress.

Ephemeral. A drainage basin or stream that flows during storms or other wet times. Typically not supplied by groundwater.

Evaporites. A natural salt or mineral deposit left after the evaporation of a body of water; A water-soluble sediment that results from concentration and crystallization by evaporation from an aqueous solution.

Federal action. An action by a Federal agency. This may include supplying funding for a project, authorizing or permitting a project, or undertaking or sponsoring a project.

Floodplain. Flat areas next to rivers and streams that are subject to inundation from precipitation. Any area that can be inundated with water. In this EIS, a floodplain can refer to either an area having unique vegetative or channel characteristics caused by flooding or a regulatory area, generally the 1 percent annual change (100-year) flood.

Free-flowing. Under the Wild and Scenic Rivers Act, “free-flowing” as applied to any river or section of a river means existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway.

Fugitive dust. Significant atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed “fugitive” because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust include unpaved roads, agricultural tilling operations, aggregate storage piles, and heavy construction operations.

Groundwater. Water found under ground in porous rock strata and soils.

Hazardous material. A secondary material (e.g., spent material, by-product, or sludge) that, when discarded, would be identified as hazardous waste.

Hazardous Substance. Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person...will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions...or physiological deformations in such persons or their offspring.

Hazardous waste. Waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Hazardous waste is generated from many sources, ranging from industrial manufacturing process wastes to batteries and may come in many forms, including liquids, solids gases, and sludges.

Historic properties. Cultural resources—such as historic buildings, structures, objects, districts, or archaeological sites—that are listed on, or eligible for inclusion on, the National Register of Historic Places.

Hogan. Primary, traditional dwelling unit of the Navajo people.

Impaired water. A water body that repeatedly exceeds regulatory water quality limits in one or more types of contamination or conditions.

Indian trust assets. Legal interests in property held in trust by the United States for the beneficial interest of Federally recognized Indian Tribes or individual Indians.

Joints. A fracture dividing rock into two sections that moved away from each other.

Key observation point (KOP). One of a series of critical viewpoints on a travel route or at a use area where the proposed project would be most revealing. This is usually along commonly traveled routes or at other likely observation points, such as culturally or locally significant sites.

Lands with Wilderness Characteristics. Public lands outside of WSAs and designated WAs, which, pursuant to its planning guidelines, BLM has inventoried and determined to contain wilderness characteristics as defined in section 2(c) of the Wilderness Act.

Leadville Formation. A geologic formation in Colorado. It is a major producing Mississippian (Leadville) carbonate sequence unit, and preserves fossils dating back to the Carboniferous period. Paleokarsts have developed upon the Leadville Formation. Caverns, sinkholes, solution-enlarged vertical joints (cutters), channelways, and breccia-rubble soil zones typify the karst-solution features, which occur extensively throughout central Colorado.

Lek. A patch of ground used for communal display in the breeding season by the males of certain birds and mammals, especially black grouse. Each male defends a small territory in order to attract females for mating.

Long-term impacts. Impacts that would occur beyond construction and from operation of the proposed facilities.

Loss. Loss of water that results from such factors as system loss and evaporation.

Manos and Metates. A metate is a type of ground stone tool used for processing grain and seeds. The mano is a hand tool used often with a metate to process the grain and seeds by hand.

Mil. A unit of length equal to 0.001 of an inch.

Minor source permit. Permit issued for a facility that has the potential to emit pollutants in amounts less than the corresponding major source threshold under the Clean Air Act New Source Review (NSR) program, which requires industrial facilities to install modern pollution control equipment when they are built or when making a change that increases emissions significantly.

Mitigation measure. A measure taken to offset the adverse impacts of an action or activity.

National Ambient Air Quality Standard (NAAQS). The specified average concentration of an air pollutant in ambient air during a specified time period, at or above which level the public health may be at risk. National ambient air quality standards have been set for the following criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and two categories of particulate matter (particulate matter with an aerodynamic diameter of 10 microns

or less [PM₁₀] and particulate matter with an aerodynamic diameter of 2.5 microns or less [PM_{2.5}]).

National Register of Historic Places (NRHP). A listing of resources that are considered significant at the national, state, or local level and that have been found to meet specific criteria of historic significance, integrity, and age.

National Pollutant Discharge Elimination System (NPDES). A program created by the Clean Water Act of 1972 that regulates discharge of pollutants into public waters.

Non-attainment area. An area considered to have air quality worse than the National Ambient Air Quality Standards as defined in the Clean Air Act Amendments of 1970.

Paleontological resource. Any fossilized remains or traces of organisms that are preserved in, or on, the earth's crust, that are of scientific interest and that provide information about the history of life.

Particulate matter. One of the six "criteria" pollutants for which the EPA established National Ambient Air Quality Standards. Particulate matter is defined as two categories, fine particulates, with an aerodynamic diameter of 10 micrometers (PM₁₀) or less, and fine particulates with an aerodynamic diameter of 2.5 micrometers or less (PM_{2.5}).

Parts per million (ppm). Parts per million, a measure of the amount of one substance found in a second, which is the carrier.

Perennial stream. A stream that flows continuously throughout the year.

Phreatophyte. Any plant species that obtains a significant portion of the water that it needs to survive from the zone of saturation or the capillary fringe above the zone of saturation. These species are found in riparian ecosystems and other areas characterized by shallow groundwater, such as bottomlands.

Plastic flow. A solid mechanics theory that is used to describe the plastic behavior of materials. Flow plasticity theories are characterized by the assumption that a flow rule exists that can be used to determine the amount of plastic deformation in the material.

Pool. Aquatic habitat in a stream with low gradient that is normally deeper and wider than aquatic habitats immediately above and below it.

Precipitate. Cause a substance to be deposited in solid form from a solution.

Project area(s). The actual footprint of proposed project facilities. These locations are not known, but they may be discussed in the impact analysis.

Project component. Components include things such as firm, reliable water supply, water treatment, short-term storage, and electrical power service.

Qualitative. A form of assessment that analyzes the impacts in a descriptive manner (e.g., low, moderate, or high).

Quantitative. A form of impact assessment that analyzes the impacts using numerical metrics (e.g., acres or cubic feet per second).

Reclamation lands. Any federal real property under the jurisdiction of or administered by Reclamation, and includes, but is not limited to, all acquired and withdrawn lands and lands in which Reclamation has a lease interest, easement, or right-of-way.

Return flow. Water that returns to streams and rivers after it has been applied to beneficial use. Return flows may return as surface flow or as an inflow of tributary groundwater.

Right-of-way (ROW). The legal right of a party to pass over or use land owned by another party for a particular purpose.

Riparian. Areas along creeks or streams and between the aquatic and terrestrial environment; river-influenced.

Salt diapiric. A type of structural dome formed when a thick bed of evaporite minerals (mainly salt, or halite) found at depth intrudes vertically into surrounding rock strata, forming a diapir. It is important in petroleum geology because salt structures are impermeable and can lead to the formation of a stratigraphic trap.

SCADA system. Supervisory Control and Data Acquisition (SCADA) is a control system architecture that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management, but uses other peripheral devices such as programmable logic controller (PLC) and discrete PID controllers to interface with the process plant or machinery. The use of SCADA has been also considered for management and operations of project-driven-process in construction.

Section 404 permit. An authorization granted by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act to place dredge or fill material in a Water of the United States.

Sedimentation. The transport of sediment into a water body.

Sensitive soils. A collection of soil types whose properties give them special cause of consideration and analysis. These soil types are erosive soil, corrosive soil, or expansive clay.

Short-term impacts. Those that would generally occur during construction.

Sodium Chloride. An inorganic compound with the chemical formula NaCl, representing a 1:1 ratio of sodium and chloride ions.

Solid waste. Any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities.

Special status species. State or Federal threatened or endangered species, as well as proposed or candidate species for threatened or endangered status.

Strikes. The direction of the line formed by the intersection of a rock surface with a horizontal plane.

Study area(s). The larger area(s) that project facilities may be sited in. These are shown as polygons on maps now. An individual alternative has a study area, and all of the alternatives combined have study areas.

Storage right. A water right that is measured in terms of volume. Storage rights allow a water user to store water for later beneficial use.

Stormwater best management practice. A set of treatment or prevention activities or constructed facilities intended to reduce pollutants entering public waters.

Subordinated. Made subservient to or dependent on.

Surface water. Water that flows on the surface, either in streams or as surface runoff across the ground.

Total dissolved solids. Combined content of all inorganic and organic substances contained in a liquid, which are present in a molecular, ionized, or micro-granular form. Primary sources of TDS are agricultural runoff, leaching of soil contamination, and point-source water pollution discharge from industrial or sewage treatment plants.

Upland. Hills, plains, mesas, or other areas not in riparian or wetland areas, where the vegetation is not supplied by hydrology from a stream or drainage.

Vertical offset. Vertical displacement between points on either side of a fault. The fault refers to the zone of fractures between two blocks of rock, and the vertical offset of a fault can cause the rocks to move.

Water delivery. The amount of water delivered to a water user.

Water right. A right to use, in accordance with its priority, a portion of the waters of the state by reason of the appropriation of the same.

Waters of the United States. As defined in the Clean Water Act, all waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide. All interstate waters including interstate wetlands. All other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, whose use, degradation, or destruction could affect interstate or foreign commerce.

Well shut-ins. The procedure of closing off a well so that the well stops producing.

Wetland. Area near the margin between water and land (such as swamps and marshes) that is wet enough to support plant growth typically found in saturated soil conditions.

Withdrawal. Withholding an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program; or transferring jurisdiction over an area of Federal land, other than property governed by the Federal Property and Administrative Services Act (40 U.S.C. 472), from one department, bureau or agency to another department, bureau or agency.

Withdrawal with Transfer of Jurisdiction. The transfer of the jurisdiction of lands from the Bureau of Land Management to the Bureau of Reclamation, as it pertains to the Paradox Valley Unit.

Yield. The amount of water that a water right supplies under a defined scenario.

Appendix B

Figures

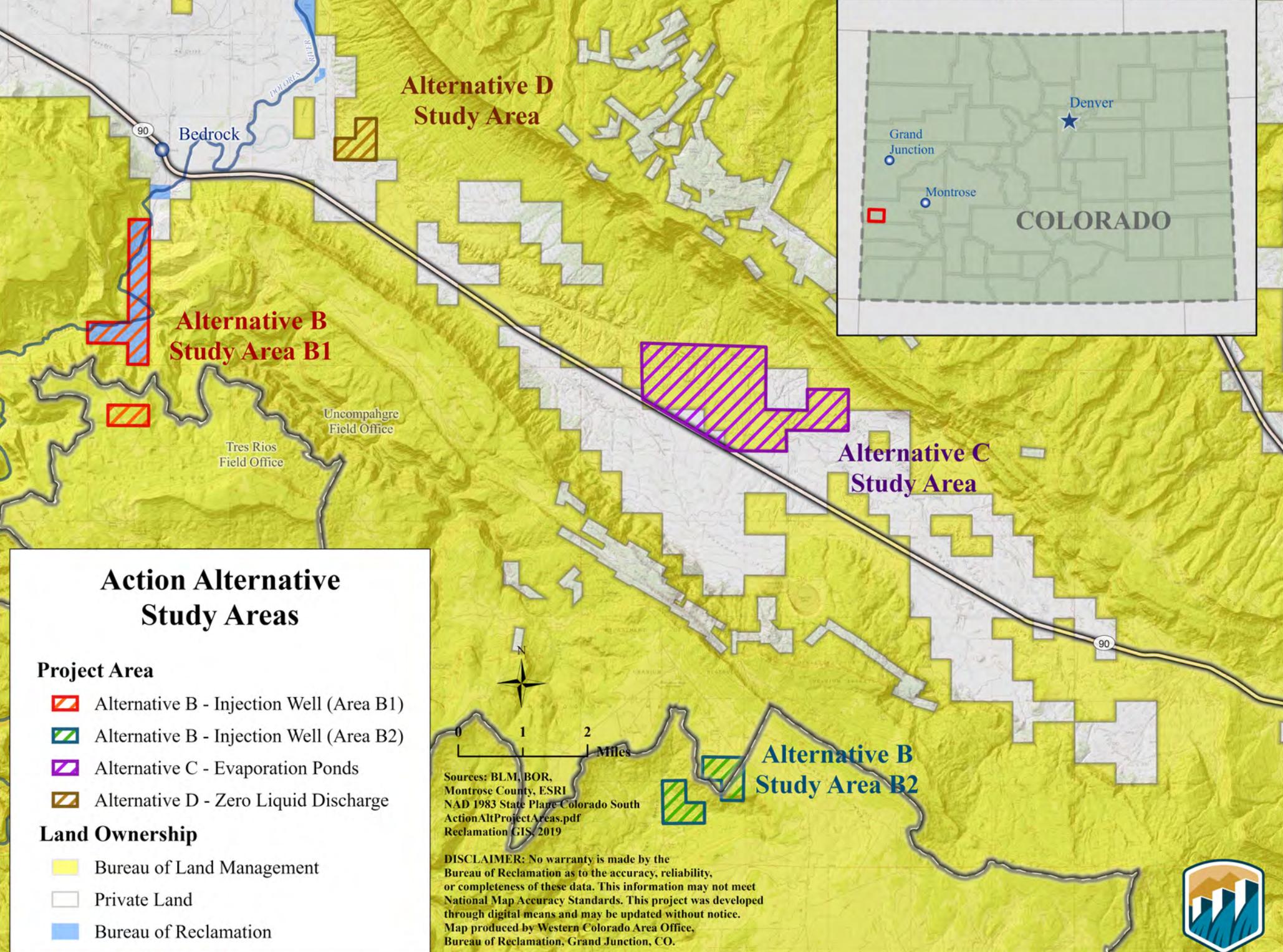
APPENDIX B

Figures

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 - 2-3 Alternative B New Injection Well Area B2
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 - 2-5 *Conceptual Schematic of Two Options for an Injection Well at Area B1 (included in Chapter 2)*
 - 2-6 Alternatives C Evaporation Ponds
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- 4-12 Cultural Resources Cumulative Impacts Analysis Area

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Figure ES-1



Action Alternative Study Areas

Project Area

-  Alternative B - Injection Well (Area B1)
-  Alternative B - Injection Well (Area B2)
-  Alternative C - Evaporation Ponds
-  Alternative D - Zero Liquid Discharge

Land Ownership

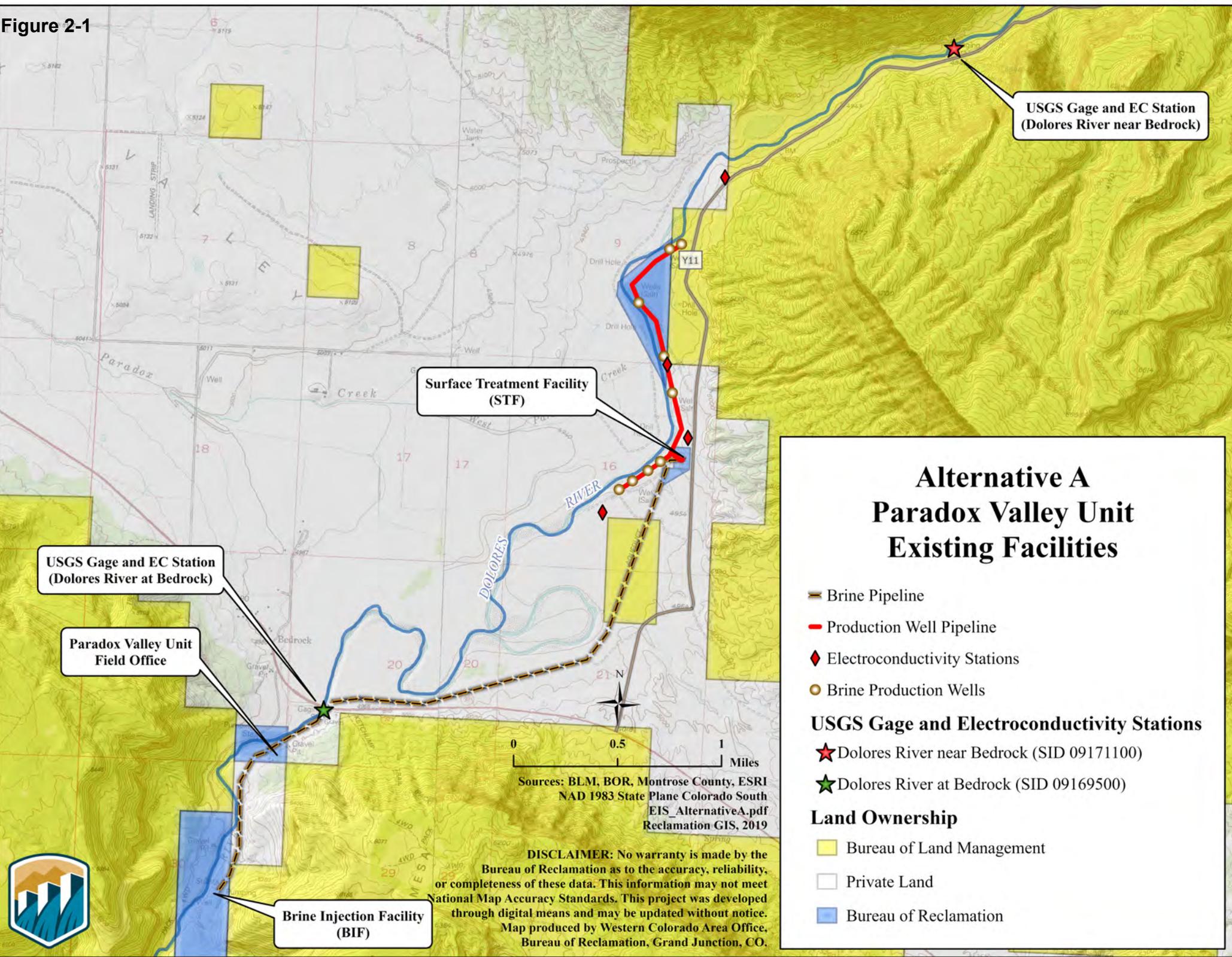
-  Bureau of Land Management
-  Private Land
-  Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado South ActionAltProjectAreas.pdf Reclamation GIS, 2019

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Figure 2-1



USGS Gage and EC Station
(Dolores River near Bedrock)

Surface Treatment Facility
(STF)

USGS Gage and EC Station
(Dolores River at Bedrock)

Paradox Valley Unit
Field Office

Brine Injection Facility
(BIF)

Alternative A Paradox Valley Unit Existing Facilities

- Brine Pipeline
- Production Well Pipeline
- Electroconductivity Stations
- Brine Production Wells

USGS Gage and Electroconductivity Stations

- Dolores River near Bedrock (SID 09171100)
- Dolores River at Bedrock (SID 09169500)

Land Ownership

- Bureau of Land Management
- Private Land
- Bureau of Reclamation

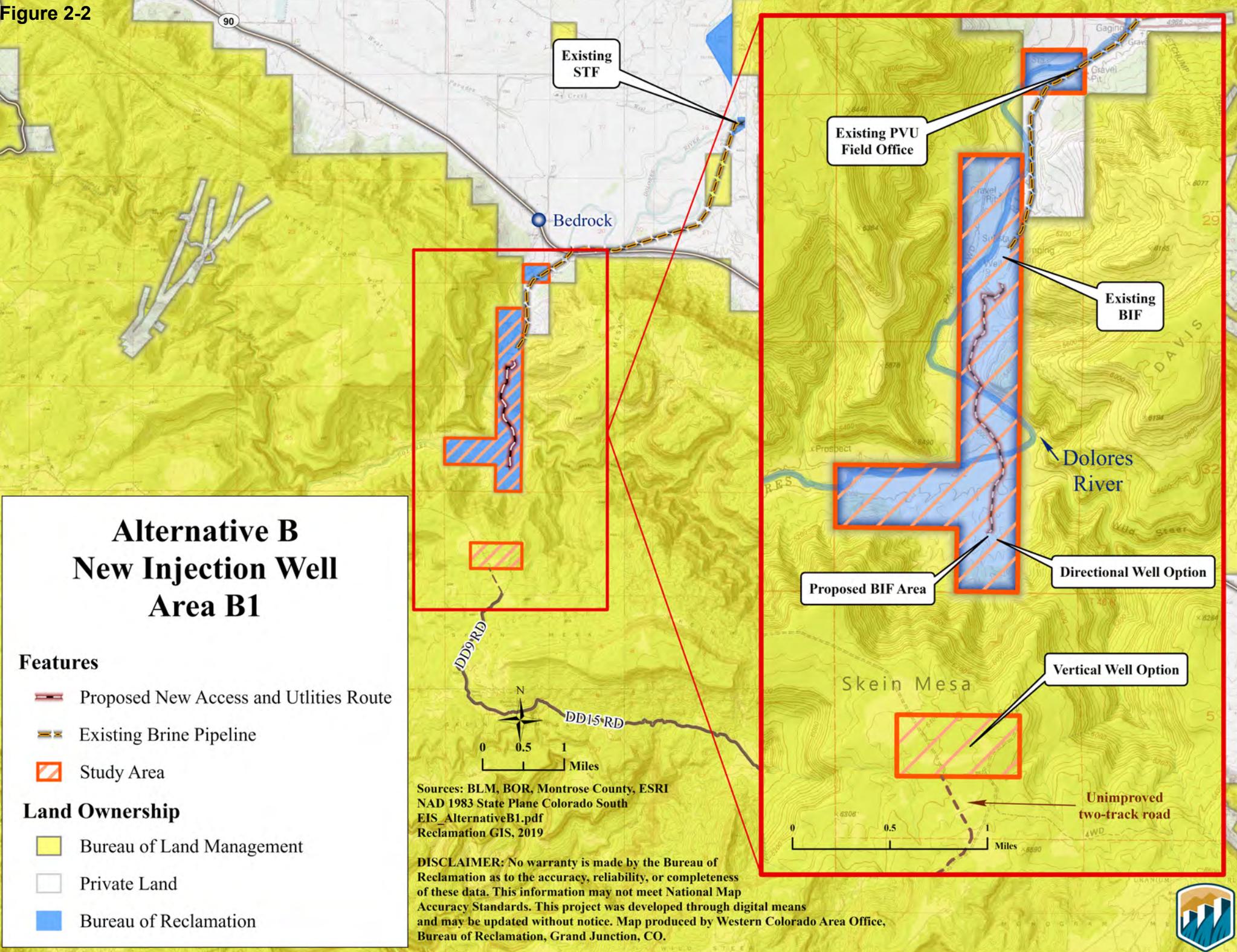
0 0.5 1 Miles

Sources: BLM, BOR, Montrose County, ESRI
NAD 1983 State Plane Colorado South
EIS_AlternativeA.pdf
Reclamation GIS, 2019

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Figure 2-2



Alternative B New Injection Well Area B1

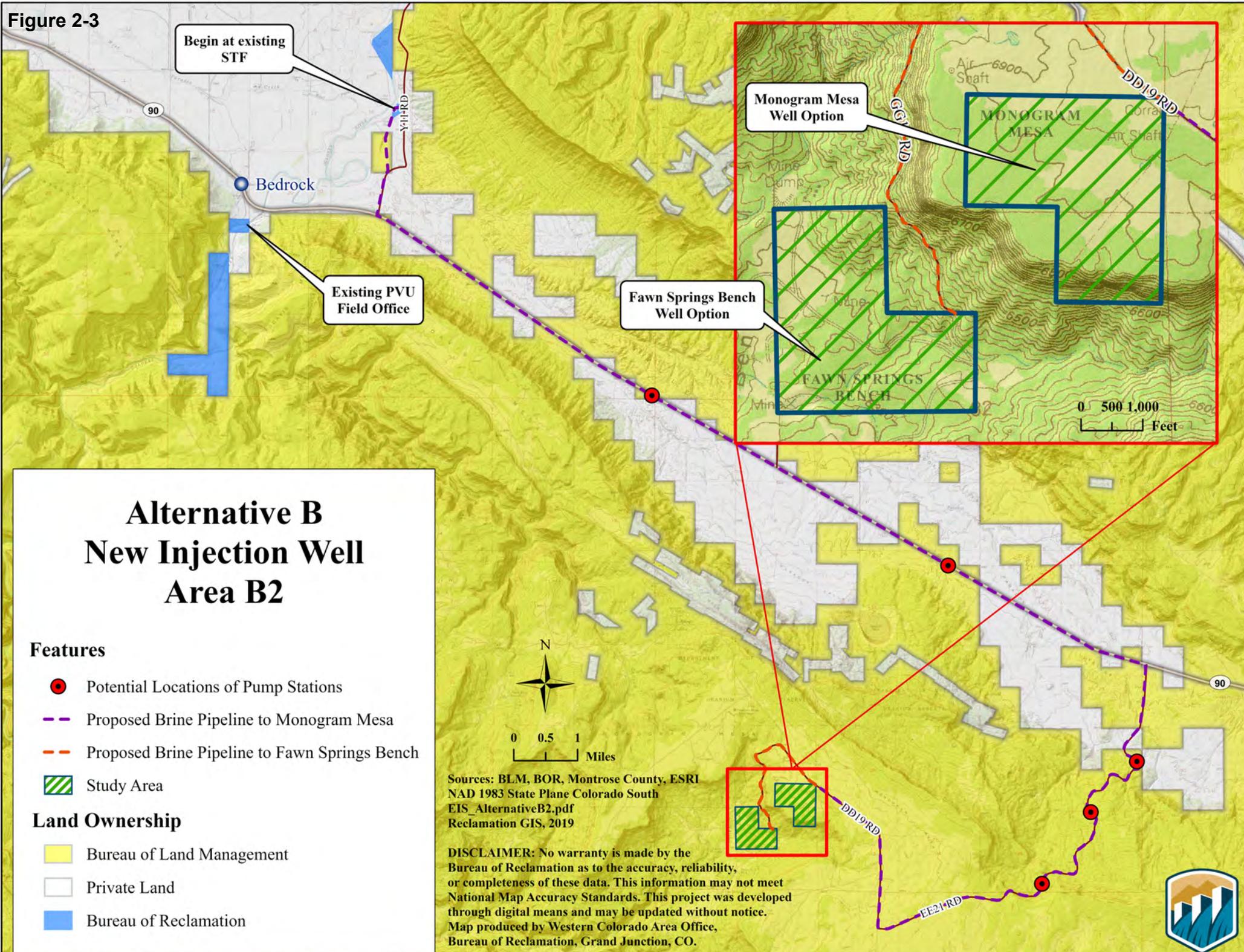
- Features**
- Proposed New Access and Utilities Route
 - Existing Brine Pipeline
 - Study Area
- Land Ownership**
- Bureau of Land Management
 - Private Land
 - Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI
 NAD 1983 State Plane Colorado South
 EIS_AlternativeB1.pdf
 Reclamation GIS, 2019

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Figure 2-3



Alternative B New Injection Well Area B2

Features

- Potential Locations of Pump Stations
- Proposed Brine Pipeline to Monogram Mesa
- Proposed Brine Pipeline to Fawn Springs Bench
- Study Area

Land Ownership

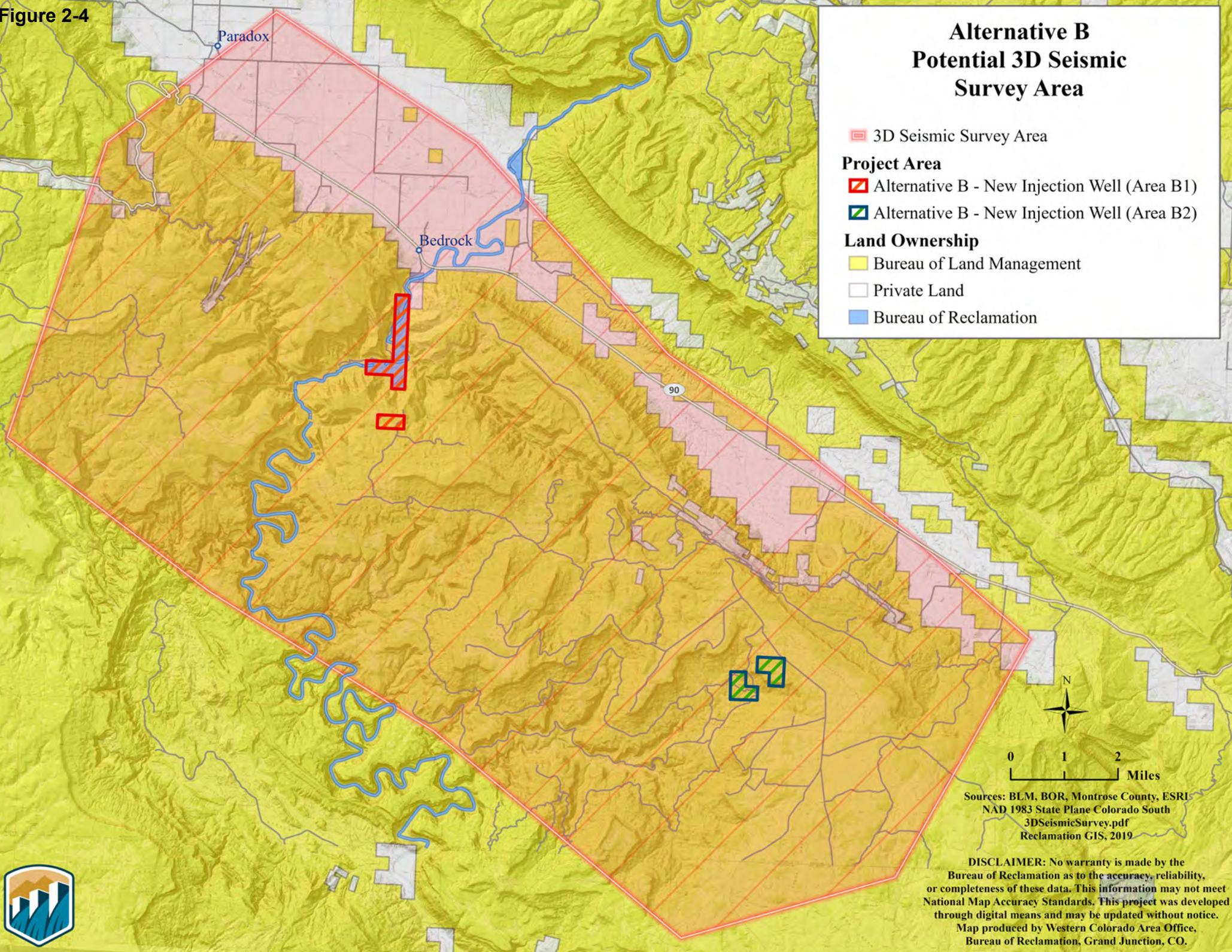
- Bureau of Land Management
- Private Land
- Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI
NAD 1983 State Plane Colorado South
EIS_AlternativeB2.pdf
Reclamation GIS, 2019

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Figure 2-4



Alternative B Potential 3D Seismic Survey Area

- 3D Seismic Survey Area
- Project Area**
- Alternative B - New Injection Well (Area B1)
- Alternative B - New Injection Well (Area B2)
- Land Ownership**
- Bureau of Land Management
- Private Land
- Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI
 NAD 1983 State Plane Colorado South
 3DSeismicSurvey.pdf
 Reclamation GIS, 2019

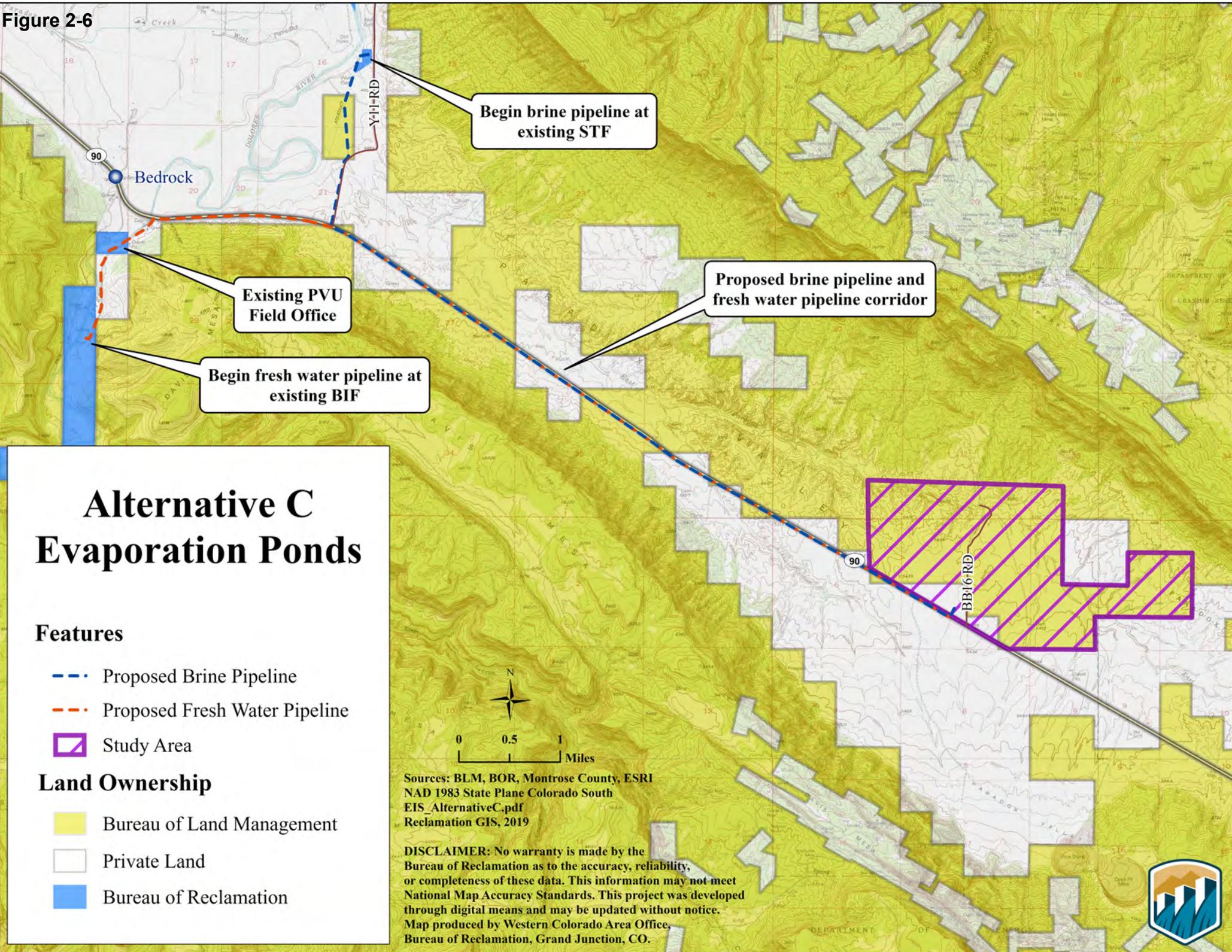
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Figure 2-5 Conceptual Schematic of Two Options for an Injection Well at Area B1

Included in Chapter 2

Figure 2-6



Begin brine pipeline at existing STF

Existing PVU Field Office

Begin fresh water pipeline at existing BIF

Proposed brine pipeline and fresh water pipeline corridor

Alternative C Evaporation Ponds

Features

- - - Proposed Brine Pipeline
- - - Proposed Fresh Water Pipeline
- ▭ Study Area

Land Ownership

- ▭ Bureau of Land Management
- ▭ Private Land
- ▭ Bureau of Reclamation



Sources: BLM, BOR, Montrose County, ESRI
 NAD 1983 State Plane Colorado South
 EIS_AlternativeC.pdf
 Reclamation GIS, 2019

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Figure 2-7

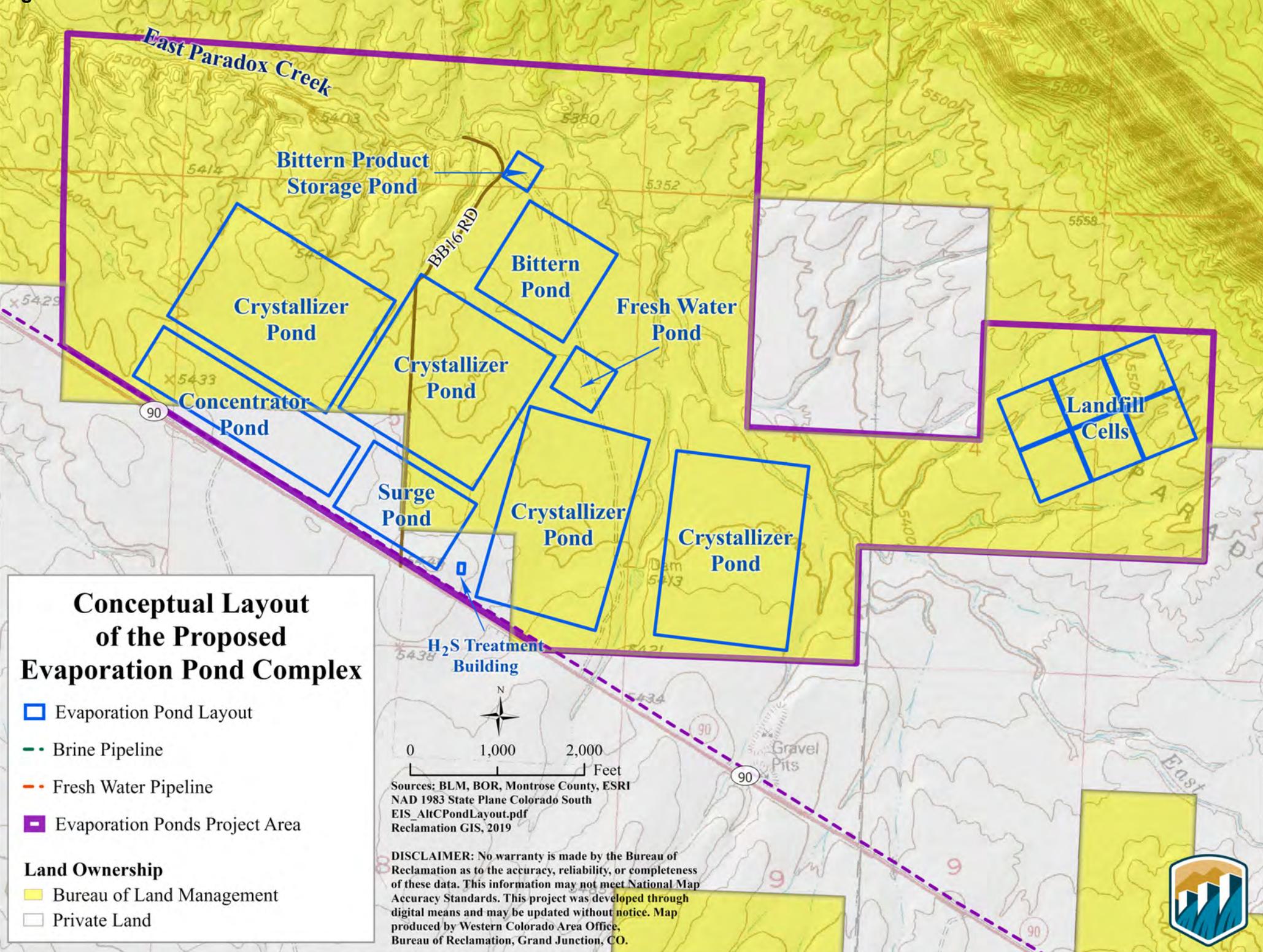
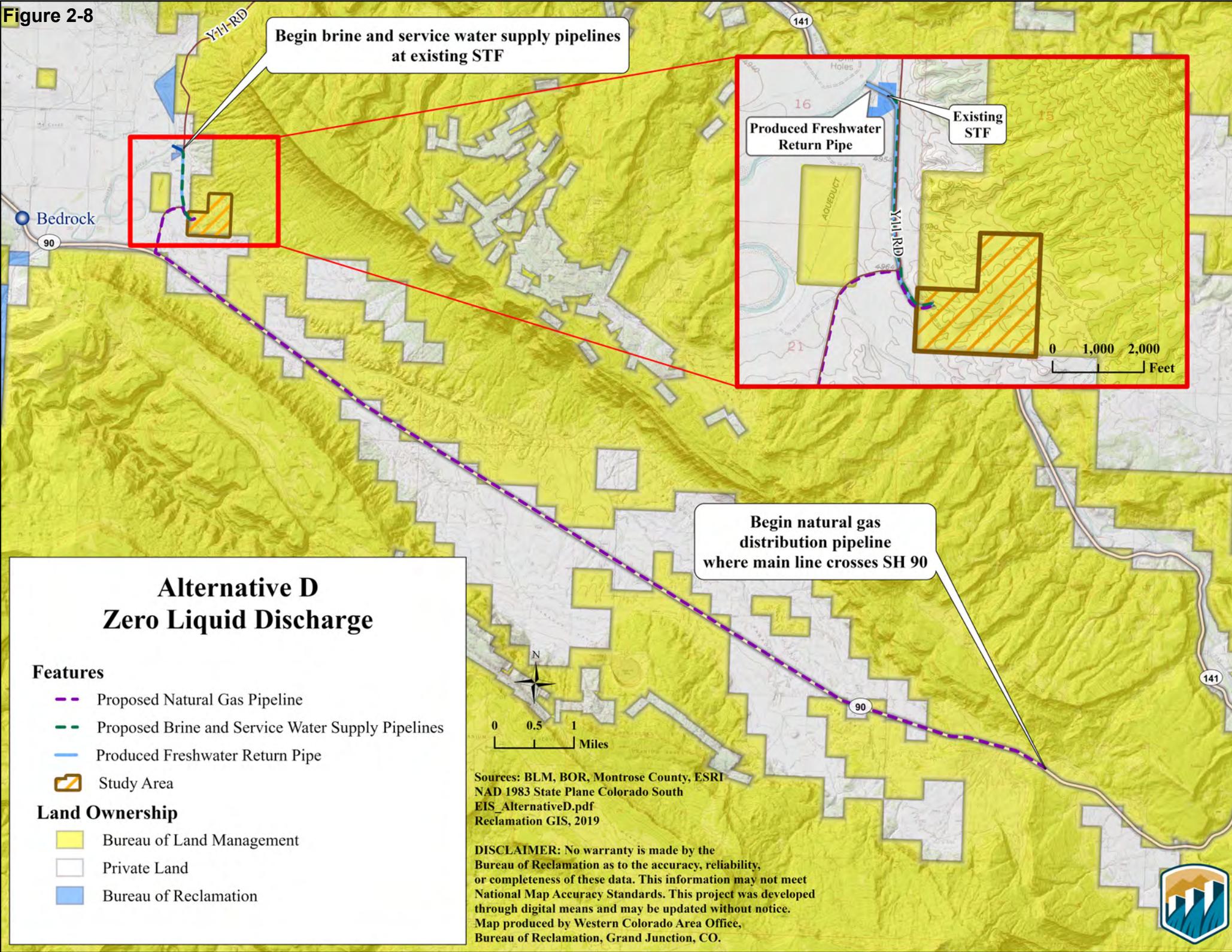


Figure 2-8



Begin brine and service water supply pipelines at existing STF

Produced Freshwater Return Pipe

Existing STF

Begin natural gas distribution pipeline where main line crosses SH 90

Alternative D Zero Liquid Discharge

Features

- - - Proposed Natural Gas Pipeline
- - - Proposed Brine and Service Water Supply Pipelines
- Produced Freshwater Return Pipe
- Study Area

Land Ownership

- Bureau of Land Management
- Private Land
- Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI
NAD 1983 State Plane Colorado South
EIS_AlternativeD.pdf
Reclamation GIS, 2019

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Figure 2-9 Holes

Conceptual Layout of the Proposed ZLD Facilities

-  ZLD Layout
-  Produced Freshwater Return Pipe
-  Proposed Natural Gas Pipeline
-  Proposed Brine and Service Water Supply Pipelines

Land Ownership

-  Bureau of Land Management
-  Private Land
-  Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI
 NAD 1983 State Plane Colorado South
 AltD_ConceptualLayout.pdf
 Reclamation GIS, 2019

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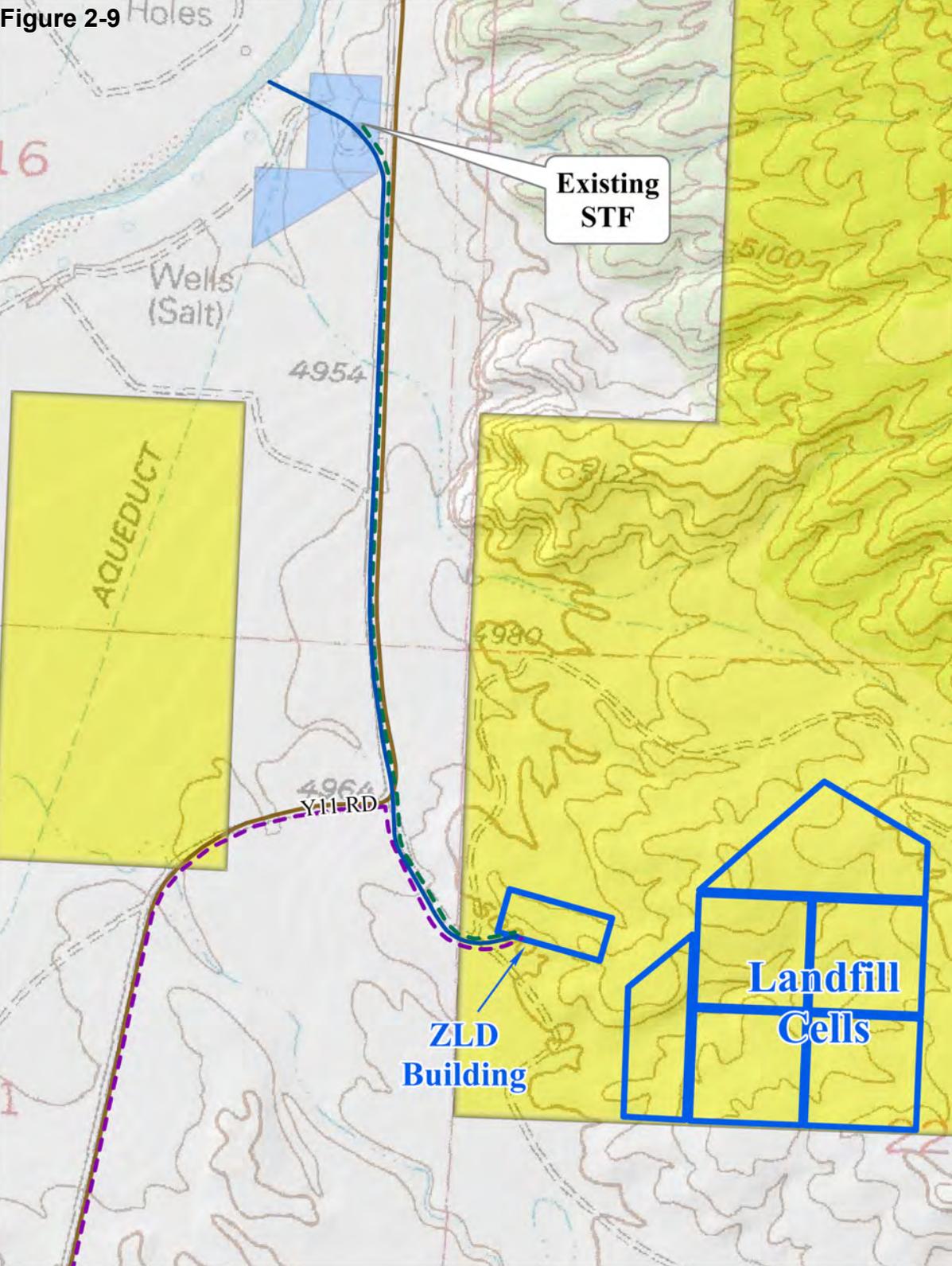


Figure 2-10 Flow Diagram of a ZLD Crystallizer Process (SaltWorks 2019)

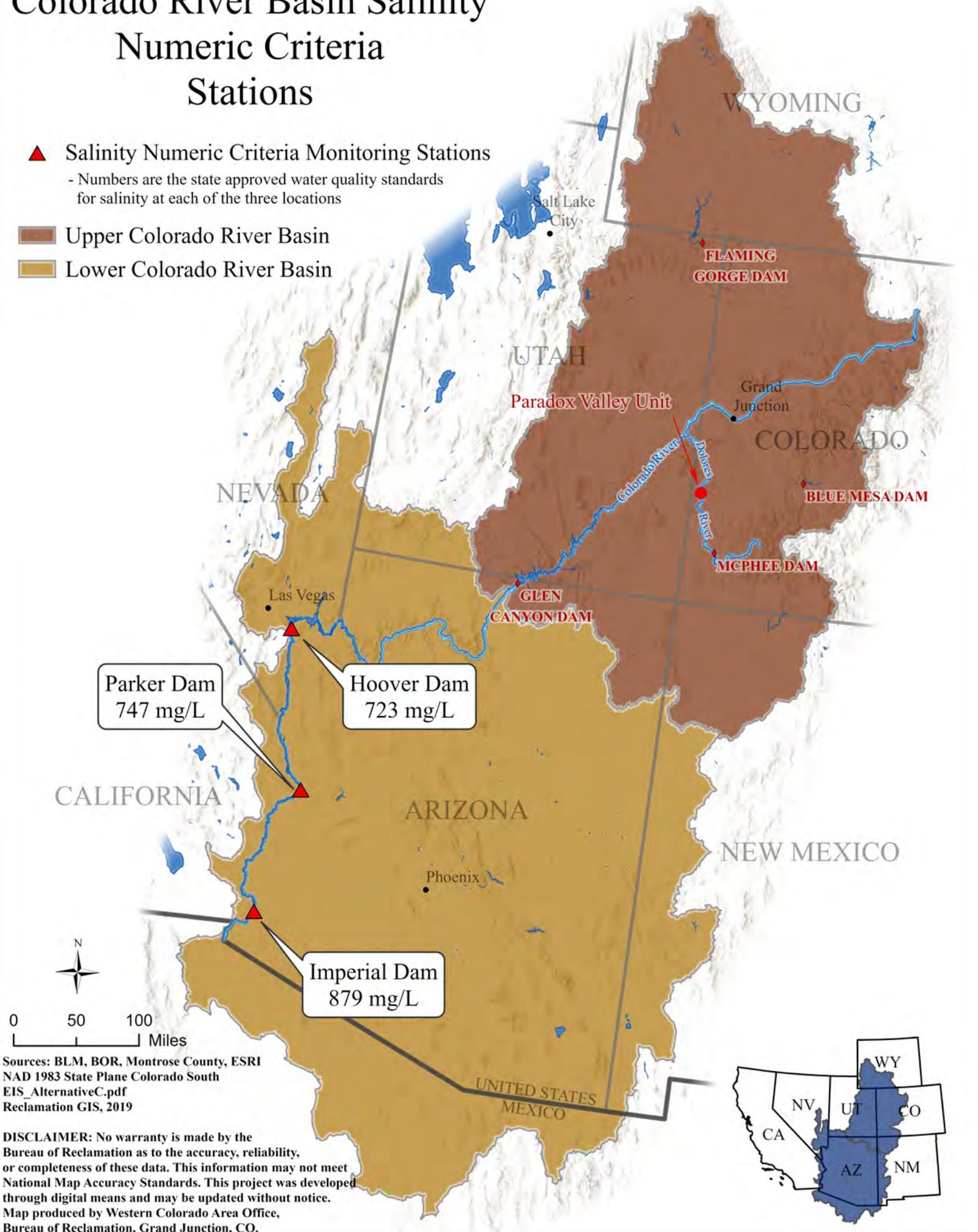
Included in Chapter 2

Colorado River Basin Salinity Numeric Criteria Stations

▲ Salinity Numeric Criteria Monitoring Stations

- Numbers are the state approved water quality standards for salinity at each of the three locations

- Upper Colorado River Basin
- Lower Colorado River Basin



Parker Dam
747 mg/L

Hoover Dam
723 mg/L

Imperial Dam
879 mg/L

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado South EIS_AlternativeC.pdf Reclamation GIS, 2019

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Figure 3-2

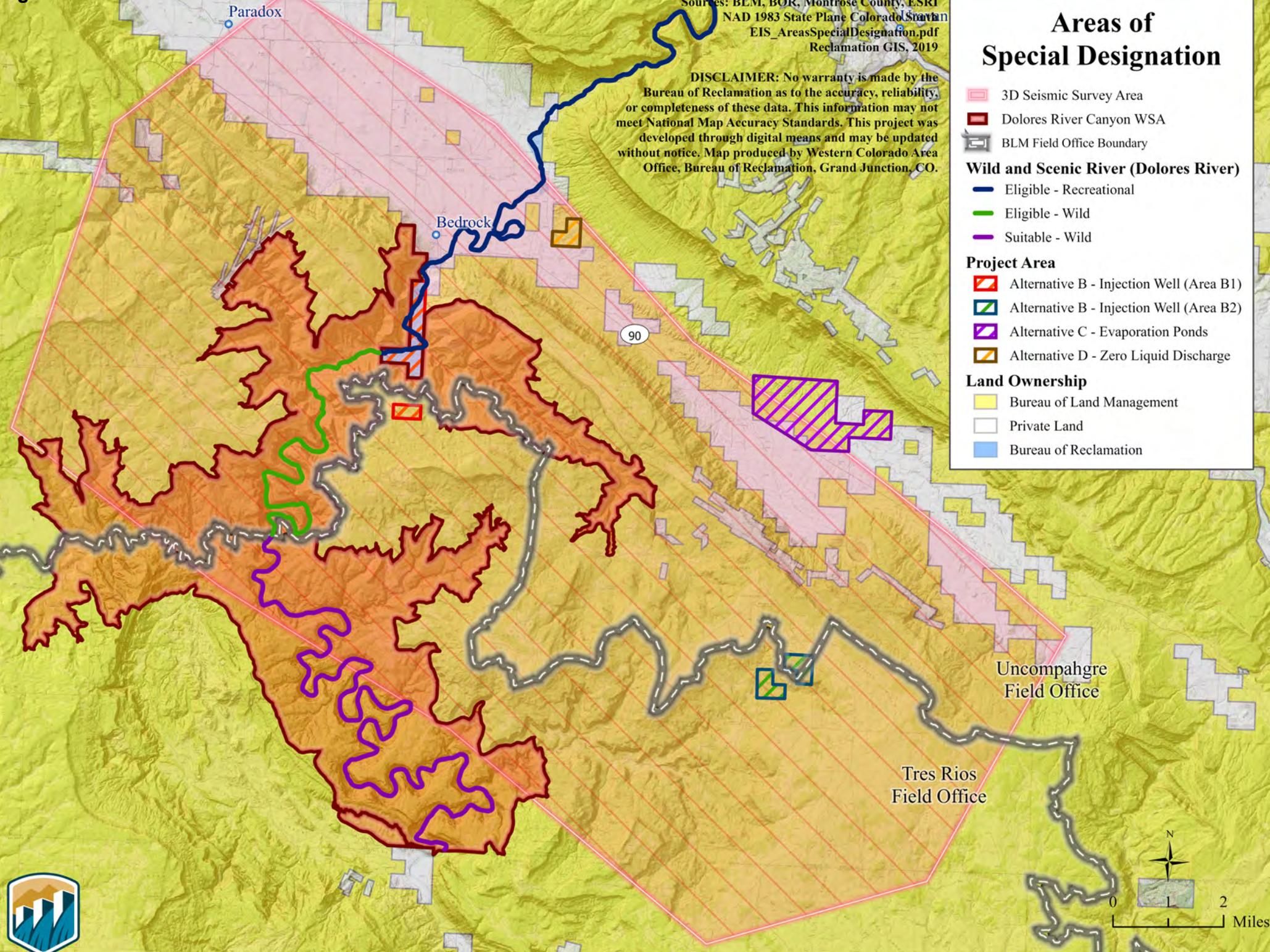
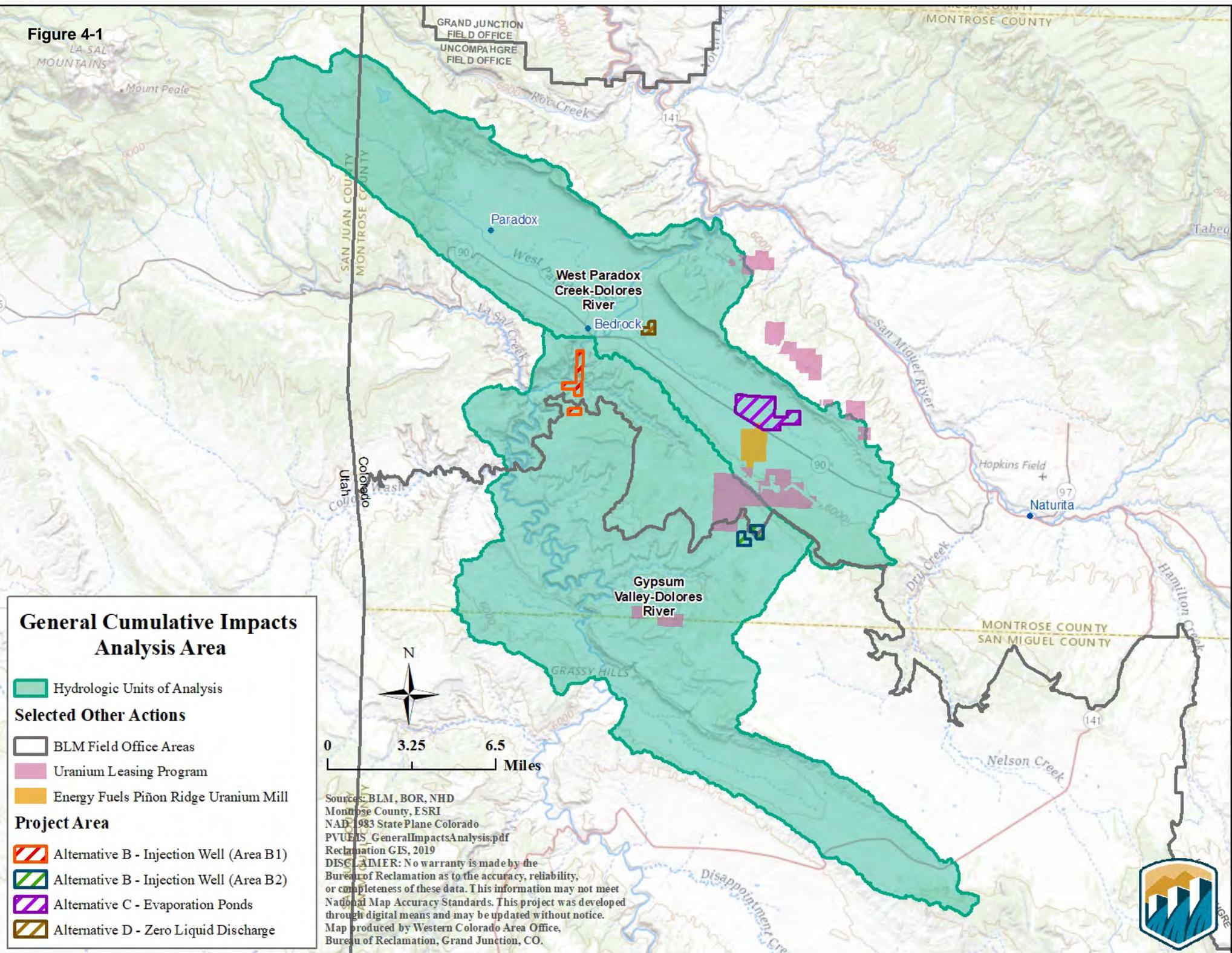


Figure 4-1



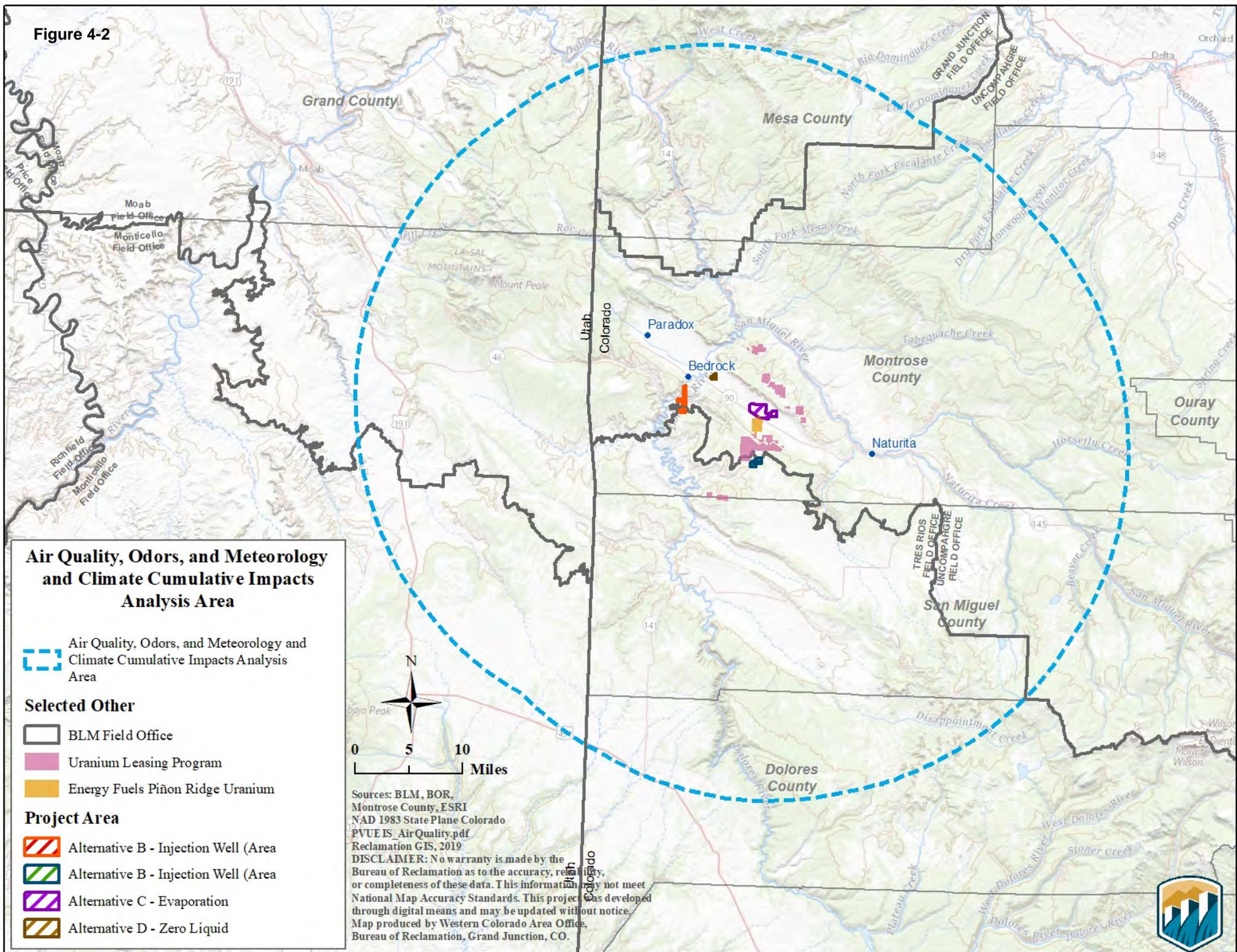
General Cumulative Impacts Analysis Area

- Hydrologic Units of Analysis
- Selected Other Actions**
- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill
- Project Area**
- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge

Sources: BLM, BOR, NHD
 Montrose County, ESRI
 NAD: 1983 State Plane Colorado
 PVUEIS_GeneralImpactsAnalysis.pdf
 Reclamation GIS, 2019
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 or completeness of these data. This information may not meet
 National Map Accuracy Standards. This project was developed
 through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office,
 Bureau of Reclamation, Grand Junction, CO.



Figure 4-2



Air Quality, Odors, and Meteorology and Climate Cumulative Impacts Analysis Area

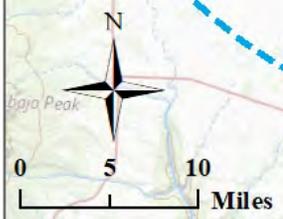
Air Quality, Odors, and Meteorology and Climate Cumulative Impacts Analysis Area

Selected Other

- BLM Field Office
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium

Project Area

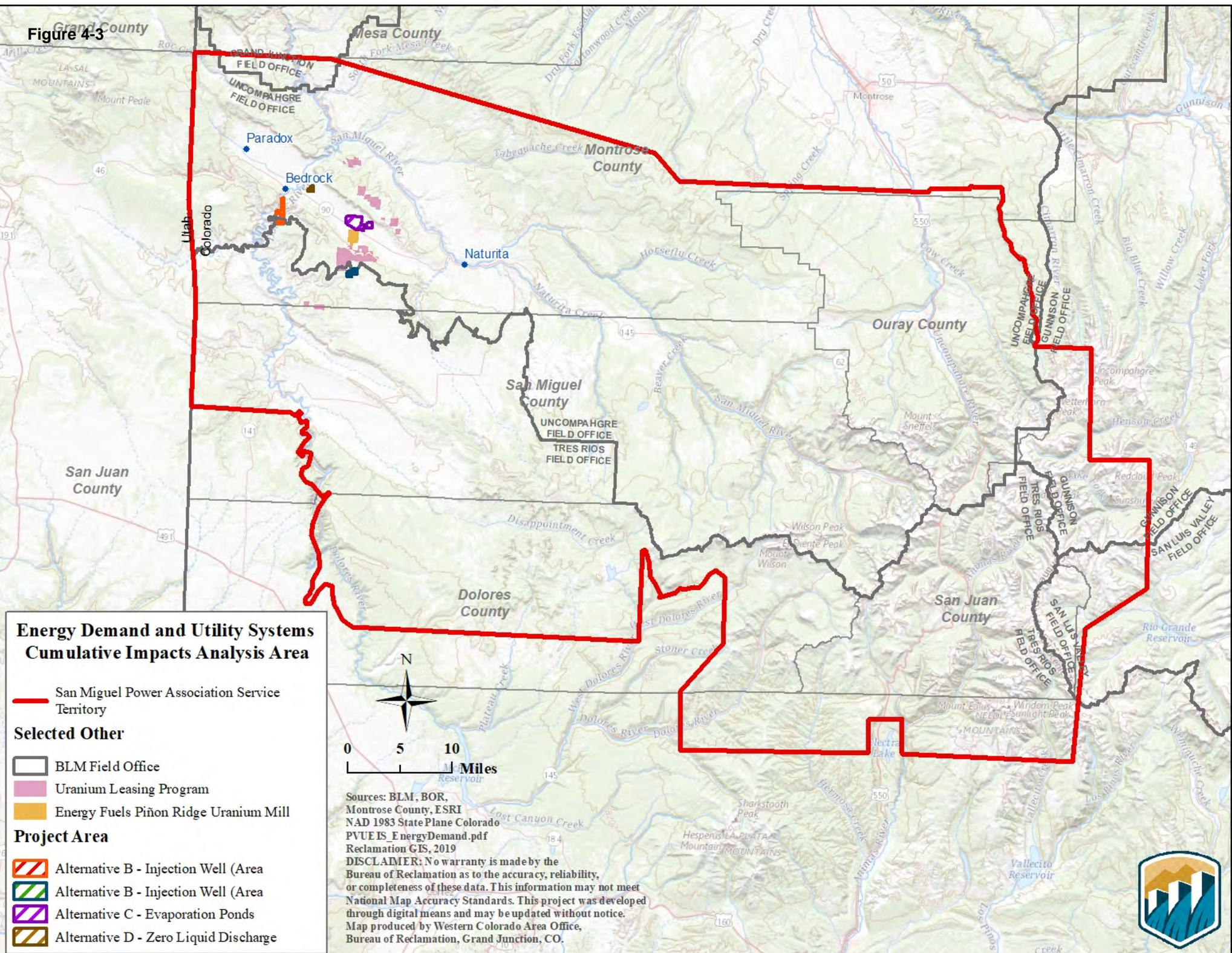
- Alternative B - Injection Well (Area)
- Alternative B - Injection Well (Area)
- Alternative C - Evaporation
- Alternative D - Zero Liquid



Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS_AirQuality.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-3



Energy Demand and Utility Systems Cumulative Impacts Analysis Area

San Miguel Power Association Service Territory

Selected Other

- BLM Field Office
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

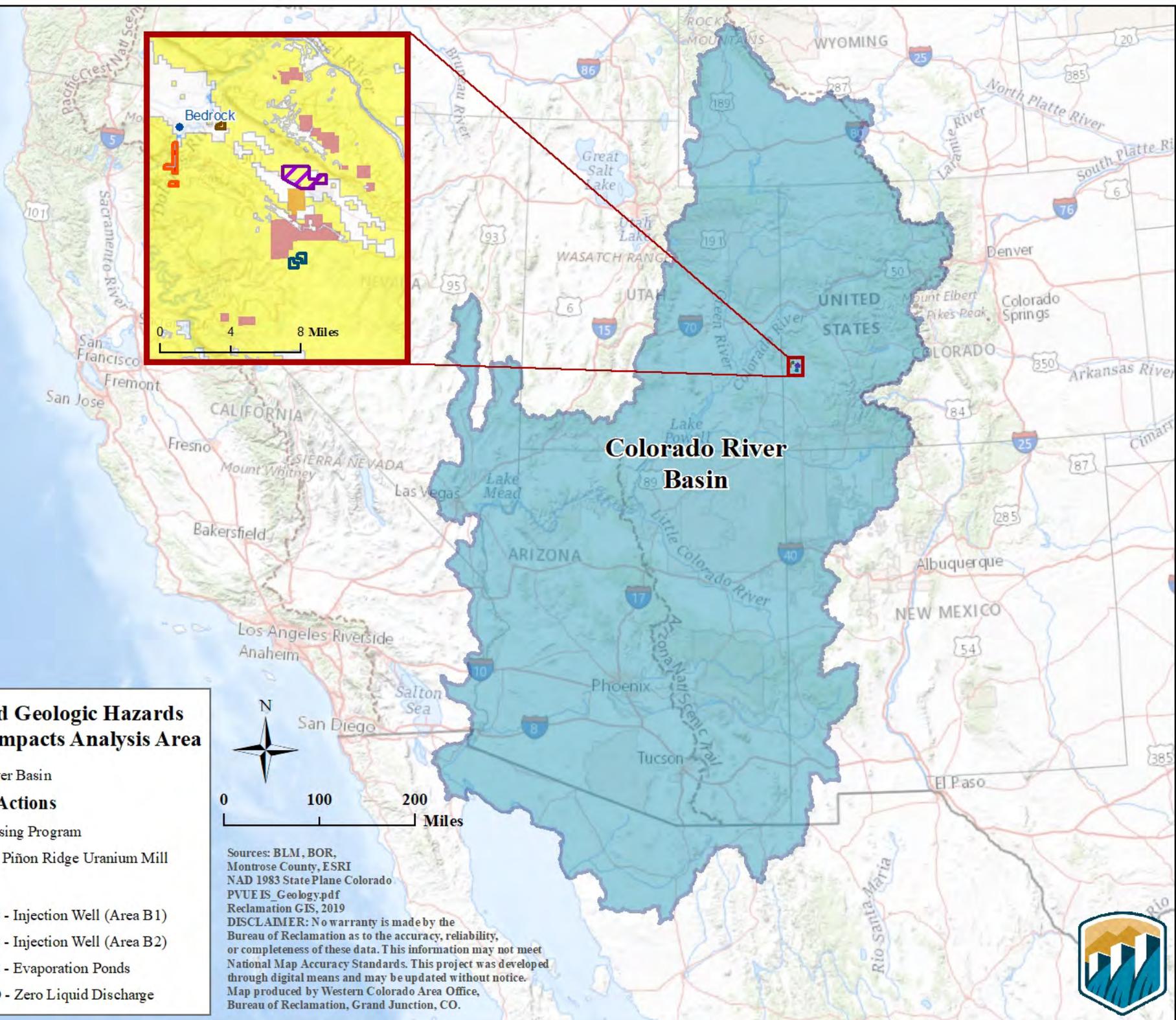
- Alternative B - Injection Well (Area)
- Alternative B - Injection Well (Area)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge



Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS_EnergyDemand.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-4



**Geology and Geologic Hazards
Cumulative Impacts Analysis Area**

-  Colorado River Basin
- Selected Other Actions**
-  Uranium Leasing Program
-  Energy Fuels Piñon Ridge Uranium Mill
- Project Area**
-  Alternative B - Injection Well (Area B1)
-  Alternative B - Injection Well (Area B2)
-  Alternative C - Evaporation Ponds
-  Alternative D - Zero Liquid Discharge

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS_Geology.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice. Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-5

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS WaterQuality.pdf Reclamation GIS, 2019
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 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.

Surface Water and Water Rights and Water Quality Cumulative Impacts Analysis Area

— Surface Water and Water Rights and Water Quality Cumulative Impacts Analysis Area

★ Imperial Dam

Select Other Actions

- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

- ▨ Alternative B - Injection Well (Area B1)
- ▨ Alternative B - Injection Well (Area B2)
- ▨ Alternative C - Evaporation Ponds
- ▨ Alternative D - Zero Liquid Discharge

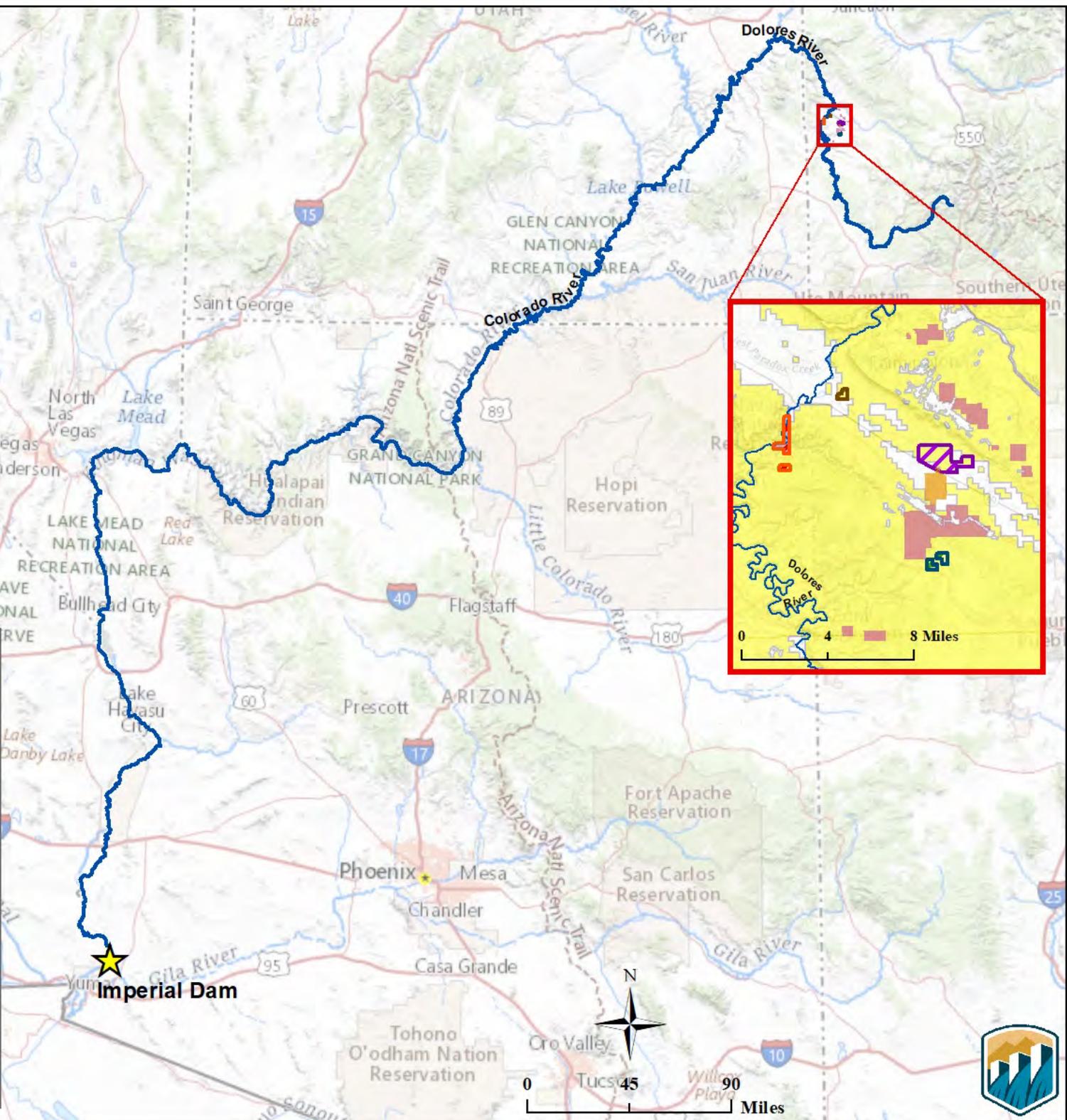
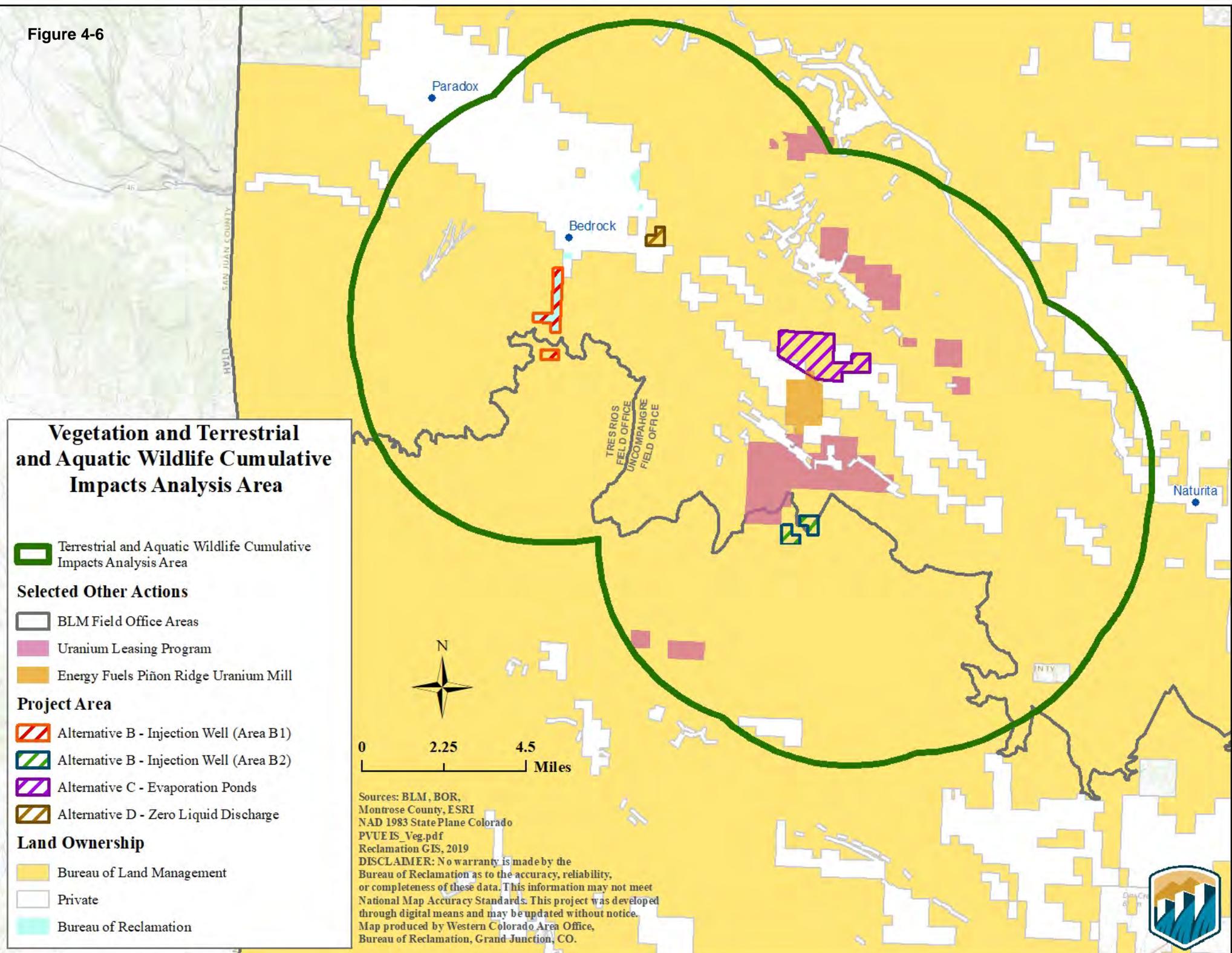


Figure 4-6



Vegetation and Terrestrial and Aquatic Wildlife Cumulative Impacts Analysis Area

Terrestrial and Aquatic Wildlife Cumulative Impacts Analysis Area

Selected Other Actions

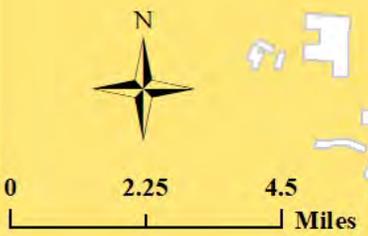
- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge

Land Ownership

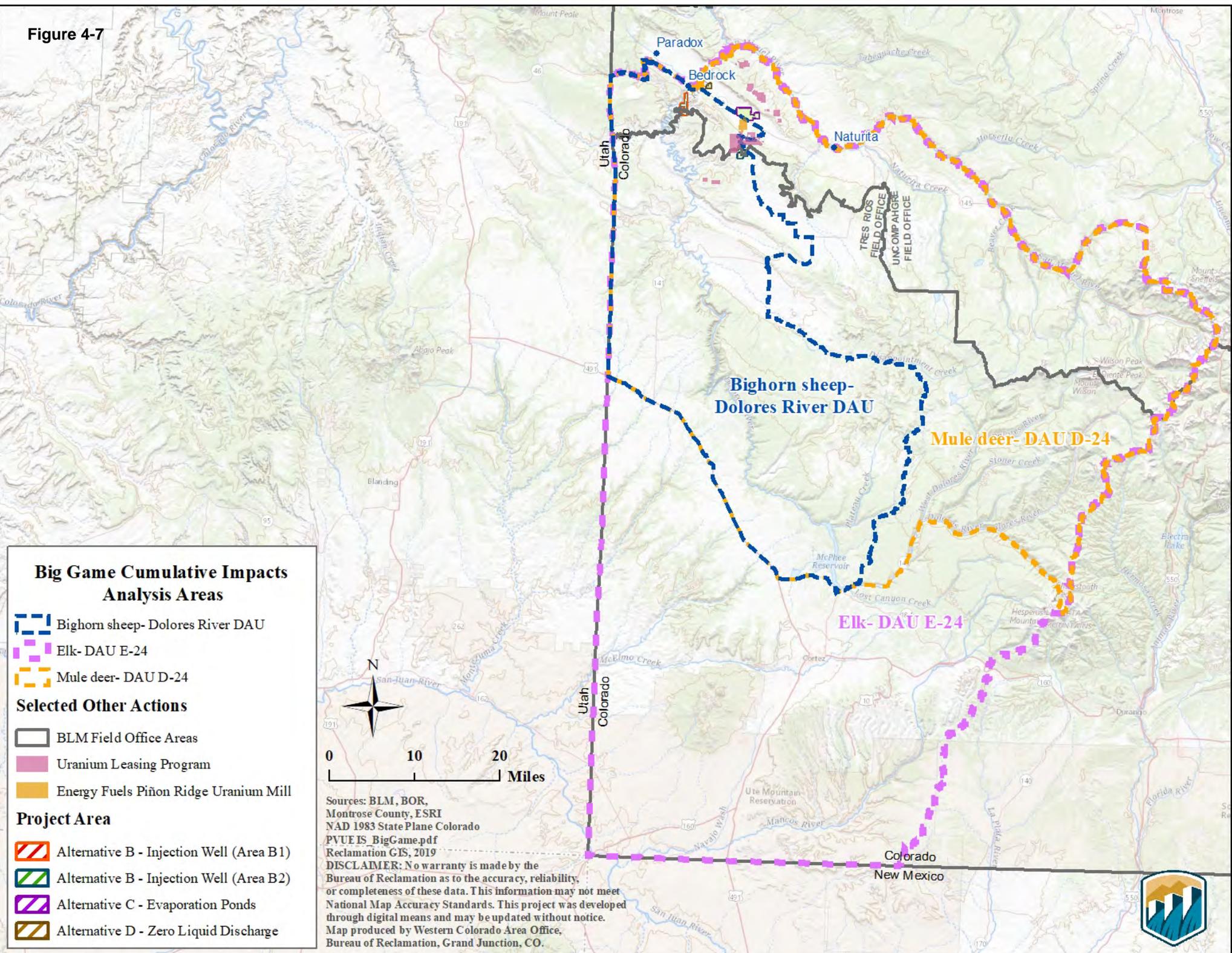
- Bureau of Land Management
- Private
- Bureau of Reclamation



Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUE IS_Veg.pdf Reclamation GIS, 2019
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Figure 4-7



Big Game Cumulative Impacts Analysis Areas

-  Bighorn sheep- Dolores River DAW
-  Elk- DAU E-24
-  Mule deer- DAU D-24

Selected Other Actions

-  BLM Field Office Areas
-  Uranium Leasing Program
-  Energy Fuels Piñon Ridge Uranium Mill

Project Area

-  Alternative B - Injection Well (Area B1)
-  Alternative B - Injection Well (Area B2)
-  Alternative C - Evaporation Ponds
-  Alternative D - Zero Liquid Discharge

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS BigGame.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



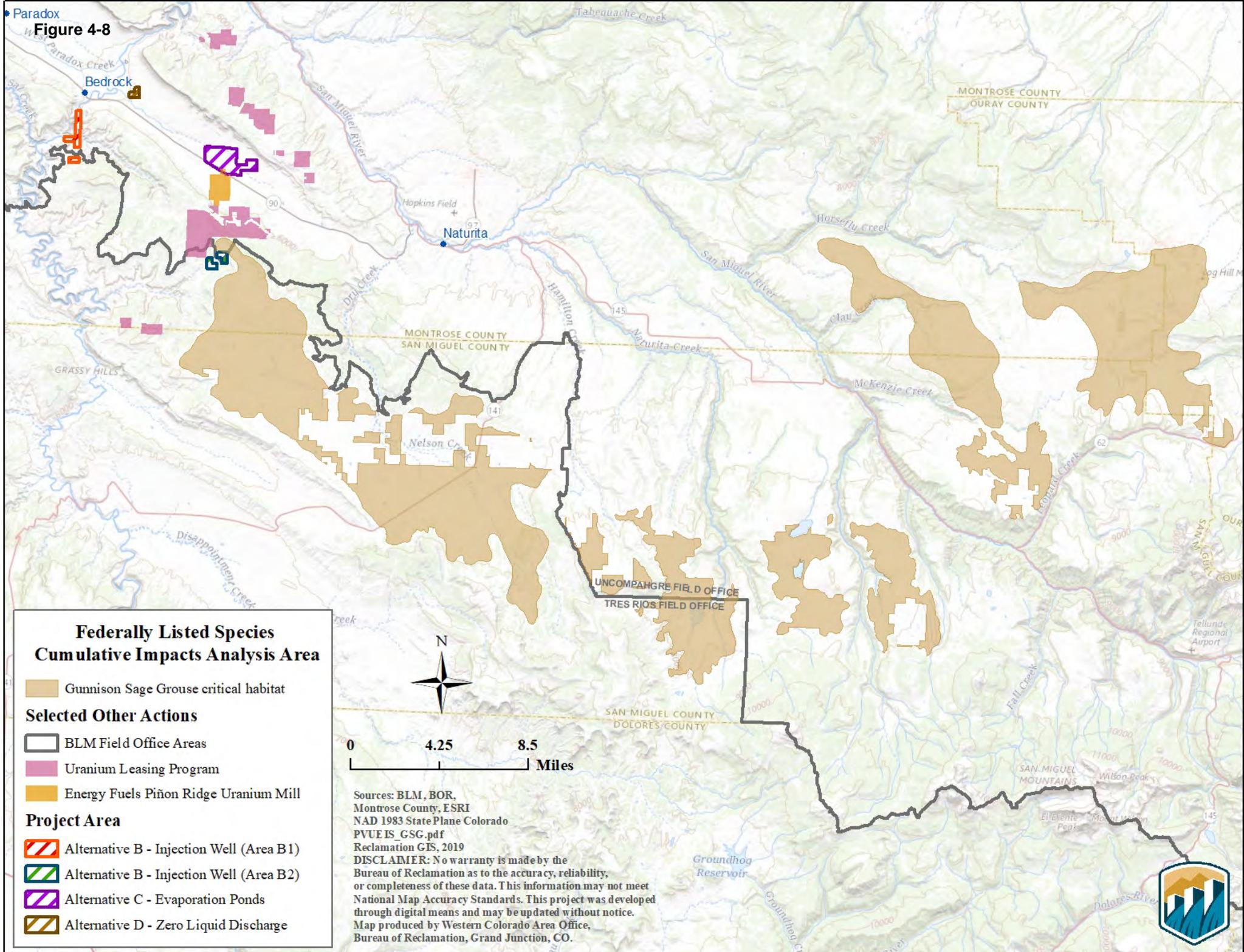
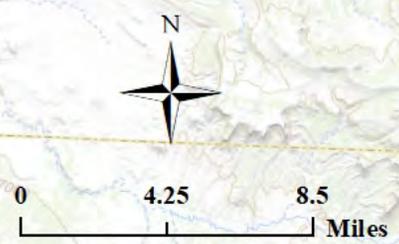


Figure 4-8

**Federally Listed Species
Cumulative Impacts Analysis Area**

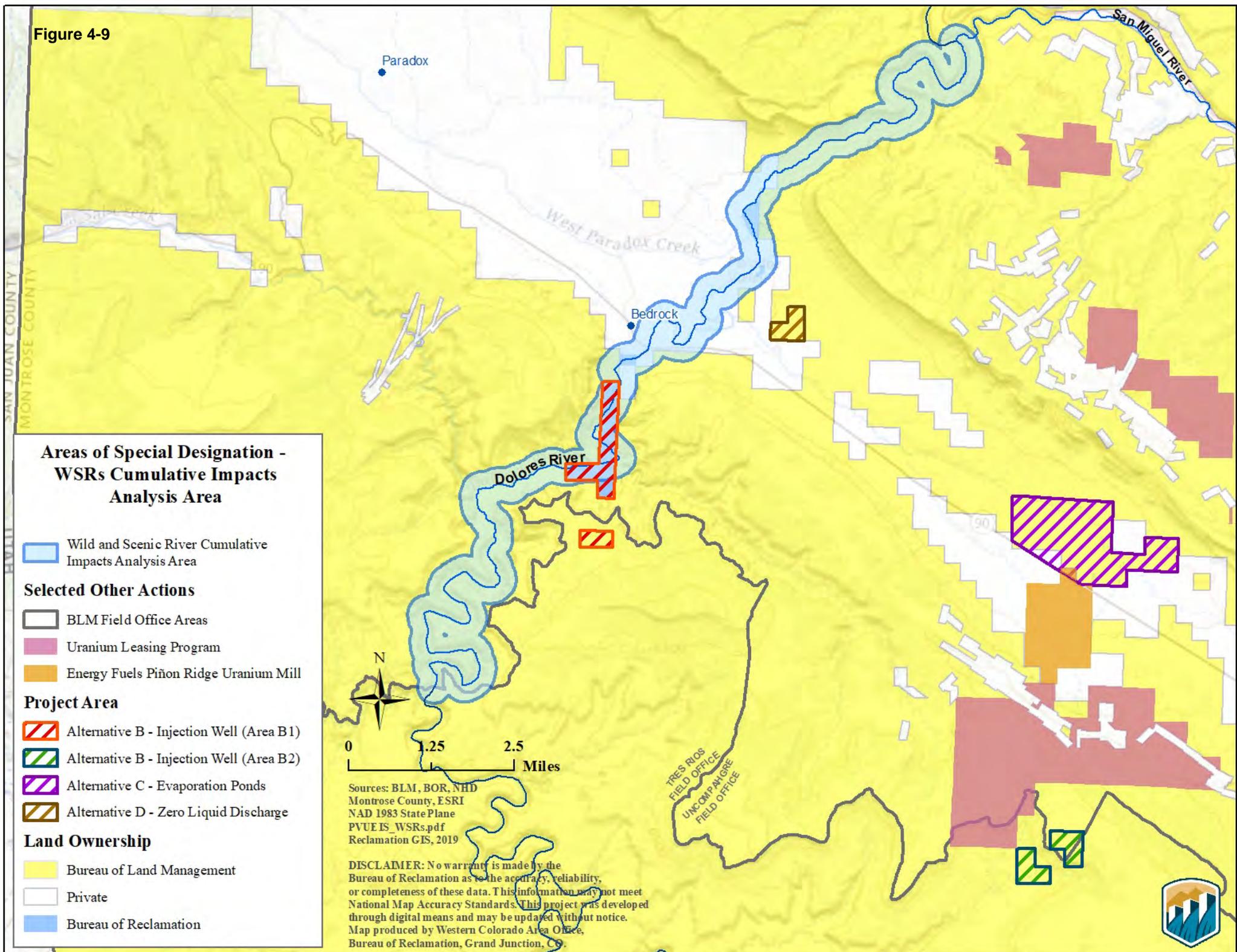
- Gunnison Sage Grouse critical habitat
- Selected Other Actions**
- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill
- Project Area**
- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge



Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUE IS_GSG.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-9



Areas of Special Designation - WSRs Cumulative Impacts Analysis Area

Wild and Scenic River Cumulative Impacts Analysis Area

Selected Other Actions

- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge

Land Ownership

- Bureau of Land Management
- Private
- Bureau of Reclamation

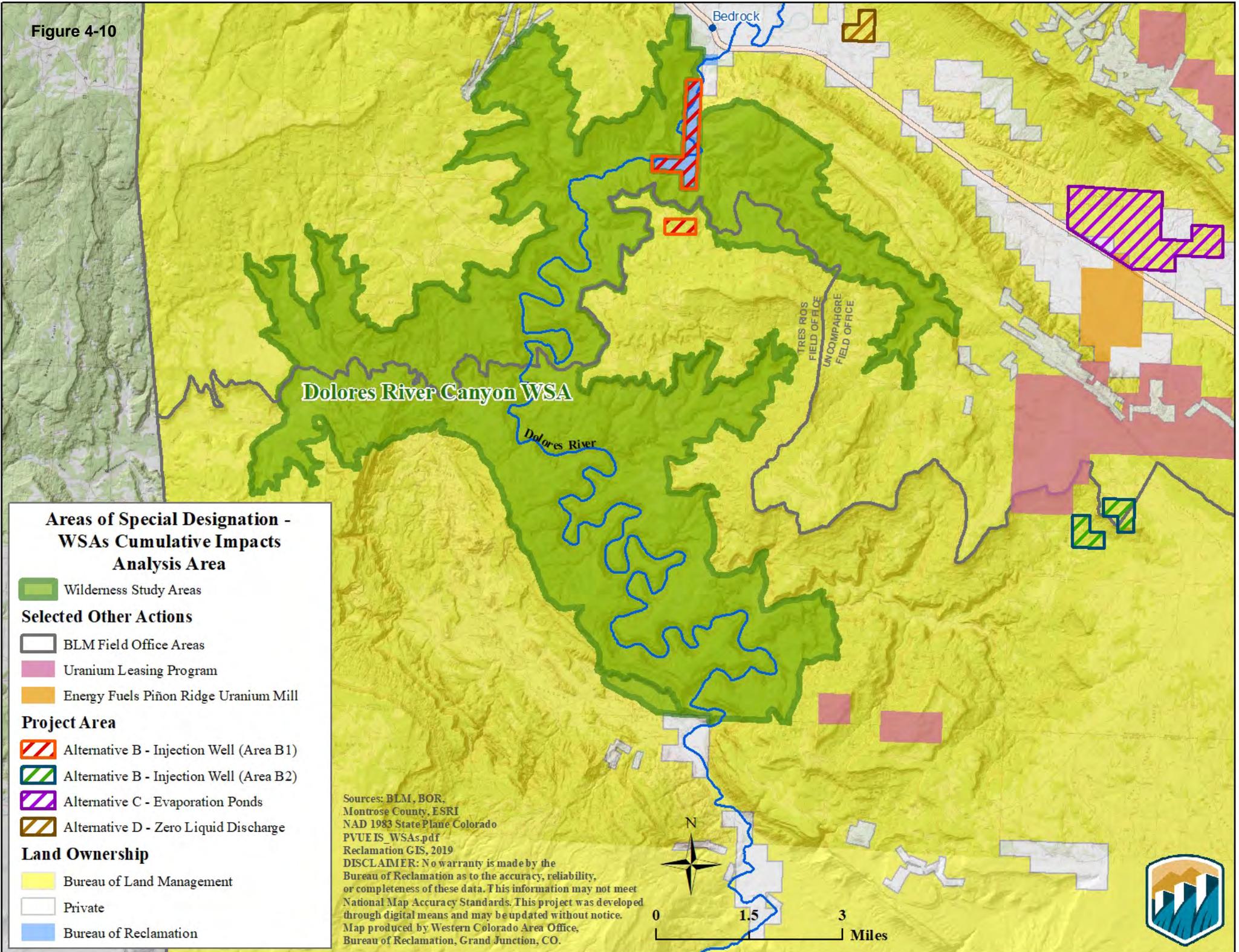
0 1.25 2.5 Miles

Sources: BLM, BOR, NHD
Montrose County, ESRI
NAD 1983 State Plane
PVUE IS WSRs.pdf
Reclamation GIS, 2019

DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice. Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-10



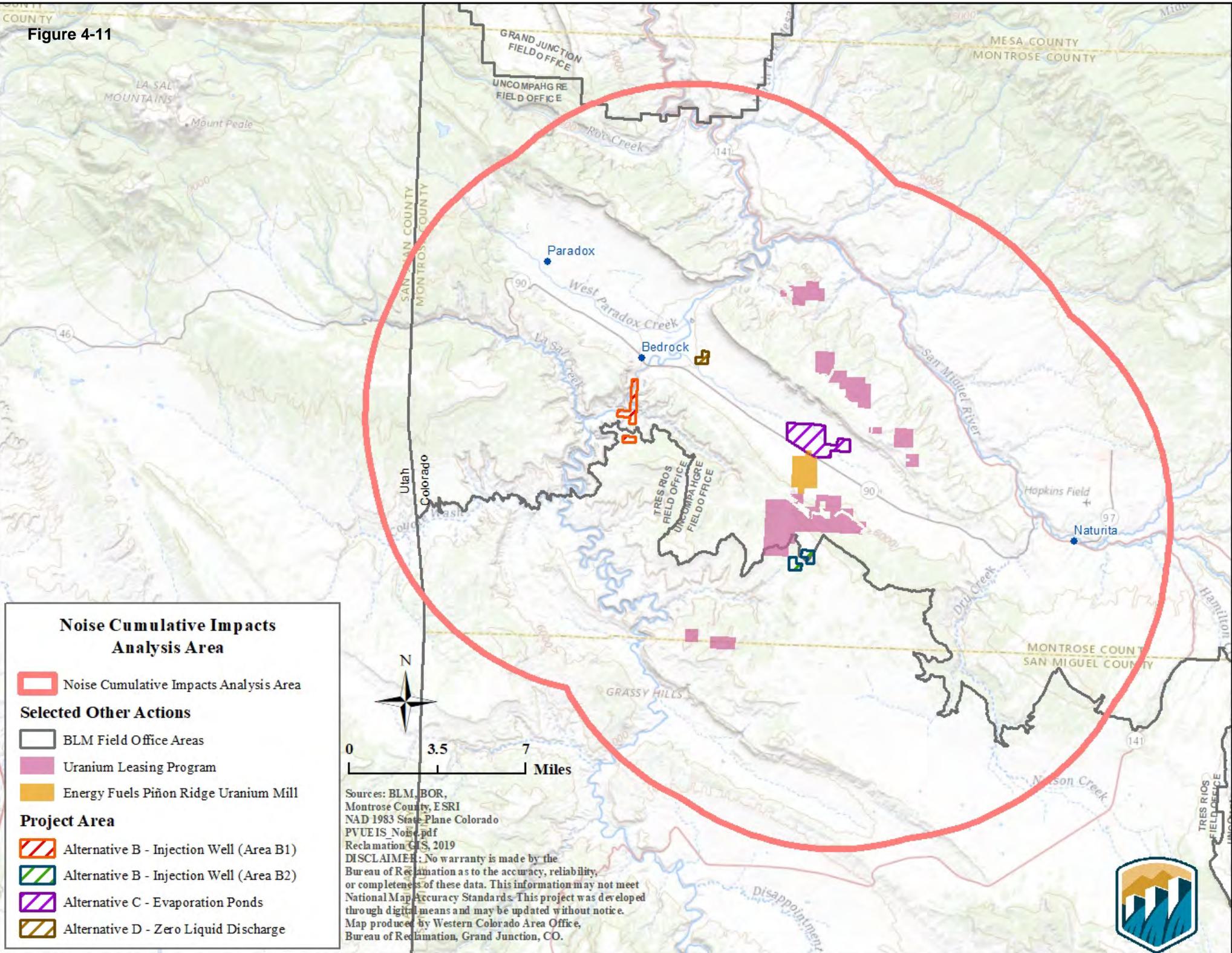
**Areas of Special Designation -
WSAs Cumulative Impacts
Analysis Area**

- Wilderness Study Areas
- Selected Other Actions**
- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill
- Project Area**
- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge
- Land Ownership**
- Bureau of Land Management
- Private
- Bureau of Reclamation

Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUE IS_WSAs.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.



Figure 4-11



Noise Cumulative Impacts Analysis Area

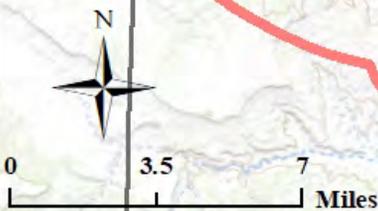
Noise Cumulative Impacts Analysis Area

Selected Other Actions

- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge

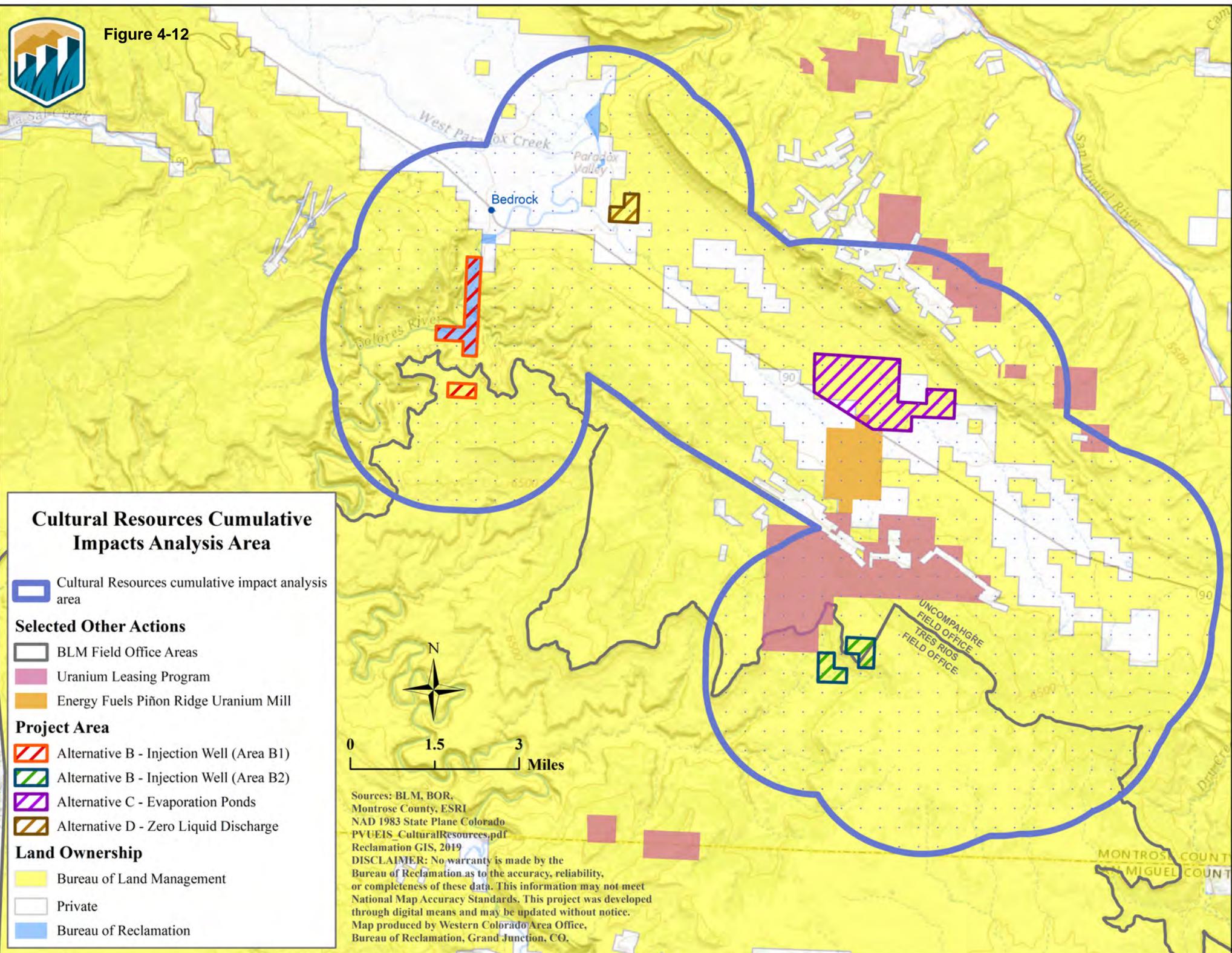


Sources: BLM, BOR, Montrose County, ESRI NAD 1983 State Plane Colorado PVUEIS Noise.pdf Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
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Figure 4-12



Cultural Resources Cumulative Impacts Analysis Area

Cultural Resources cumulative impact analysis area

Selected Other Actions

- BLM Field Office Areas
- Uranium Leasing Program
- Energy Fuels Piñon Ridge Uranium Mill

Project Area

- Alternative B - Injection Well (Area B1)
- Alternative B - Injection Well (Area B2)
- Alternative C - Evaporation Ponds
- Alternative D - Zero Liquid Discharge

Land Ownership

- Bureau of Land Management
- Private
- Bureau of Reclamation



Sources: BLM, BOR, Montrose County, ESRI
 NAD 1983 State Plane Colorado
 PVUEIS_CulturalResources.pdf
 Reclamation GIS, 2019
 DISCLAIMER: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of these data. This information may not meet National Map Accuracy Standards. This project was developed through digital means and may be updated without notice.
 Map produced by Western Colorado Area Office, Bureau of Reclamation, Grand Junction, CO.

MONTROSE COUNTY
 SANTIAGO COUNTY
 SAN MIGUEL COUNTY

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Appendix C

Distribution List

Appendix C – Distribution List

Recipients of the DEIS are listed below:

U.S. Representatives and Senators	City, State
Cory Gardner U.S. Senator of Colorado	Washington, D.C.
Diana Degette U.S. Representative of Colorado	Denver, CO
Doug Lamborn U.S. Representative of Colorado	Buena Vista, CO
Ed Perlmutter U.S. Representative of Colorado	Lakewood, CO
Jason Crow U.S. Representative of Colorado	Boulder, CO
Joe Neguse U.S. Representative of Colorado	Aurora, CO
Ken Buck U.S. Representative of Colorado	Castle Rock, CO
Michael Bennett U.S. Senator of Colorado	Washington, D.C.
Scott Tipton U.S. Representative of Colorado	Grand Junction, CO

State of Colorado Representatives	City, State
Colorado General Assembly	Denver, CO
Chris Hansen Colorado State Representative, District 6	Denver, CO

Agencies and Businesses	City, State
PVU EIS Cooperating Agencies	
U.S. Army Corps of Engineers, Sacramento District Regulatory Division, Colorado West Regulatory Branch	Grand Junction, CO
U.S. Bureau of Land Management, Colorado State Office	Denver, CO
U.S. Bureau of Land Management, Southwest District Office	Montrose, CO
U.S. Bureau of Land Management, Tres Rios Field Office	Dolores, CO
U.S. Bureau of Land Management, Uncompahgre Field Office	Montrose, CO
U.S. Environmental Protection Agency, Region 8	Denver, CO
U.S. Fish and Wildlife Service, Western Colorado Ecological Services	Grand Junction, CO
U.S. Geological Survey, Utah Water Science Center	Salt Lake City, UT
U.S. Geological Survey, Colorado Water Science Center	Grand Junction, CO
Arizona Department of Water Resources	Phoenix, AZ
Colorado Department of Natural Resources	Denver, CO
Colorado Department of Public Health and Environment	Denver, CO

Agencies and Businesses	City, State
Colorado River Board of California	Glendale, CA
Colorado River Commission of Nevada	Las Vegas, NV
New Mexico Interstate Stream Commission	Santa Fe, NM
Southern Nevada Water Authority	Las Vegas, NV
Utah Department of Environmental Quality	Salt Lake City, UT
Wyoming Department of Environmental Quality	Cheyenne, WY
Wyoming State Engineer's Office	Cheyenne, WY
Colorado River Water Conservation District	Glenwood Springs, CO
Montrose County Government Affairs & Natural Resources	Montrose, CO
Southwestern Water Conservation District	Durango, CO
Federal Government Agencies	
U.S. Bureau of Reclamation, Paradox Valley Field Office	Bedrock, CO
U.S. Bureau of Reclamation, Upper Colorado Regional Office	Salt Lake City, UT
U.S. Bureau of Reclamation, Western Colorado Area Office	Durango, CO Grand Junction, CO
U.S. Department of the Interior, Office of Environmental Policy and Compliance, Denver Region	Denver, CO
U.S. Department of the Interior, Office of the Solicitor, Intermountain Region	Salt Lake City, UT
State Government Agencies	
ADOA, Office of Grants and Federal Resources	Phoenix, AZ
California Department of Water Resources	Sacramento, CA
California State Clearinghouse, Office of Planning and Research	Sacramento, CA
Colorado Department of Transportation	Durango, CO Denver, CO
Colorado Division of Water Resources	Denver, CO
Colorado Oil and Gas Conservation Commission	Denver, CO
Colorado Parks and Wildlife, Nucla District Wildlife Manager	Nucla, CO
Colorado Parks and Wildlife, Montrose Wildlife Service Center	Montrose, CO
Colorado Parks and Wildlife, Rocky Mountain Regional Office	Denver, CO
Colorado State Conservation Board Department of Agriculture	Norwood, CO
Colorado State Historic Preservation Office	Denver, CO
Colorado Water Conservation Board	Denver, CO
Nevada Office of Grant Procurement, Coordination and Management	Carson City, NV
State of Colorado Water Commissioner, District 61	Paradox, CO
Utah Department of Agriculture and Food	Salt Lake City, UT
Utah Division of Water Resources	Salt Lake City, UT
Utah Governor's Office of Planning and Budget Utah State Capital Complex	Salt Lake City, UT
Utah Public Lands Policy Coordinating Office	Salt Lake City, UT
Wyoming Water Development Commission	Cheyenne, WY
County Government Agencies	
Montrose County Board of Commissioners	Montrose, CO

Agencies and Businesses	City, State
Montrose County Management	Montrose, CO
Montrose County Planning and Development	Montrose, CO
Montrose County West End Planning Advisory Committee	Montrose, CO
Tribal Governments	
Hopi Tribe	Kykotsmovi, AZ
Navajo Nation	Window Rock, AZ
Southern Ute Indian Tribe	Ignacio, CO
Ute Indian Tribe	Ft. Duschene, UT
Ute Mountain Ute Tribe	Towaoc, CO
Zuni Pueblo	Zuni, NM
Colorado River Basin Salinity Control Forum	
Chad Espenscheid	Big Piney, WY
Clint Chandler	Phoenix, AZ
David Robbins	Denver, CO
David Waterstreet	Cheyenne, WY
Don Barnett	Bountiful, UT
Eric Millis	Salt Lake City, UT
Gawain Snow	Vernal, UT
James Harris	Salt Lake City, UT
John Entsminger	Las Vegas, NV
Krista Osterberg	Phoenix, AZ
Patrick Dent	Bountiful, UT
Patrick Pfaltzgraff	Denver, CO
Patrick Tyrrell	Cheyenne, WY
Rebecca Mitchell	Denver, CO
Suzanne Ticknor	Phoenix, AZ
Tom Blaine	Santa Fe, NM
William Hasencamp	Los Angeles, CA
Water Users and Organizations	
Central Arizona Project	Phoenix, AZ
Dolores River Conservancy District	Cortez, CO
Metropolitan Water District of Southern California	Los Angeles, CA
Utility Companies	
San Miguel Power Association	Ridgway, CO
Waste Management	Nucla, CO
Recreation/Tourism	
American Whitewater	Cullowhee, NC
Colorado River Outfitters Association	Northglenn, CO
Dvorak Raft, Kayak, & Fishing Expeditions	Nathrop, CO
Lower Dolores Boating Advocates	Dolores, CO
Rocky Mountain Recreation Initiative	Nederland, CO

Agencies and Businesses	City, State
Environmental and/or Local Organizations, Partnerships, and Alliances	
Biodiversity Conservation Alliance	Laramie, WY
Canyonlands Watershed Council	Moab, UT
Center for Biological Diversity	Flagstaff, AZ
Colorado Environmental Coalition	Denver, CO Grand Junction, CO
Colorado Mountain Club	Golden, CO
Dolores River Coalition	Cortez, CO
Dolores River Dialogue	Durango, CO
Dolores River Restoration Partnership	Durango, CO
Environmental Defense Fund	Boulder, CO
Gateway-Unawep Fire Protection District	Gateway, CO
Grand Canyon Trust	Castle Valley, UT
Grand Valley Audubon Society	Grand Junction, CO
High Country Citizens Alliance	Crested Butte, CO
Living Rivers	Moab, UT
RiversEdge West	Grand Junction, CO
Rocky Mountain Chapter of the Sierra Club	Boulder, CO
Rocky Mountain Wild	Denver, CO
San Juan Citizens Alliance	Durango, CO
San Miguel Watershed Coalition	Telluride, CO
Sheep Mountain Alliance	Telluride, CO
Southern Utah Wilderness Alliance	Moab, UT
The Conservation Center	Paonia, CO
The Nature Conservancy	Telluride, CO
The Nature Conservancy in Colorado	Boulder, CO
The Walton Family Foundation	Bentonville, AR
The Wilderness Society	Montrose, CO
Trout Unlimited	Delta, CO Grand Junction, CO
Uncompahgre Valley Association	Grand Junction, CO
Utah River Council	Salt Lake City, UT
Western Colorado Alliance	Grand Junction, CO
Western Resources Advocates	Boulder, CO
Media	
Delta County Independent	Delta, CO
Moab Sun News	Moab, UT
Moab Times-Independent	Moab, UT
Montrose Daily Press	Montrose, CO
Ouray County Plaindealer	Ridgway, CO
The Daily Sentinel	Grand Junction, CO
The Watch	Telluride, CO

Agencies and Businesses	City, State
The Western Slope Watchdog	Montrose, CO
Libraries	
Montrose Regional Library District	Montrose, CO
Naturita Community Library	Naturita, CO
Nucla Public Library	Nucla, CO
Paradox Community Library	Paradox, CO
Schools and Colleges	
Water Center at Colorado Mesa University	Grand Junction, CO
Over 220 Individuals (Interested Parties and Landowners)	

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Appendix D

References

Appendix D – References

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