BLM
UTAH Monticello Field Office

United States Department of the Interior
Bureau of Land Management

Environmental Assessment

Daneros Mine Plan Modification

Applicant/Address:

Energy Fuels Resources (USA) Inc.
225 Union Blvd. Suite 600
Lakewood, Colorado 80228

Prepared for:

Monticello Field Office
365 N. Main Street
Monticello, Utah 84535

DOI-BLM-UT-Y020-2016-0001-EA
Plan of Operations Modification UTU-74631

May 2016

Table of Contents

CHAPTER 1 – PURPOSE AND NEED 1
1.1 Introduction 1
1.2 Background 1
1.3 Proposed Project Location and Description 2
1.4 Purpose and Need for the Proposed Action 4
1.4.1 BLM Purpose and Need 4
1.4.2 Applicant Purpose and Need 5
1.5 Conformance with the BLM Land Use Plan 5
1.6 Relationship to Statutes, Regulations, or Other Plans 5
1.7 Identification of Issues 9
1.7.1 Air Quality 10
1.7.2 Water Quality 10
1.7.3 Human Health and Safety 10
1.8 Summary 10
CHAPTER 2 – DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION 11
2.1 Introduction 11
2.2 Alternative A – Proposed Action 11
2.2.1 Mine Development 11
2.2.2 Mine Infrastructure and Equipment 19
2.2.3 Workforce, Access, and Transportation 21
2.2.4 Noxious Weed and Invasive Plant Control Plan 22
2.2.5 Fugitive Dust Control Plan 23
2.2.6 Material Storage and Disposal 23
2.2.7 Reclamation 25
2.3 Alternative B – No Action 30
2.4 Alternatives Considered but Not Analyzed in Detail 32
2.4.1 Reclamation Alternative 32
2.4.2 South Portal Area Alternative 33
2.4.3 Mitigation Alternative 33
2.5 Summary Comparison of Environmental Impacts 34
CHAPTER 3 – AFFECTED ENVIRONMENT 36
3.1 Introduction 36
3.2 General Setting 36
3.3 Resources Eliminated from Further Analysis 36
3.4 Resources/Issues Brought Forward for Analysis 37
3.4.1 Air Quality 37
3.4.2 Water Quality 45
3.4.3 Human Health and Safety Concerns 49
CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES 54
4.1 Introduction 54
4.2 Direct/Indirect Impacts Alternative A – Proposed Action 54
4.2.1 Air Quality 54
4.2.2 Water Quality 64
4.2.3 Human Health and Safety Concerns 70
4.2.4 Mitigation Measures for the Proposed Action 80
4.2.5 Monitoring and/or Compliance 80
4.3 Direct/Indirect Impacts Alternative B – No Action 80
4.3.1 Air Quality 81
4.3.2 Water Quality 81
4.3.3 Human Health and Safety Concerns 81
4.4 Cumulative Impacts Analysis 81
4.4.1 Air Quality 82
4.4.2 Water Quality 88
4.4.3 Human Health and Safety 91

4.4.4 Cumulative Impacts Analysis Summary 96
CHAPTER 5 - CONSULTATION AND COORDINATION 98
5.1 Introduction 98
5.2 Persons, Groups, and Agencies Consulted 98
5.3 Summary of Public Participation 100
5.4 List of Preparers 101
CHAPTER 6 - REFERENCES AND ACRONYMS 102
6.1 References Cited 102
6.2 List of Abbreviations and Acronyms 109

List of Tables

Table 1 Daneros Mine List of Permits or Approvals 8
Table 2 Surface Disturbance 12
Table 3 Summary of Development Rock and Stockpile Storage Capacity 14
Table 4 Underground Equipment 20
Table 5 Surface Equipment 20
Table 6 Raise Bore Equipment (Vent Shaft Installation) 21
Table 7 New Construction and Concurrent Reclamation Summarized by Project Phase 25
Table 8 Seed Mix 28
Table 9 Summary of Impacts to Resources from Each Alternative 34
Table 10 Federal Air Quality Classifications within 200 km of the Project Area 38
Table 11 National Ambient Air Quality Standards 40
Table 12 Monitoring Locations with 3-Year Average 4th Highest 8-Hour Ozone Concentration Greater Than or Equal to 60 ppb (2008) 41
Table 13 Long-term Trends in Annual 4th Highest 8-Hour Daily Maximum Ozone Concentration (2008) 41
Table 14 Long-term Trends in Annual Deciview (dv) on Clearest and Haziest Days 42
Table 15 Long-term Trends in Wet-Deposition Concentration 43
Table 16 Sources of Visibility-Reducing Compounds in Class I Areas near the Proposed Mine 45
Table 17 Bullseye Spring and Well Sample Results (April 22, 2014) 47
Table 18 Daneros Well Sample Results (August 26, 2009) 49
Table 19 U.S. and Daneros Mine Project Area Regional Natural Background Radiation Doses 50
Table 20 Comparative Doses of Radiation 51
Table 21 Proposed Project Criteria Air Pollutant and HAP Emission Rates Average Annual Operating Case (tons/year) 58
Table 22 Proposed Project Emissions Comparison to UDAQ Modeling Thresholds – 60
Table 23 Dispersion Modeling Results Summary, PM_{10}, NOx, and CO 61
Table 24 Comparison of Mill Emissions 62
Table 25 Development Rock Dose Modeling Results 72
Table 26 BLM Human Health Soil Screening Levels (SSLs) for Commonly Found Metals at Mining Sites 75
Table 27 Representative Permitted Uranium Mine Emissions 83
Table 28 Cumulative Pollutant Concentrations (CARMMS 2021 High Development Scenario) at Canyonlands National Park ($\mu g/m^3$) 87
Table 29 CARMMS Cumulative Visibility Results (Δdv) for Worst 20% and Best 20% Visibility Days at Class I Areas for Current Year (2008) and 2012 High Development Scenario All Emissions and Contributions from RFD Sources, Canyonlands National Park 87
Table 30 Cumulative RFD Nitrogen and Sulfur Deposition Impacts (CARMMS 2021 High Development Scenario) at Canyonlands National Park 87
Table 31 Radiation Doses for the Public from Ore Shipments 95
Table 32 Summary of Scoping Contacts and Response Submittal 98

List of Appendices

Appendix A	2011 BLM FONSI/DR - Conditions of Approval (attachment A) and Compliance and Monitoring Requirements (attachment B)	
Appendix B	Figures	
	Figure 1	General Location Map
	Figure 2	Access Roads and Vent Shaft Area
	Figure 3	Daneros Portal Area Existing and Proposed Disturbance
	Figure 4	Bullseye Portal Area Existing and Proposed Disturbance
	Figure 5	South Portal Area Existing and Proposed Disturbance
	Figure 6	Typical Vent Shaft
	Figure 7	Daneros Portal Area Reclamation
	Figure 8	Bullseye Portal Area Reclamation
	Figure 9	South Portal Area Reclamation
	Figure 10	PSD Class I and Sensitive Class II Areas
	Figure 11	Surface Water
	Figure 12	Groundwater
	Figure 13	Conceptual Geologic Cross Section of the Daneros Portal Area
	Figure 14	Gamma Survey – Daneros and Bullseye Portal Areas
	Figure 15	Gamma Survey – South Portal Area
	Figure 16	Air Quality Cumulative Impact Area
	Figure 17	Water Quality Cumulative Impact Area
	Figure 18	Human Health and Safety Cumulative Impact Areas
Appendix C	Interdisciplinary Team Analysis Record Checklist	
Appendix D	Scoping Report	
Appendix E	Evaluation of the Radiological Characteristics of Uranium Mine Waste Rock	
Appendix F	Air Quality Emissions Inventory	
Appendix G	Daneros Mine Dispersion Modeling Results, Natural Bridges National Monument	

CHAPTER 1 – PURPOSE AND NEED

1.1 Introduction

Energy Fuels Resources (USA) Inc. (Energy Fuels or Applicant), formerly Denison Mines (USA) Corp., proposes to expand the development of an existing conventional underground uranium mine on the Daneros mine property in southeast Utah (Proposed Action or Proposed Project). This Environmental Assessment (EA) has been prepared to analyze the potential impacts to the environment that could result from implementation of the Proposed Action or the No Action Alternative. This EA analyzes the site-specific impacts associated with the Proposed Action and its alternatives, identifies mitigation measures to potentially reduce or eliminate those impacts, and provides agency decision makers with detailed information upon which to approve or deny the Proposed Action or an alternative. It will assist the U.S. Department of the Interior (USDOI) Bureau of Land Management (BLM) in project planning, ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any significant impacts could result from either of the analyzed alternatives.

This EA complies with the requirements of NEPA and federal regulations found in 40 Code of Federal Regulations (CFR), Chapter V, and 43 CFR 4.413. The project record contains an interdisciplinary analysis to support the findings in this document and is located at the BLM Monticello Field Office (MFO). Pursuant to 40 CFR 1508.28 and 1502.21, this site-specific EA tiers to the information and analysis contained in the BLM MFO Resource Management Plan (RMP) (BLM, 2008a) and Final Environmental Impact Statement (FEIS) (BLM, 2008b). Tiering to a NEPA document containing broader impact analysis allows the BLM to consider a narrower range of alternatives for this Proposed Action. In particular, this EA tiers to the cumulative impact analysis contained in the FEIS, coupled with the level of development proposed by the Reasonable Foreseeable Development (RFD) scenario. This EA also incorporates, by reference, applicable environmental analysis documented in the 2011 EA prepared for the approved Daneros Mining Plan of Operations (MPO).

An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of Finding of No Significant Impact (FONSI). A Decision Record, which includes a FONSI statement, is a document that briefly presents the reasons why implementation of the Proposed Action would not result in significant environmental impacts. Significance is defined by NEPA and is found in regulation 40 CFR 1508.27. If the decision-maker determines that the Proposed Project has significant impacts following the analysis in the EA, then an EIS would be prepared. If not, a Decision Record may be signed for the EA approving the Alternative selected.

1.2 Background

On December 20, 2013 Energy Fuels submitted to the BLM MFO a Mining Plan of Operations Modification (MPOM) for the Daneros Mine pursuant to 43 CFR Subpart 3809, which regulates surface operations conducted under the General Mining Law of 1872 and other applicable laws and regulations. The BLM is the lead agency for preparation of this EA, and the BLM MFO manager is the authorizing officer.

Uranium mining has occurred in Bullseye Canyon and the surrounding areas since the 1950s, with intervening periods of decreased or increased mining activity in relation to changing economic conditions. The proposed Daneros Mine disturbance area includes portions of several historical uranium mining operations including the Bullseye, Lark (formerly Cove), and Royal (formerly Mineral Channel) mines.

Utah Energy Corporation (UEC) submitted a MPO to the BLM in 2008 for the Daneros Mine, which the BLM approved in 2009. Mining began while the decision was being appealed to the Interior Board of Land Appeals (IBLA). Energy Fuels acquired the assets of UEC on June 17, 2011, including the Daneros Mine property. Upon partial remand from IBLA (IBLA 2010-138), the BLM Monticello Field Office revised the project EA (UT-090-07-43). The BLM Utah State Director signed a Finding of No Significant Impact and Decision Record (FONSI/DR) on June 28, 2011, again approving the UEC MPO. The MPO was authorized subject to Conditions of Approval (Attachment A to the FONSI/DR) and Compliance and Monitoring Requirements (Attachment B to the FONSI/DR) (see Appendix A). The BLM Utah State Director's June 2011 Decision was affirmed by the IBLA on September 26, 2012 (IBLA 2011-209). The 2011 MPO approval includes the following:

- Production of up to 100,000 tons of uranium ore during a seven-year period of operation.
- Transportation of ore by truck on existing county and state roads to the White Mesa Mill, near Blanding, Utah.
- Construction and/or rehabilitation of two declines into the uranium ore body for purposes of ore haulage, mine ventilation, and a secondary escape route.
- Construction of two 7-foot diameter mine ventilation boreholes.
- Drilling of 22 development drill holes to further delineate the ore body.
- Installation of a water supply well to support surface and underground activities.
- Construction and operation of surface facilities at the Daneros Portal Area, including a mine yard/portal area, office/shop area, ore stockpile area, development rock area (DRA) and two topsoil stockpile areas.

The 2009 MPO provides for a total of 4.5 acres of surface disturbance, the majority of which (3.5 acres) is located within areas of pre-existing mining disturbance (i.e., mine disturbance that occurred historically, prior to the advent of reclamation laws). The following has occurred since the MPO was approved:

- The Daneros Mine operated from 2009 to October 2012. The site is currently on "care and maintenance" status.
- The two declines at the Daneros Portal were constructed and used for haulage, mine ventilation, and as a secondary escape route.
- Two ventilation shafts were constructed.
- A water well was drilled and used to supply water for mining activities.
- Surface facilities were constructed and operated.

1.3 Proposed Project Location and Description

The Daneros Mine property is located in Bullseye Canyon, in the central portion of the Colorado Plateau in southeastern Utah (see Figure 1 in Appendix B). The Daneros Mine is located approximately 67 miles west of Blanding and 5 miles southwest of Fry Canyon, Utah, in western San Juan County. It is situated in a relatively remote and sparsely populated area on BLM managed land. The MPOM area includes portions of Sections 5, 6, 7, 8, 17, and 18 of Township 37 South, Range 16 East, Salt Lake Meridian. The mine is accessed from Utah Highway 95 via County Road B258 (Radium King Road) and County Road D0029.

Uranium deposits at the Daneros Mine are found in localized horizons that follow meandering fluvial sandstone channels in the Shinarump member of the Chinle Formation. Ore is mined using random room-and-pillar methods in which development drifts are advanced to known ore bodies, which are then selectively mined as part of a production stope (underground excavation). Pillars are generally comprised of non-ore material that is left in place to support

the back (i.e., the top or roof of an underground passage). The ore is hauled to the surface where it is stockpiled at the mine in areas removed from surface runoff, until such stockpiled material can be loaded into highway trucks and transported off-site for processing. The development rock, generated as part of the underground mining activities, is placed in mined out areas underground or the DRAs located on the surface. There is no on-site physical or chemical mineral processing at the mines; accordingly, no tailings or mineral processing chemicals are generated or stored on site. Ore produced from the Daneros Mine is shipped to the White Mesa Mill, located near Blanding, Utah, for processing.

Underground mining equipment includes loaders, haul trucks, drills, man trips and miscellaneous support vehicles. Jacklegs operating on compressed air are utilized to drill the blast holes and rock-bolt holes in the production areas while jumbo drills are typically used to drill the development drifts. The ore averages about four to five feet in thickness while the drifts are about 9 feet in height and the stopes are a minimum of 6 feet in height. To avoid excessive dilution of the ore, the development rock or waste is typically drilled and shot separately from the ore using what is referred to as “split shooting.” Blasting operations are conducted in accordance with MSHA regulations using ammonium nitrate and fuel oil (ANFO) prills (small spheres or pellets) with a blasting cap and chemical booster. The blasts are initiated using a non-electric system (nonels) with the hole pattern, firing sequence and delays designed to allow for optimum breakage and minimum ore dilution. After blasting is completed, the ore and development rock are loaded by low-profile diesel loaders into underground diesel trucks for transport to the surface. In some cases, the development rock can be placed (i.e., gobbed) in underground stopes that have already been mined out.

Surface equipment includes a motor grader, water truck, loader, dozer and highway haul trucks. The motorgrader and water truck are used to maintain the surface roads while the dozer is used to maintain the DRAs, strip topsoil and perform excavation and reclamation tasks when needed. The front-end loader is used to load ore into the highway haul trucks for delivery to the mill. The haul trucks are tarped and scanned for radiation prior to leaving the site. Stationary equipment located both in the underground and surface areas include air compressors, diesel generators and ventilation fans.

The MPOM includes components to support additional mine development and mine operation beyond the currently approved plan. It is designed to facilitate mineral development activities for a minimum of 5 and up to approximately 20 years of continued production, depending on market conditions and additional resource discoveries during underground long-hole exploration. Proposed activities include expanding the DRA at the Daneros Portal and developing two additional portal areas referred to as the Bullseye and South Portal areas. Up to eight additional vent shafts and associated access roads to support future mining are also proposed.

The 2009 MPO provided for a total of 4.5 acres of surface disturbance, 3.5 acres of which was located within areas of pre-existing mining disturbance. The additional disturbance proposed by this MPOM is 41.8 acres, which would bring the total disturbance to 46.3 acres. The MPOM incorporates the following activities:

- **Daneros Portal Area:** expanding the DRA, which would increase the permitted disturbance area from 4.5 to 5.3 acres.
- **Bullseye Portal Area:** rehabilitating the existing Bullseye Portal and constructing two DRAs, an ore stock pile, an inert material stockpile, and a topsoil stockpile. This portal area contains 0.7 acre of existing, historic mine disturbance and the total proposed disturbance area would equal 8.1 acres.

- **South Portal Area:** constructing two portals, a DRA, an ore stockpile, an inert material stockpile, and a topsoil stockpile. The South Portal Area contains 4.9 acres of existing, historic mine disturbance and the total proposed disturbance area would equal 20.9 acres.
- **Vent Shafts:** installing eight additional vent shafts and associated access roads. The estimated surface disturbance area for vent shafts and related access roads is 1.5 acres per vent shaft, resulting in a total proposed disturbance of 12 acres for the 8 additional vent shafts and associated access roads.

Expanding the mine operations would employ up to 40 miners and support personnel, with the majority of the employees coming from the existing, local workforce. Phased construction and concurrent reclamation would allow new portal areas to be constructed as mining progressed and reclaimed as they were no longer needed over the 20-year mine life.

1.4 Purpose and Need for the Proposed Action

1.4.1 BLM Purpose and Need

The BLM MFO Record of Decision and RMP of November 2008 specifies that BLM will "provide opportunities for environmentally responsible exploration and development of mineral and energy resources subject to appropriate BLM policies, laws, and regulations" (BLM, 2008a:79). The Federal Land Policy and Management Act of 1976 (FLPMA) and regulations at 43 CFR Subpart 3809 mandate that operations authorized by the mining laws are conducted in a manner that will prevent unnecessary or undue degradation of public lands. Accordingly, the BLM's primary purpose for considering the Proposed Action, as stated in the 2008 RMP, is to "evaluate all operations authorized by the mining laws in the context of its requirement to prevent unnecessary or undue degradation of Federal lands and resources" and to ensure that "consistent with the rights afforded claimants under the mining laws, operations will conform to the management prescriptions in the plan" (Management Decision MIN-18; BLM, 2008a:82). To accomplish its primary purpose, BLM must ensure that operations meet the performance standards outlined at 43 CFR 3809.420. These include compliance with federal and state air quality and water quality standards, and measures to protect public safety and cultural and wildlife resources.

As required by federal regulations at 43 CFR 3809.431, Energy Fuels has filed a MPOM for the continued development of an existing, conventional, underground uranium mine. These lands are not withdrawn from mineral entry and, therefore, are subject to location under the mining laws of the United States (Management Decisions MIN-4, MIN-16 and MIN-31; BLM, 2008a:79, 82, and 84).

The BLM manages public lands for multiple uses, including the exploration and development of locatable minerals. The BLM MFO Record of Decision and RMP declares BLM's policy as: "Continue to meet local and national energy and other public minerals needs to the extent possible" (BLM, 2008a:79). The Energy Policy Act of 2005 emphasizes adding energy supplies from diverse sources including nuclear power. The Energy Independence and Security Act of 2007 was enacted, in part, to move the United States toward greater energy independence. The BLM recognizes that public lands are an important source of the nation's energy and mineral resources. The Proposed Action would provide a domestic source of uranium that would help fuel nuclear power plants in the United States, and therefore would help meet the BLM's broad policy objectives.

1.4.2 Applicant Purpose and Need

The underlying need for the Proposed Action is for Energy Fuels to expand its Daneros Mine operation in order to develop and profitably extract a valuable deposit of uranium from unpatented mining claims under the authority of the Mining Law of 1872, as amended. The DRA at the Daneros portal area is reaching capacity and is nearing the limit of the current authorization. There is insufficient space in the mine for development rock disposal. Therefore, increasing the capacity of the DRA is necessary for continued ore production at the Daneros portal area. It is also necessary to install similar facilities at the Bullseye and South portal areas to safely and economically mine the Daneros uranium deposit.

There is a growing regional and national demand for a continuous, reliable energy supply and a need to reduce U.S. dependence on foreign energy supplies. Total electricity consumption in the United States is projected to grow from 3,826 billion kilowatt-hours in 2012 to 4,954 billion kilowatt-hours in 2040, increasing at an average annual rate of 0.9 percent. Foreign energy supplies accounted for 28 percent of U.S. energy consumption in 2012 and are projected to decrease to 22 percent in 2040 (Energy Information Administration [EIA], 2014a).

Uranium ore is needed for the continued operation of existing nuclear reactors in the United States as well as the future operation of new nuclear reactors proposed for construction. As of December 31, 2013, there were 100 commercial nuclear reactors licensed by the U.S. Nuclear Regulatory Commission (NRC, 2013a). As of April 2013, an additional 18 new reactors had been proposed for construction (NRC, 2013b). In 2013, existing U.S. nuclear reactors required 47 million pounds of uranium fuel to operate (EIA, 2014b); at that time, uranium-mining production in the United States was only 4.6 million pounds per year (EIA, 2014c). Owners and operators of U.S. civilian nuclear power reactors purchased the equivalent of 57 million pounds of uranium during 2013; 17 percent came from the United States and 83 percent was of foreign-origin (EIA, 2014b).

1.5 Conformance with the BLM Land Use Plan

The Proposed Action is in conformance with the RMP, which was approved by the Record of Decision on November 17, 2008. The RMP provides for a variety of mineral exploration and development activities within the planning area. Page 79 of the RMP reads as follows: “Continue to meet local and national energy and other public mineral needs to the extent possible. Provide opportunities for environmentally responsible exploration and development of mineral and energy resources subject to appropriate BLM policies, laws, and regulations” (BLM, 2008a:79). The RMP identifies lands available for mineral entry. The Proposed Action is in conformance with Minerals Management Action 16 (MIN-16) of the RMP: “All public domain lands overlying federal minerals are available for mining claim location unless specifically withdrawn from mineral entry by Secretarial Order or public law or segregated from mineral entry under specific reservations…” Minerals Management Action 4 (MIN-4) also states: “The MFO will be open for mineral entry unless specifically withdrawn…” (BLM, 2008a:79, 82). The proposed Project Area is not recommended for withdrawal in the RMP but remains open to mineral entry under the General Mining Law, as amended.

1.6 Relationship to Statutes, Regulations, or Other Plans

BLM Handbook H-1790-1, Supplemental Authorities to be Considered, lists authorities other than NEPA that the BLM must consider when considering a proposal in an environmental analysis. There may be other laws, regulations, or policies that apply to this Proposed Action.

Mining operations are subject to a wide range of federal, state, and local requirements. Many of these require permits, approvals or consultations before the mining operations commence, whereas others mandate the submission of various documents or establish specific prohibitions or standards (Environmental Protection Agency [EPA], 1994). The following section describes the purposes and requirements of the major federal, state, and local statutes. The Proposed Action would be subject to the following laws, regulations, and policies where applicable:

- **27 CFR 555 Commerce in Explosives** authorizes the Bureau of Alcohol, Tobacco and Firearms to regulate the sale, transportation, and storage of explosives.
- **43 CFR 3715 Use and Occupancy Under the General Mining Laws** regulates residency or seasonal occupancy of mining claims by mining claimants and requires that the BLM concur with the use and occupancy of public lands for the development of locatable mineral deposits by limiting such use or occupancy to that which is reasonably incident.
- **43 CFR 3809 Mining Claims Under the General Mining Laws** requires proper permits and authorizations for mineral exploration, mining, and reclamation actions on the public lands administered by the BLM and sets performance standards for preventing undue and unnecessary degradation of federal lands.
- **Clean Air Act** establishes National Ambient Air Quality Standards to control air pollution. Impacts to air quality from mineral development are controlled by mitigation measures developed on a case-by-case basis. The Utah Division of Air Quality oversees air quality regulations and standards for stationary sources of air pollution.
- **Comprehensive Environmental Response, Compensation and Liability Act** requires owners/operators to report to the government releases of hazardous substances to the environment and inventory chemicals handled.
- **Endangered Species Act** mandates protection for plants and animals that are federally listed as threatened with or in danger of extinction. Concurrence from the U.S. Fish and Wildlife Service would be required, were the Proposed Action to potentially or adversely affect any threatened, endangered, or candidate species, as determined by the authorizing agency.
- **Executive Order 12898 of 1994, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations** requires federal agencies to ensure that proposed projects under their jurisdictions do not cause a disproportionate environmental impact that would affect any group of people because of a lack of political or economic strength. Environmental justice requires “the fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”
- **Executive Order 11988, Floodplain Management** requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
- **Federal Land Policy and Management Act** requires the Secretary of the Interior to manage public lands under principles of multiple use and sustained yield and authorizes the Secretary to regulate the use of public land for the prevention of unnecessary or undue degradation.

- **Federal Mine Safety and Health Act** authorizes the U.S. Department of Labor Mine Safety and Health Administration (MSHA) to regulate more effective means and measures to improve the working conditions and practices in the nation's mines, in order to prevent death and serious physical harm, and in order to prevent occupational diseases originating in such mines. To comply with these standards, Energy Fuels would be required to obtain the necessary MSHA mine permit and to submit an MSHA-approved miner training plan, escape and evacuation plan, and ventilation plan.
- **Federal Water Pollution Control Act (Clean Water Act)** directs standards to be set for surface water quality and for controlling discharges to waters of the U.S. Under Section 402 of the Clean Water Act (as amended), the EPA was directed to develop a phased approach to regulate stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program. Industrial activities disturbing more than 1 acre of land may require an NPDES permit for stormwater discharge. Depending on the acreage disturbed, either a Phase I industrial activity (5 or more acres of disturbance) or a Phase II small construction activities (between 1 and 5 acres of disturbance) permit may be required. The Utah Division of Water Quality oversees the Utah Pollutant Discharge Elimination System (UPDES) and stormwater regulatory programs. Additionally, a joint U.S. Army Corps of Engineers and State of Utah Division of Water Quality Section 404 permit and associated Section 401 certification for the discharge of dredge and fill materials into waters of the U.S. may be required.
- **General Mining Law of 1872** allows private U.S. citizens and businesses to prospect for, discover, locate, and extract certain valuable minerals on federal public domain lands that are open for that purpose. Later amendments, including the Hard Rock Mining Act, withdrew particular public lands from mining.
- **Migratory Bird Treaty Act** prohibits the taking, killing, or possessing of migratory bird species.
- **National Environmental Policy Act** requires an interdisciplinary approach to ensure disclosure of effects and proper consideration being given to the environment prior to undertaking any federal action that may impact the environment.
- **National Historic Preservation Act** requires federal agencies to inventory and protect historic and archaeological resources. Concurrence from the State Historic Preservation Officer is required, if any historic properties may be affected by the Proposed Action.
- **Resource Conservation and Recovery Act** regulates the generation, storage, and disposal of hazardous waste and management of solid, non-hazardous waste. Under the Bevill Amendment, wastes that are uniquely associated with the extraction of ores and minerals are exempt from RCRA requirements, but not wastes generated at mining sites that are not uniquely associated with the mining operations, such as solvents, lubricants, or degreasers (EPA, 2009).
- **Safe Drinking Water Act** directs standards to be set for quality of drinking water supplied to the public (states are primary authorities) and regulates underground injection operations. The Utah Division of Drinking Water has regulatory authority for drinking water systems supporting 25 people or more per day.

The permits, approvals and requirements for the Daneros Mine are listed in Table 1 below. Copies of formal permit approvals are included in the MPOM as Attachment J. Operations at the Daneros Mine would be conducted in a manner that complies with pertinent federal, state, and local laws and regulations, including permit requirements. Energy Fuels would provide the BLM

with a copy of permits, plans, and monitoring reports issued or required by other local, state, and federal entities.

Table 1
Daneros Mine List of Permits or Approvals

Permit / Number	Agency
Mining Plan of Operations for Daneros Mine (UTU-74631); including reclamation bond	BLM (Approved for existing operations)
Decision Record, Finding of No Significant Impact and Environmental Assessment for Daneros Mine (UT–090-07-43)	BLM (Approved for existing operations)
Mining Plan of Operations Modification for Daneros Mine (UTU-74631)	BLM (Application submitted for MPOM)
Small Mine Permit/Mine and Reclamation Plan – Daneros (S/037/0121); including reclamation bond.	Utah Division of Oil, Gas and Mining (UDOGM) (Approved for existing operations)
Large Mine Permit/Mine and Reclamation Plan – Daneros Mine (M/037/0126)	UDOGM (Application submitted for MPOM)
Approval for Construction under 40 CFR Part 61 Subparts A and B (DAQE-AN144920002-14, Site ID 14509) (Radon NESHAPs)	Utah Division of Air Quality (Approved) (May 23, 2012 Approval for Construction covers mine expansion – no update or revision required at this time)
Approval Order for a New Underground Uranium Mine San Juan County (Project No. N14492-0002)	Utah Division of Air Quality (Approved July 8, 2014)
Stormwater Pollution Prevention Plan and Permit (UTR 260661)	Utah Division of Water Quality (Approved)
Spill Prevention, Control, and Countermeasures (SPCC) Plan	Plan Modification Complete
Stream Alteration Permit (Application No. 15-99-01SA) for Daneros Portal Area	Utah Division of Water Rights (Under review)
Stream Alteration Permit for Bullseye Portal Area	Utah Division of Water Quality (Would be applied for prior to altering the stream at the Bullseye Portal)
Test Well# 0999001M00 at Daneros Portal Area	Utah Division of Water Rights (Approved)
Application to Appropriate Water Number 09-2315 (A78359)	Utah Division of Water Rights (Approved)
Potable Water System	Utah Division of Drinking Water (Would be applied for prior to installation of system for greater than 25 employees)
Access Permit	San Juan County Public Works Department (Would be applied for prior to any new access needs)
Building Permit	San Juan County Community Development and Planning Department (Would be applied for prior to any building construction)
Septic System Permit	Southeast Utah Public Health Department (Would be applied for prior to installation of system)
Pesticide Application Licensing	Utah Department of Agriculture (Approved)
Mine Safety and Health Administration (MSHA) Mine Registration	U.S. Department of Labor (Would be applied for prior to reopening the mine)
MSHA Training Plan, Escape and Evacuation Plan and Ventilation Plan	U.S. Department of Labor (Revised plans would be submitted prior to reopening the mine)
Transportation Requirements	Permits, licenses, certificates, training and compliance with UDOT and USDOT requirements are the responsibility of the carrier or transportation contractor. Energy Fuels would require contractors to adhere to its Transportation Policy (MPOM, Attachment N)

1.7 Identification of Issues

Scoping helps identify resources that could be impacted, reducing the chances of overlooking a potentially significant issue or reasonable alternative. The scoping process for this EA meets the public involvement requirements of FLPMA and NEPA. The process includes soliciting input from interested agencies, organizations, and individuals on issues, concerns, needs, and resource uses. For internal scoping, the BLM resource specialists utilized the Interdisciplinary Team Checklist found in Appendix C. As part of the public scoping effort, letters and news releases solicited input from agencies and the public.

A public notice/legal ad and a press release outlining the Proposed Action as well as the BLM's intent to prepare an EA to analyze the request and proposal were posted. The legal ad was posted in two newspapers of record for the region: the San Juan Record on February 12, 2014, and the Times Independent on February 13, 2014. The MPOM and the press release were posted to the BLM Environmental Notification Bulletin Board at http://www.blm.gov/ut/enbb/index.php and the MFO website. The BLM invited the public to provide comments on the proposal from February 5, 2014 through March 14, 2014. On February 4, 2014, the BLM sent letters to 12 tribal entities requesting comments on the Proposed Action. Letters were also sent to interested parties. On February 10, 2014, a letter was sent to several State of Utah agencies requesting input on issues and concerns.

During the scoping period, the BLM received 9 comment letters: 1 from EPA Region 8, 1 from the National Park Service (NPS), 2 from cultural groups – The Hopi Tribe and The Navajo Nation, 2 from environmental advocacy groups, and 3 unique letters from individuals. Additionally, the BLM received 2,045 identical form letters generated from the Southern Utah Wilderness Alliance website. These letters, presenting a range of information, allegations, concerns, and issues, were carefully considered and helped drive both issue identification and impact analysis. Not all of the comments presented during scoping were actual resource issues to be discussed in detail in this EA. Some comments are outside the scope of this EA; some are addressed through standard operating procedures because they are required by federal law, rule, or regulation; and some are issues that will be discussed in detail in this EA. Comment letters were carefully reviewed and responses to scoping comments are found in Appendix D.

NEPA requires that the discussion of issues and concerns be commensurate with the potential impacts. Federal Council on Environmental Quality (CEQ) Regulations (1500.5(c)) state "impacts shall be discussed in proportion to their significance." Other CEQ Regulations (1501.7 (3)) make it clear that discussion of all resources is not necessary, only those that are potentially significant. This allowed the BLM to narrow the discussion of the issues in the EA to a brief presentation in Appendix C, Interdisciplinary Team Checklist, of why the Proposed Action would not have a significant effect on some resources and focus the discussion on relevant resources that may be impacted.

. Based on scoping, the BLM found three issues/resources that required detailed discussion in the EA. Documentation regarding other resources are found in Appendix C – Interdisciplinary Checklist.

There were a range of comments, the majority concerning the NEPA process, human health and safety, inadequacy of the MPOM, water resources, reclamation, transportation, cultural resources, cumulative impacts, and air quality. Upon completion of the scoping process, the following issues were identified as warranting further analysis in this EA:

1.7.1 Air Quality

- Would federal and state emission thresholds for air pollutants be exceeded?
- Would Class I or Sensitive Class II areas (i.e., Natural Bridges National Monument) be affected by fugitive dust?
- Would dust be controlled along the roads to the mine site?

1.7.2 Water Quality

- Would state water quality standards be exceeded?
- What would the effect of the presence of metals and hazardous materials be on surface and groundwater resources?
- Would mining impact existing water resources?

1.7.3 Human Health and Safety

- Would employees and the public be exposed to unsafe levels of radon gas and gamma radiation?
- What would the effects be from acid-forming or deleterious materials?
- Would road maintenance occur due to the increased travel of large vehicles on public roads?
- Would there be an increase in traffic incidents?

1.8 Summary

This chapter has presented the Purpose and Need for the Proposed Action, as well as the relevant issues and concerns related to the implementation of the Proposed Action that were identified in scoping. In order to meet the Purpose and Need of the Proposed Action in a way that resolves the issues, the BLM has developed Alternative A – Proposed Action, with project design measures intended to minimize potential impacts to the human environment. Alternative B – No Action, would not meet the Purpose and Need of the Proposed Action. The latter provides baseline environmental data and serves as a comparison for analysis of the potential resource impacts of Alternative A. These alternatives are presented in Chapter 2. The affected environment is presented in Chapter 3, focusing on only that part of the environment that might be impacted to the degree that detailed analysis is necessary. The potential environmental impacts or consequences resulting from the implementation of each Alternative are then analyzed in Chapter 4 for the identified elements of the human environment that could be affected by the implementation of each Alternative.

CHAPTER 2 – DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Introduction

The purpose of this chapter is to provide information on the Proposed Action and alternatives. This document analyzes two alternatives: Alternative A - the Proposed Action Alternative, and; Alternative B - the No Action Alternative. Under the Proposed Action Alternative, expanded underground uranium mining would occur at the Daneros mine property, including associated surface disturbance. Under the No Action Alternative, the MPOM would not be approved and mining operations would occur as allowed under the approved MPO. The No Action Alternative is included to provide a baseline for analysis. No issues or unresolved conflicts were identified that would necessitate detailed analysis of other action alternatives. In addition to Alternative A, three other action alternatives were identified through scoping. These three alternatives are considered but not carried forward for detailed analysis (see Section 2.4).

2.2 Alternative A – Proposed Action

The Proposed Action summarizes the more detailed information provided in the MPOM. Key information is included as appendices to the EA; the entire MPOM is incorporated into the EA by reference. The Proposed Action incorporates the requirements of applicable federal, state and local laws, and regulations and permits as specified in Section 1.6. The Proposed Action also incorporates applicable management actions prescribed in the BLM Land Use Plan, including Best Management Practices (BMPs), Standard Operating Procedures (SOPs) and stipulations. Applicant-proposed mitigation or design measures are included in the Proposed Action to reduce the impacts to sensitive resources. Some of the built-in measures include public and worker protection from radiation exposure (MPOM – Sections 8.9 and 8.10), stormwater pollution prevention (MPOM – Attachment G), spill prevention (MPOM – Attachment I), weed control (MPOM – Attachment P), watering roads and posting speed limits to mitigate dust generation (MPOM – Attachment O), and approved revegetation and reclamation methods (MPOM – Section 4). These measures are an integral part of the Proposed Action. The mine would operate in accordance with federal and state regulations that are designed to protect the mine workers and general public from radiation exposure.

2.2.1 Mine Development

Energy Fuels proposes mine modifications which are designed to facilitate mineral development activities for a minimum of five and up to approximately 20 years of continued production. The facilities would be constructed in a phased manner as follows:

- Mine operations would resume at the Daneros Portal Area.
- Construction would start at the Bullseye Portal Area.
- As mining continued at the Daneros/Bullseye portals, the South Portal Area would be developed.
- As mining continued at the South Portal, disturbance at the Daneros and Bullseye Portal areas would be reclaimed, including the DRAs.

Table 2 provides a summary of the surface disturbance expected from the Proposed Action and previously approved actions. Figure 2 (see Appendix B) shows the three main areas of proposed surface disturbance and the two existing vent shafts. Figures 3, 4, and 5 (see Appendix B) show areas of existing and proposed surface disturbance at the Daneros, Bullseye and South Portal areas, respectively. The project components are described in the sections that follow; the sections are organized by component/location rather than chronologically.

Table 2
Surface Disturbance

Component	Previously Permitted Disturbance Acreage	Proposed Modification Disturbance Acreage (Existing Disturbance) [2]	Total Disturbance
Daneros Portal	4.5[1]	0.8	5.3
Bullseye Portal	0.0	8.1 (0.7)	8.1
South Portal	0.0	20.9 (4.9)	20.9
Vent Shafts and Access Roads[1]	0.0[1]	12.0[1]	12.0
Total	**4.5**	**41.8** **(5.6)**	**46.3**

[1] Typical disturbance from vent shafts includes 0.25 acre per vent shaft and approximately 1.25 acres per vent shaft for access roads. The acreage for 2 existing vents was included in the Daneros Portal Previously Permitted Disturbance Acreage.
[2] Existing disturbance is due to historic mining activities in the area.

2.2.1.1 Portal Areas

Daneros Portal Area. The Daneros Portal area would remain the same except for expansion of the DRA, which is described in Section 2.2.1.3 below. As shown on Figures 2 and 3 (see Appendix B), the existing Portal Area facilities include two portals, a DRA, ore storage and topsoil areas, a shop and office, a water well, and a stormwater pond.

Bullseye Portal Area. The existing Bullseye Portal is just southwest of the Daneros Portal Area along existing road CR D0029. It would be re-opened as a ventilation and haulage portal into the existing mine workings as shown on Figures 2 and 4 (see Appendix B). In addition to the existing historic portal, the proposed portal area facilities include two DRAs, ore storage and topsoil areas, and an inert material storage area.

South Portal Area. The South Portal would be located along CR B258, approximately 1 mile south of the Daneros Portal Area as shown on Figures 2 and 5 (see Appendix B). The Spook Portal, just north of the South Portal Area is an existing decline that accesses old mine workings that date primarily from the mid-1950s-60s. Given the relatively old age of the Spook mine workings, Energy Fuels would construct new portals and declines at the South Portal Area. No surface disturbance is planned in the vicinity of the Spook Portal. Energy Fuels would construct two new portals right next to each other, sometimes referred to as twin declines, with one new portal used for primary access and ore haulage and the other portal used for ventilation. Other facilities proposed for the South Portal Area include a DRA, ore storage and topsoil areas, an inert material storage area, a shop and office, a water well, and stormwater ponds.

2.2.1.2 Ore Stockpile Areas

Based on an estimated 500,000 tons to be mined over a mine life of up to 20 years, the annual ore production would be approximately 25,000 tons/year. This would equate to an annual ore volume of approximately 14,250 cy/year. No mineral processing would be conducted at the Daneros Mine, and, therefore, ore would only be present in temporary stockpiles. Ore would be transported from the underground workings via low-profile, end-dump haul trucks and dumped into temporary ore stockpiles. These stockpiles would be located on bermed pads near the portal entrances. Stockpiled ore would then be loaded into over-the-road carriers for transport to the White Mesa Mill in Blanding, Utah, a distance of approximately 67 miles, as shown on Figure 1 (see Appendix B).

Daneros Portal Area. An ore stockpile area at the Daneros Portal Area was previously approved. The maximum amount of ore stored at this location at any given time would be approximately 1,500 cy.

Bullseye Portal Area. The proposed ore stockpile area at the Bullseye Portal Area would be located between the portal entrance and the roadway east of the DRAs as shown on Figure 4 (see Appendix B). The maximum amount of ore stored at this location at any given time would be approximately 1,500 cy.

South Portal Area. The proposed ore stockpile area at the South Portal Area would be located approximately 200 feet southeast of the portal across CR B258 as shown on Figure 5 (see Appendix B). Within this large ore pad, ore and low-grade ore would be stockpiled. The maximum amount of ore stored at the South Portal Area at any given time would be approximately 1,500 cy. A low-grade ore stockpile would provide for storage of up to 30,000 cy of material. The need for low-grade ore storage and volume of material would be dependent on mining operations and uranium market prices therefore the low-grade storage area is not shown separately on the figures.

2.2.1.3 Development Rock Areas

The DRAs would contain rock, which must be mined to reach the ore, but which does not contain sufficient uranium to warrant mineral processing.

Daneros Portal Area. The existing DRA would be expanded to the north as shown on Figure 3 (see Appendix B). It is proposed that this facility be constructed by placing development rock on the existing DRA, then continuing to the north up to the base of the proposed diversion channel. The DRA would be initially constructed at an angle of repose slope ranging from approximately 30 to 35 degrees and provide for placement of approximately 22,000 cubic yards (cy) of additional development rock material at the Daneros DRA #1.

Bullseye Portal Area. The proposed DRAs would be constructed in a series of lifts with an overall slope angle of 2 horizontal to 1 vertical (2H:1V) as shown on Figure 4 (see Appendix B). Development rock would be hauled from the Bullseye Portal across CR D0029 to the DRAs, which are approximately 300 feet away. A total of 12,200 cy of storage capacity is proposed at Bullseye DRA #2 and 12,000 cy of capacity is proposed at Bullseye DRA #3.

South Portal Area. At the South Portal Area, DRA #4 would be constructed using a series of lifts similar to the techniques proposed above for the Bullseye DRAs as shown on Figure 5 (see Appendix B). A total capacity of 210,000 cy is proposed for the South Portal Area DRA. Development rock would be hauled from the South Portal approximately 300 feet west to the DRA.

The proposed DRA modifications and additions at the three portal areas would provide storage capacity for up to 270,000 cy of development rock. Table 3 provides a summary of the estimated storage capacity at each proposed DRA. The table also shows planned storage capacity for ore, inert material, and topsoil stockpiles.

Table 3
Summary of Development Rock and Stockpile Storage Capacity

Stockpile	Proposed Approximate Portal Area Storage Capacity (cy)				
	Daneros	Bullseye	South	Roads and Vent Shafts	Total
Ore	1,500	1,500	1,500		4,500
Low Grade Ore Per Year			3,000		3,000
Low Grade Ore Total			30,000		30,000
Development Rock	22,000[1]	24,200	223,800		270,000
Inert Material		8,000[2]	27,500[3]		35,500
Topsoil	4,000[1]	4,443	17,000[3]	10,800	36,243

[1] Additional storage.
[2] Inert material at the Bullseye Portal Area would be excavated and stockpiled prior to placement of development rock.
[3] Excess inert material and topsoil salvaged at the South Portal Area can be used, where needed, to reclaim the other development rock piles.

2.2.1.4 Inert Material Stockpile Areas

Analysis of development rock produced from the ore zone indicates that it has the potential to generate acid. As a result, a rock management plan (see MPOM - Section 3.6.2) was designed to address potential adverse effects of deleterious or acid-forming material. The rock management plan addresses Shinarump Member development rock, development rock generated from non-ore-bearing geologic units overlying the Shinarump Member, ore, and low grade ore. “Inert material” is defined herein as development rock and soils generated from the geologic units above the Shinarump ore zone.

The rock management plan includes the following components:

- To the extent practicable, development rock generated from the Shinarump Member would be placed into mined out voids within the underground mine, and would not be hauled to the surface.
- Development rock piles at the Daneros, Bullseye and South portal areas would be constructed in a vertically zoned design. Development rock generated from the Shinarump Member would be placed in the lower zone of the piles. These potentially acid-forming or deleterious materials would then be covered with an upper zone composed of inert materials prior to reclamation. The upper zone is designed to serve as a buffer to prevent upwards migration of products of sulfide mineral oxidation into the soil layer during evaporation and/or transpiration.
- Ore would be managed within discrete stockpiles, and would be hauled to the White Mesa Mill for mineral processing on a daily to weekly basis.
- Low-grade ore (ore-bearing rock that could be economical to process in the future) would be managed in the proposed stockpile areas. If this rock has not been processed by the end of the mine life, it would be hauled back underground during reclamation.

In order to reclaim the DRAs and reduce the risk of acid drainage, Energy Fuels would stockpile inert material. The inert material would be used during reclamation as additional cover material, applied evenly over the graded DRAs, prior to applying topsoil. Inert materials would consist of development rock and soils produced from non-ore-bearing soil and rock units overlying the Shinarump Member, which are excavated during construction of surface facilities, ventilation shafts, mine declines, or other mine activities. Approximately 35,500 cy of inert materials would be stockpiled at the Bullseye and South Portal areas for use during mine reclamation. The inert material stockpiles would be scarified and broadcast seeded in the late fall with the BLM and UDOGM approved seed mix.

Stockpiling of inert materials at the Daneros Portal Area is not proposed due to space limitations. At the Bullseye Portal Area, the bulk of the inert material would be excavated from the areas to be used for development rock and topsoil stockpiles. Some may be placed directly on the Daneros DRA during concurrent reclamation; the remainder would be placed in a stockpile just east of DRA #3 as shown on Figure 4 (see Appendix B). At the South Portal area, inert material would be excavated from the area to be used for DRA #4 and the two new declines and stockpiled just across the road as shown on Figure 5 (see Appendix B).

In the event that acid-forming or deleterious materials were to be excavated from rock units other than the Shinarump Member, these materials would be managed as acid-forming or deleterious materials.

2.2.1.5 Topsoil Stockpile Areas

As much soil material as is practical (i.e., approximately 0 to 51 inches at the Bullseye Portal Area and approximately 0 to 38 inches at the South Portal Area) would be salvaged and stockpiled within the disturbed boundary of each portal site. Most soil removal would be performed using a tracked dozer, although a front-end loader and/or motor grader may also be used. Haulage equipment would not be allowed to cross the stockpiles so that compaction of stockpiled soil would be avoided or minimized. The topsoil storage locations would be located outside of drainage areas to minimize erosion. The topsoil stockpiles would be scarified and broadcast seeded in the late fall with the BLM and UDOGM approved seed mix. Seeding efforts would continue until vegetation is established.

Daneros Portal Area. Topsoil from the expanded DRA would be removed and stockpiled at both the proposed Daneros topsoil stockpile area northeast of the proposed DRA#1 and at the proposed Bullseye topsoil stockpile area, if additional storage is required. The existing topsoil stockpile at the Daneros Portal Area is currently storing topsoil and has a previously approved design capacity of approximately 1,200 cy and the proposed topsoil stockpile area would have a capacity of approximately 4,000 cy. The locations of these stockpiles are shown on Figure 3 (see Appendix B).

Bullseye Portal Area. Topsoil salvaged from the disturbed areas as a result of construction of the DRAs, ore stockpile areas, and the mine yard at the Bullseye Portal Area would be stored at the proposed topsoil stockpile area in the south portion of the disturbed area boundary as shown on Figure 4 (see Appendix B). The total capacity of the topsoil stockpile at the Bullseye Portal Area would be approximately 4,400 cy.

South Portal Area. Topsoil salvaged from the disturbed areas as a result of construction of the DRA, ore stockpile area, and mine yard at the South Portal Area would be stored at the proposed topsoil stockpile area, south of the DRA as shown on Figure 5 (see Appendix B). The total capacity of the topsoil stockpile at the South Portal Area would be approximately 17,000 cy.

Vent Shafts and Access Roads. Topsoil would be salvaged during construction of the access roads to the ventilation shafts and the ventilation pad areas. This soil would be windrowed along the sides of the access roads and along one or two sides of each pad area. Assuming salvage of an average of 6 inches of topsoil and 1.5 acres of surface disturbance per vent shaft site (i.e., 0.25 acre per pad area and 1.25 acre per access road), approximately 1,200 cy of topsoil would be stored in windrows along the side of a typical access road and vent pad. A total of 8 additional vent shafts are proposed and approximately 1,200 cy of topsoil are currently stored near the existing vent shafts, which would result in approximately 10,800 cy of total salvaged topsoil for the vent shafts (see Table 3).

2.2.1.6 Drainage Control Structures

The purpose of the drainage control structures is to manage stormwater and mitigate potential effects of erosion on water quality. Drainage control structures would include diversion

channels, berms, sediment ponds, and other drainage structures designed to manage stormwater in accordance with requirements of the federal Clean Water Act (CWA) and other laws. The MPOM references two reports; 1) Hydrology and Hydraulics Narrative for Utah Energy Corporation Daneros Mine (Shephard-Wesnitzer, Inc., 2008); and 2) Drainage Report for Daneros Mine, San Juan County, Utah (CDM Smith, 2013a) that evaluate existing drainage characteristics of the watersheds adjacent to the mine. The scope of the two reports covers aspects of stormwater collection, conveyance, and retention design necessary to comply with the BLM requirements for the mine site including Title 43 Code of Federal Regulations Section 3809 (43 CFR §3809.401(2)(iii)), and the Utah Division of Oil, Gas, and Mining requirements including Utah Administrative Code (UAC) Title R647 Natural Resources; Oil, Gas and Mining; Non-Coal, and Utah Code Title 40 Chapter 08 Utah Mined Land Reclamation Act.

The Proposed Action includes measures to minimize disturbance of existing natural drainage channels, sedimentation, erosion, and to protect surface water and groundwater systems. The Stormwater Pollution Prevention Plan (SWPPP) has been updated for the Daneros Mine in conformance with the UDEQ requirements under the Utah Water Pollution Control Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended. The SWPPP (MPOM - Attachment G) establishes BMPs to mitigate migration of sediments by surface water runoff. These BMPs include regrading at portal areas and use of berms, ditches and other erosion control practices to minimize surface water run-on. They also include regrading in order to direct surface water drainage from within the disturbance area into stormwater detention ponds. The temporary sediment ponds would be designed to capture water impacting the surface facility area from a 100-year/24-hour storm event. The stormwater controls would be inspected and maintained routinely and immediately following major storm events to verify that stormwater controls are functioning as designed. The sediment ponds and ditches would be cleaned out, as necessary, to preserve their function and capacity. Materials removed from the ponds would be placed in a DRA.

Areas of potential erosion include the topsoil and inert material stockpiles, the ore stockpiles, and the DRAs. These facilities are designed to handle drainage from the 100-year, 24 hour storm event and are sited outside the 100-year floodplain. As discussed in more detail in the Drainage Report (MPOM – Attachment C), diversion channels would be constructed upstream of the disturbed areas to route off-site runoff around these facilities. Runoff within the disturbed areas would be contained within berms and/or routed to temporary sediment ponds. The topsoil and inert material stockpiles would be temporarily seeded using the BLM and UDOGM approved seed mix during the first fall planting season after the material is stockpiled. Seeding may be done in combination with other stabilization measures (i.e., mulching, berming). Drainage control measures for the various mine areas are detailed below.

Daneros Portal Area. The drainage control design for the Daneros Portal Area would include one diversion channel, one diversion berm, and a sedimentation pond as shown on Figure 3 (see Appendix B). The diversion channels have been designed to convey peak flows from the design storm event around the disturbance area associated with the Daneros Portal Area. The berms and sedimentation pond have been designed to contain the water generated within the disturbance areas during the design storm event.

Bullseye Portal Area. At the Bullseye Portal Area, three diversion channels are proposed as shown on Figure 4 (see Appendix B). Two channels would route offsite surface water run-on from the drainage basins north of the DRAs to the existing drainage channel, and a third channel would route offsite surface water run-on from the drainage basin east of the portal and mine yard to the existing drainage channel. Engineered drainage crossings would be installed for each of the two proposed crossings along the major existing drainage. A stream alteration permit would be obtained with the Utah Division of Water Quality prior to culvert installation. Berms around the disturbance area have been designed to contain the water generated during a 100-year, 24-hour storm event.

South Portal Area. Two upstream diversion channels would route offsite surface water run-off around the proposed disturbance areas and from the drainage basin to the north into the existing drainage channels as shown on Figure 5 (see Appendix B). Stormwater runoff from the northwest disturbance area (i.e., DRA #4) would be captured by an earthen berm to the west and routed through a culvert under the road to a stormwater pond southwest of the inert material storage area. Stormwater runoff from the eastern side of DRA #4 would be captured by collection channel 1 and routed through a culvert under the road and under diversion channel 2 where it would flow into the portal area sediment pond. Stormwater runoff from the portal area would be contained by berms and flow into that same sediment pond. Stormwater runoff from within the south central and southwest disturbance area (i.e., buildings, topsoil storage area, laydown yard and inert material storage) would be captured by earthen berms and drained into temporary sediment ponds at the east and west edges of this disturbance area. Stormwater runoff from within the ore stockpile area, located in the southeast corner of the site, would be captured and retained by perimeter earthen berms.

2.2.1.7 Vent Shafts and Related Access Roads

Adequate ventilation is required for underground mining activities and would be conducted in accordance and compliance with applicable federal and state rules and regulations. Worker health and safety at the Daneros Mine depends on the installation of vent shafts, which are vertical shafts that provide for intake and/or exhaust of air. A total of 8 vent shafts are proposed within the future development area shown on Figure 2 (see Appendix B). This area of potential future development is based on Energy Fuels' professional judgment, past operations, and estimated ore trends. Installation and maintenance of access roads to the vent shafts would also be required. Existing roads would be rehabilitated and used, to the extent practicable, for access to vents. The total disturbed area associated with the installation of the vent shafts and construction of the access roads would result in an estimated surface disturbance of 12 acres. This estimate is based on an average surface disturbance of 0.25 acre per vent shaft and 1.25 acres for associated access roads (1.5 acres total per vent shaft).

The specific location of individual vent shafts and access roads within the area of future development cannot be determined at this time. The placement of vent shafts is dependent on the specific location and geometry of ore delineated during future underground operations. Prior to vent shaft construction, Energy Fuels would identify the specific locations for these facilities and associated access roads and would obtain approval from the BLM after completing all necessary surveys and consultations.

Where existing access is not present, an access road would be constructed to the vent shaft location. A small-diameter pilot hole would then be drilled from the surface into the mine workings. A large six- to ten-foot cutting head would be connected to the drill steel within the mine and used to upream the hole from the mine to the surface. The resulting cuttings that collect below in the mine workings would be mucked out and hauled to the surface where they would be placed in an inert stockpile for later use during reclamation.

During each drilling operation, there would typically be a 1,000-gallon portable diesel tank, one or two 55-gallon drums of hydraulic oil and several 5-gallon cans of motor oil present at the raise bore machine. These petroleum products would be stored with adequate secondary containment using BMPs. In the event of an inadvertent leak of petroleum products during drilling activities, the BLM would be contacted and containment and clean-up activities would be conducted. Any necessary mitigation activities, such as excavation of affected soil, would be conducted in accordance with state and federal requirements.

The proposed vent shafts would be between six and ten feet in diameter. Metal diffusers would be installed above the proposed opening for vents where the fan is placed on the surface. Diffusers would be used to maximize flow and ventilation system efficiency. The diffusers would be approximately four to five feet tall, painted with an approved BLM color to match the

surrounding terrain, and screened on top to prevent entry. Fans are generally placed on the surface to improve mine ventilation and avoid noisy underground conditions to meet MSHA requirements for workers; however, in some cases, fans can be placed underground in areas where workers would not be continuously working. Figure 6 in Appendix B depicts a typical vent shaft layout (with photograph of a typical diffuser). Electrical lines to power the vent fans would be placed underground. In some instances where underground power is initially unavailable, a generator may be placed on the surface next to the fan until electrical line power is established.

Individual vent shafts may be reclaimed prior to final reclamation of the Daneros Mine if they are no longer needed for ventilation or an emergency escapeway. This could occur where an area is mined out and sealed off from the main workings. However, concurrent reclamation would only be performed if the activities do not jeopardize worker health and safety (i.e., adequate ventilation and emergency escapeways would have to remain in place until the mine is closed).

2.2.1.8 Office/Shop Complex at the South Portal Area

The South Portal access would be required to provide safe entry into historical workings in the area and access reserves and potential resources to the north of its surface location. The South Portal Area would not be constructed until after underground development advances further to the south, but it would ultimately become a primary entry point into the Daneros Mine workings. An office/shop complex, ore stockpile pads, a large DRA, and other facilities would be constructed at this location. Infrastructure would include:

- Mine offices and dry (changing and shower facility);
- Maintenance shop and warehouse;
- Designated parking areas and storage yard;
- Water well (including water systems);
- Non-potable water holding tank;
- Portable sanitation facilities; and
- Septic system (including leach field).

The location and orientation of the office/shop complex is shown on Figure 5 (see Appendix B). The proposed size and orientation of the surface facilities may change to some extent during construction; however, these surface facilities would remain within the proposed disturbed area.

2.2.1.9 Surface Support Facilities

Water would be necessary to support the mining operation for general uses at the surface facilities and for drilling and dust suppression in the underground mine. The surface facilities utilize water for washing equipment, dust suppression, construction purposes, and other general uses. Water would be necessary in the underground workings to drill and to control dust during drilling, mining, and haulage activities.

A water well is located at the Daneros Portal Area in the office/shop yard next to the pressure holding tank supplying non-potable water to the site as shown on Figure 3 and Figure 13 (see Appendix B). This well draws water from approximately 1,360 feet below the ground surface and about 1,300 feet below the primary mine workings. Water from the lower Cutler Group is pumped into a water tank that provides the approximately 5,000 gallons per day needed for the site.

An additional water well would be developed at the South Portal Area to support similar activities in the future. Based on regional geologic mapping and the well drilling and construction information from the Daneros Well, the depth to groundwater at the South Portal is likely to be about 1,570 feet.

Drinking water is provided by bottled-water systems at the mine. In the event that mine employment increases to 25 or more employees, a potable water system would be installed for bathrooms and showers, as required by state law. This system could be supplied by the new well at the South Portal Area or by a cistern that is periodically filled with potable water obtained from an off-site source and trucked to the mine.

2.2.2 Mine Infrastructure and Equipment

An integrated mine infrastructure system would be located at the Daneros Portal Area and ultimately expand to the South Portal Area. The satellite mining location at the Bullseye Portal area would also require mine infrastructure to support future mining activities. The quantities and types of equipment at each location would be subject to change depending on future mine development, market conditions, and other factors.

2.2.2.1 Mine Infrastructure

Daneros Portal Area. The main surface infrastructure would be located at the Daneros Portal Area. This installation would include two synchronized diesel-powered Caterpillar Prime 455 kilowatt (kW), 568.7 kilovolt-ampere (kVA) generators that would allow for the expansion of the underground power system. An emergency generator (255 kW) would be onsite to provide back-up power when needed. A small portable generator (140 kW) would be stored on site to provide temporary power for vent shaft construction, operation of new ventilation fans, and other uses as needed.

Two 975 cubic feet per minute (CFM) electric air compressors would be utilized and installed underground so that the surface footprint would not need to be further expanded. Compressed air would be used underground to power jack-leg rock drills and other mining equipment.

Two 6,000-gallon aboveground self-contained fuel tanks would be installed to provide diesel storage for the generators and the underground equipment. These tanks would be double walled, designed for storage of petroleum products, and constructed in accordance with Underwriter Laboratories Inc. (UL) standards for aboveground storage tanks. The tanks would be leak tested prior to installation and would be maintained and monitored in accordance with the mine Spill Prevention, Control, and Countermeasures (SPCC) Plan. Energy Fuels plans to install these tanks on concrete pads with concrete containment walls designed to contain the maximum capacity of the largest tank, as discussed in the SPCC Plan (MPOM – Attachment I). Two existing propane tanks are located just north of the shop and provide propane for heating the buildings.

Bullseye Portal Area. The Bullseye Portal Area would use similar equipment as the Daneros Portal Area. It would have one diesel-powered Caterpillar 455 kW generator, one 975 CFM electric air compressor, and one 6,000-gallon aboveground fuel tank. In addition, two 5,000-gallon water tanks would be installed at the site.

This satellite installation would be temporary in nature. Once underground development advanced to connect the Daneros underground workings to the historical workings, the Bullseye surface installations would be decommissioned since power, water, and compressed air would be supplied by the installations at the Daneros and South Portal areas. Most of the equipment would be moved to the South Portal Area and the majority of the disturbed area, including the DRAs, would be reclaimed at that time. The Bullseye Portal would remain open to provide ventilation and an emergency escapeway.

South Portal Area. Mining infrastructure from the temporary satellite installation at the Bullseye Portal Area would be relocated to the South Portal Area upon connection to the Daneros underground workings. The South Portal Area would ultimately have two diesel-powered Caterpillar 455 kW generators (one relocated from the Bullseye Portal Area), one 975 CFM

electric air compressor, and eventually two 6,000-gallon aboveground fuel tanks. Two 5,000-gallon water tanks would also be installed at the site.

2.2.2.2 Mine Equipment

A variety of underground and surface equipment would be utilized during production at the Daneros Mine. Tables 4 through 6 provide summaries of the expected equipment. The raise-bore equipment would only be on site during installation of new vent shafts. The quantities and types of equipment would be subject to change depending on market conditions, equipment availability, mining conditions, and other factors.

Table 4
Underground Equipment

Description	Daneros Mine (Quantity)	
	Current	Future
Diesel Loaders, 2 – 3.5 cy capacity	4	6
Diesel Trucks, 2 - 10 ton capacity	7	10
Development Drills, Jumbos	0	2
Production Drills, Jacklegs	24	35
Diesel Mantrips and Utility Vehicles	5	9
Water Truck	1	1
Skid Steer	1	2
Exploration Long Hole/Short Hole Machine	2	2

Table 5
Surface Equipment

Description	Daneros Mine (Quantity)	
	Current	Future
Front-End Loader	2	2
Tracked Dozer	0	1
Dump Truck, 10 ton	0	1
Highway Haul Trucks, 25 tons [1]	10-15	10-15
Water Truck	1	1
Motor Grader	1	1
Tanker Truck (water)	1	1
Generator, 230 kW	1	0
Generator, 140 kW	1	1
Generator, 455 kW	0	4
Emergency Generator, 255 kW	0	1
Portable Compressor, 375H	2	3
Pick-up Trucks and vans, 3/4-ton (4-wheel drive)[2]	7	10
Water Tanks	1	6
Propane Tanks	2	4

[1] Highway haul trucks would be provided by a Contractor
[2] Up to 10 pick-up trucks and passenger vans or buses would be used for employee and contractor transportation to and from the site; only 4 such vehicles would be used onsite at a time.

Table 6
Raise Bore Equipment (Vent Shaft Installation)

Description	Daneros Mine (Quantity)
Raise Bore machine	1
Caisson Machine	1
Skid Steer Loader	1
4 WD Pickup Trucks	3
Concrete Trucks	1
Drill Rig	1
Dozer	1

2.2.3 Workforce, Access, and Transportation

The Daneros Mine is an underground mining operation with limited surface disturbance and located in a relatively remote area. Because of the steep surface topography and depth of the resource, the full extent of the ore body is unknown at this time. The estimated workforce and transportation requirements are conservatively based on the maximum potential extent of the ore body.

2.2.3.1 Workforce

The mine would employ up to 40 miners and support personnel. No on-site accommodations would be provided; employees would be housed at the Fry Canyon Lodge, 14 miles from the mine site, or in other local area communities. During 2012, 14 employees worked at the Daneros Mine, and the mine operated on two 10-hour shifts, four days per week with light maintenance on an occasional Friday.

2.2.3.2 Roads and Public Access

Access to the mine is via a year-round county maintained road, CR B258, and a lesser county-maintained road in Bullseye Canyon, CR D0029. CR B258 and CR D0029 are both designated routes in the BLM MFO Travel Plan. Route CR D0029 passes the existing Daneros DRA and ore stockpile area and continues past the mine portal area, providing access onto Wingate Mesa. A locked gate and informational signs have been installed just south of the Bullseye Portal Area to prevent public access to the mine area during operations. Access is still provided to local ranchers, BLM personnel, and others that periodically need access to the mesa. For public safety purposes, access on CR D0029 would continue to be restricted for the duration of mine operations. Public access would be restored once mining operations are completed.

As shown on Figure 2 (see Appendix B), County Road D5319 provides access to the existing vent shafts. It would also be used to access future vent shaft locations. The road is generally in good condition and would be maintained when necessary using a grader during mine operations.

2.2.3.3 Transportation

Ore extracted from the Daneros Mine would be hauled to the White Mesa Mill near Blanding, Utah for processing via State Highways 95 and 191 and San Juan County Roads (CR) B258 and D0029. An independent contractor would transport the ore according to U.S. Department of Transportation (USDOT) regulations (CFR Title 49, Transportation), and in accordance with Energy Fuels' "Transportation Policy for Shipments of Colorado Plateau Uranium Ores to the White Mesa Uranium Mill" (MPOM – Attachment N).

Up to 15 ore trucks per day would travel to and from the mine site. In addition to the 15 ore trucks, up to an additional 10 trips per day are anticipated for employee traffic and support vehicles to and from the mine (of the support vehicles, 4 would be used for operations within the mine), for a total of 25 vehicle round trips per day. It is likely that most traffic would occur Monday through Friday.

It is, and would continue to be, the responsibility of Energy Fuels to verify that the radiation levels associated with ore transportation fall within applicable limits. Based on the grade of the Daneros Mine uranium ore, the exposure rate would be less than 1 mrem/hr to recipients standing outside of the truck. As a result, the following requirements would be met:

- The requirements of 49 CFR 173.427(a)(1) that the external dose rate may not exceed a radiation level of 1,000 mrem/hr at 3 meters from the unshielded material; and
- The requirements of 49 CFR 173.427(a)(5) and 173.441(a) that under conditions normally incident to transportation:
    - The radiation level does not exceed 200 mrem/hr at any point on the external surface of the package
    - The transport index (TI) does not exceed 10. TI is a dimensionless number placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. TI is determined by multiplying the maximum radiation level in millisieverts (mSv) per hour at 1 meter (3.3 feet) from the external surface of the package by 100 (equivalent to the maximum radiation level in mrem/hr at 1 meter (3.3 feet)

Given the ore grade for the mine, it is expected that the average reading in the occupied space of each truck cab would not exceed the USDOT limit of 2 mrem/hr specified in 49 CFR 173.441(b)(4). In addition, Energy Fuels would perform and document spot gamma surveys on uranium ore shipments as appropriate in order to verify that the regulatory standards are satisfied.

Energy Fuels' Transportation Policy (MPOM – Attachment N) specifies that ore trucks must be covered at all times, with or without ore, except for loading and unloading. A tarpaulin or other suitable mechanism would be used to cover the trucks' trailers. With regard to accidents and other incidents involving the spillage of uranium ore, the Transportation Policy states that the transportation contractor is responsible for handling the accident and that the contractor must have an Emergency Response Plan in place in case of emergency. Emergency response crews from the White Mesa Mill would also assist in any cleanup and confirmation sampling at a spill site.

2.2.4 Noxious Weed and Invasive Plant Control Plan

A noxious weed and invasive plant control plan was prepared to prevent and control the spread of noxious weeds and invasive plants during and following construction, operations, and reclamation (MPOM – Attachment P). Energy Fuels and its contractors would be responsible for carrying out the methods described in this plan.

The following measures have been implemented and would be continued to prevent the spread of noxious/invasive plants during construction and future operations and maintenance activities:

- Prior to construction, Energy Fuels and its contractors would be trained in the methods for cleaning equipment, identification of problem plant species within the mine property, and procedures to follow when an invasive or noxious weed is located. To assist in identification, construction personnel would be supplied with a list and pictures of noxious and invasive species that may exist within the mine property.

- Prior to any construction disturbance, known noxious weed populations would be flagged so that they may be avoided.
- Prior to entering the mine property, vehicles and equipment would be cleaned by manual methods or forced air of mud, dirt and plant parts where there is a potential to import weeds. This would be done to remove weed seed that may be attached to the equipment. Dry washing would occur at designated sites that include appropriate containment systems.
- Equipment, materials and vehicles would be stored at specified work areas or construction yards. Personal vehicles, sanitary facilities and staging areas would be confined to a limited number of specified weed-free locations to decrease chances of incidental disturbance and spread of noxious weeds and invasive plants.
- Disturbed areas would be promptly seeded following completion of activities to reduce the potential for the spread and establishment of noxious weeds and invasive plants. Seeding would occur as soon as possible following the disturbance activities and during the optimal fall planting time period. Only state/BLM-approved mixtures of certified "weed-free" seed would be used. All other introduced materials used for the mining activities, such as straw and fill, would also be certified weed-free.

Should problematic weed infestation areas occur on site, Energy Fuels would confer with the BLM and the County regarding the appropriate control measures to be implemented. Energy Fuels would mark areas where noxious weeds are found on the reclaimed areas and either spray or remove the weeds by hand. Weed identification and removal efforts would be documented and reported to the BLM and UDOGM.

2.2.5 Fugitive Dust Control Plan

A fugitive dust control plan (MPOM – Attachment O) was developed to establish dust suppression measures including tarping of truck beds on ore haul trucks prior to leaving the mine, implementation of speed limits, and application of water and/or other approved dust suppressants on the mine access and haulage roads and other areas of the mine site as needed.

2.2.6 Material Storage and Disposal

Oils, lubricants and chemicals would be stored in locked, partitioned areas within the shop building. Training, labeling, listing of chemicals, disposal records and material data sheets would be maintained. Used oil, used antifreeze and other maintenance related wastes would be containerized and shipped offsite for recycling or proper disposal. An 18- to 30-cubic yard solid waste container would be kept adjacent to the shop and office buildings. Trash disposal would be commercially contracted and hauled to a licensed local landfill.

Scrap metal, old batteries, used tires and other recyclables that are not above ambient levels of radiation would be shipped offsite for recycling or proper disposal. Any solid wastes that would qualify as low-level wastes for radiation contamination, per NRC guidelines (i.e., not a product or a by-product of ore extraction or production), would be handled in accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985 at an NRC-approved facility or Utah Division of Radiation Control-approved facility.

2.2.6.1 Temporary Cessation of Operations

Temporary closure may occur, as it has in the past, due to market conditions. In the past, market fluctuations have led to temporary closure and re-opening of uranium mines in the U.S. In the event that market conditions or other circumstances require a temporary closure of mine

operations, Energy Fuels would provide notice to the BLM in accordance with the requirements of 43 CFR Part 3809.401(b)(5)(vi). During non-operating periods, Energy Fuels would maintain the buildings, drainage structures, roads, and other surface facilities in a safe and environmentally acceptable condition as detailed in Energy Fuels' Interim Management Plan (see Section 6 of the MPOM) and outlined below. Underground openings, gates, and buildings would be locked (or otherwise blocked) to discourage unauthorized access when mine personnel are not present.

To prevent unnecessary or undue degradation during temporary closure, the following interim management measures would be implemented:

- Mine portals would be gated and locked, or blocked with development rock, during periods of temporary closure;
- Vent shafts would have metal diffusers (if fans are on the surface) and metal grates (on vents) to prevent access to them. These diffusers and grates would remain in place during periods of non-operation. Energy Fuels may also seal each vent during extended closure periods.
- The signage and gates would remain in place and would be maintained by Energy Fuels.
- Appropriate measures would be taken to control toxic or deleterious materials in the event of short-term temporary closure of mining operations. No mineral processing is conducted at the Daneros Mine. Therefore, neither mineral processing chemicals nor waste generated by mineral processing would be present at the mine.
- Stormwater control structures associated with the DRAs would be maintained during periods of temporary closure to mitigate potential erosion of development rock.
- Stockpiled ore would be transported for milling or placed back into the mine prior to periods of temporary closure. Stockpiled low-grade ore would remain in the proposed low grade stockpile at the South Portal Area.
- Energy Fuels would continue to manage noxious weeds at the mine site during any periods of temporary closure. If Russian knapweed or any other noxious weed infestations are found at the Daneros Mine, the BLM would be notified and additional weed control measures would be implemented.
- Equipment and supplies at the mine would be placed into locked storage boxes and within the locked and gated mine workings. No equipment and supplies would remain outside of mine buildings or outside of the workings. The mine offices and dry would be locked and maintained. The locks and buildings would be monitored periodically and repaired in the event of damage due to vandalism or other causes.
- Signage for speed limits and access limitations would remain in place at the mine sites and would be maintained.
- Topsoil and inert material stockpiles would be seeded if not already stabilized and measures would be taken to ensure that the DRAs are stable and stormwater controls are functioning. Earthen berms would be checked and repaired prior to cessation and maintained as needed during the closure period.
- The mine facilities and surface structures (i.e., buildings, portals, vent shafts, roads, sediment controls structures, and fencing) would be monitored periodically. Maintenance of facilities and stabilization of structures and controls would occur at the mine site following monitoring activities and would be reported to the BLM and other regulatory agencies where applicable.
- Permits would be maintained and permit conditions would continue to be adhered to during temporary closure including environmental monitoring programs.

The Daneros Mine was placed in temporary closure in October 2012 due to depressed uranium prices. The BLM was notified of the temporary closure in accordance with the approved Interim Management Plan and requirements of 43 CFR Part 3809.401(b)(5)(vi)..

2.2.7 Reclamation

Reclamation of the mine site would include the demolition and/or removal of buildings and other structures, regrading of disturbed areas to achieve a stable, free draining land form, placement of inert material and topsoil, establishment of erosion control measures and seeding. Temporary roads would also be reclaimed and vent shafts would be sealed. Figures 7, 8, and 9 (see Appendix B) provide reclamation details for the Daneros Portal, Bullseye Portal, and South Portal areas.

Current disturbance at the Daneros Mine is limited to the Daneros Portal Area and, concurrent with the BLM requirements, the approved 2009 MPO is bonded for reclamation with UDOGM. Expansion of the Daneros DRA and work at the Bullseye Portal Area and South Portal Area would occur later on a phased basis. Construction of ventilation shafts to support the underground mine would also occur on a phased basis. The timing of these phases would depend on uranium prices, available resources and other economic considerations. Incremental bonding based on phased construction would allow new portal areas to be constructed as mining progresses, and concurrently reclaimed as they are no longer needed, over the 20-year mine life.

The MPOM proposes that the mine portal areas and vent shafts be bonded on an incremental basis and that submittal of reclamation bonds for individual phases be required prior to commencement of these activities (MPOM – Attachment K). Energy Fuels proposes to maintain the existing bond in place until the restart of mining operations. Prior to the proposed expansion of the Daneros DRA, the Phase 1 incremental bond increase would be posted with UDOGM. When Energy Fuels is prepared to initiate future phases of development, the bond increase would be calculated, reviewed, and approved by the BLM and UDOGM. The bond would then be posted with UDOGM prior to initiating construction. Table 7 details the proposed mine phases, including the construction and concurrent reclamation associated with each phase.

Table 7
New Construction and Concurrent Reclamation Summarized by Project Phase

Project Phase	New Construction	Concurrent Reclamation
Phase 1	Expanding the Daneros DRA.	None
Phase 2	Rehabilitating the existing Bullseye Portal. Constructing/installing other Bullseye Portal Area facilities including 2 DRAs, an inert material stockpile, an ore pad, topsoil stockpiles, tanks, stationary equipment, and drainage and sediment control features. Constructing three additional vent shafts and associated access roads.	Reclaiming Daneros DRA
Phase 3	Developing the South Portal Area including two portals, a DRA, an inert material stockpile, an ore pad, a topsoil stockpile, mine buildings, tanks, stationary equipment and associated drainage and sediment control features. Constructing the remaining 5 proposed ventilation shafts and associated access roads.	Reclaiming Bullseye DRAs. Removing other Daneros and Bullseye Portal area features when they are no longer needed. Reclaiming vent shafts and associated access roads when it is safe to do so.
Phase 4	None	Reclaiming South Portal Area and all other portal area features, vent shafts, and non-county access roads

The various reclamation activities that would be performed throughout the Proposed Project are detailed below.

2.2.7.1 Removal of Buildings and Other Structures

No mine surface facilities would be left after reclamation of the Daneros Mine. Trailers would be hauled to another facility, sold, or hauled to a landfill for disposal. Prefabricated buildings would be disassembled and reassembled at another facility, sold, or disposed of at an off-site landfill.

Solid waste meeting the definition of “inert waste” under UAC Rule R315-301-2 (e.g., concrete, blocks, brick, incidental rebar and glass) would be broken up and buried on site. Concrete foundations and pads would be broken, using a hydraulic excavator with a concrete breaker (or equivalent) to dimensions of five feet or less. The broken concrete would be buried/covered with a minimum of three feet of soil or development rock, or alternately, it could be hauled to and disposed of within the mine underground workings prior to closing the portals.

2.2.7.2 Regrading

The slopes created by mining activities would be regraded to achieve reclaimed slopes of 3 horizontal to 1 vertical (3H:1V) or less steep, with the exception of the mine portals which would be graded to 2H:1V slopes. In conjunction with site grading, compacted areas would be ripped on contour to a depth of 12 inches. Details of the grading planned for the various areas of the mine are presented below.

Mine Portals. The mine portals would be sealed by pushing development rock 30 feet into each opening and then backfilling additional material against the opening to create a 2H:1V slope. Material from the DRAs in the Daneros, Bullseye, and South Portal areas would be used for backfill within each of the portals. Inert material would be used to create the 2H:1V slopes. Topsoil would be placed over the final slope and seeded with the BLM and UDOGM approved seed mix upon reclamation.

Drainages. Most drainage channels at the Daneros Mine would be reclaimed. Selected drainage channels at the Daneros Portal Area and Bullseye Portal Area would remain in place following closure of the mine sites to minimize the amount of runoff flowing down the slopes of the reclaimed DRAs and across the reclaimed mine sites. These drainage channels have been designed as permanent facilities to handle the 100-year, 24-hour storm event. Additional information regarding these drainage channels is provided in the Drainage Report for the Daneros Mine (see MPOM - Attachment C).

Culverts installed along County Road D0029, which runs through Bullseye Canyon at the Daneros Portal, would remain in place after mine reclamation is complete as requested by San Juan County. The county will accept maintenance responsibility for these culverts after mine reclamation is complete and reclamation liability has been released by BLM and the State of Utah (Laws, 2013). The drainage crossing installed at the Bullseye Portal Area would be removed during reclamation. Figures 7, 8, and 9 (see Appendix B) show the drainage channels and culverts that would remain post-reclamation at each portal area.

Sediment Ponds. After accumulating runoff from the DRAs and other disturbed areas, the stormwater detention ponds could potentially contain sediment with radiological levels above background concentrations. Therefore, the collected sediment would be removed and placed on the DRA. Subsequently, the sediment ponds would be backfilled, regraded, and covered with a minimum of 6 inches of topsoil.

Development Rock Areas. In-place reclamation of DRAs would include reduction of slopes, re-contouring, scarification of the surface to alleviate soil compaction, placement of inert rock and topsoil, and seeding. Figures 4-1a, 4-1b, and 4-1c in the MPOM provide cross sections of the

existing and reclaimed DRAs at the Daneros, Bullseye, and South Portal areas. The top of the DRAs would be re-contoured to create natural appearing and free-draining surfaces. The angle of repose slopes would be graded to achieve slopes of 3H:1V or less.

After re-contouring is complete, compacted areas of the DRA's would be ripped with suitable equipment. Inert material consisting of non-acid generating rock from development of vent shafts and declines and subsoils salvaged from surface construction activities would be placed over the regraded surface. Topsoil would then be placed as the final cover material. An average of 18 inches of loose inert material and topsoil would be placed over the regraded DRAs. The ratio of soil to inert material would be dependent on material availability, but the depth of topsoil would be maximized to the extent practicable. The DRAs would be seeded with the UDOGM and BLM approved seed mix(es).

Stockpiled Ore Materials. Any remaining ore stockpiles would be shipped to the mill for processing if market conditions are favorable. Because the ore stockpiles contain relatively high levels of uranium and radionuclides, the ore stockpiles would be placed underground within the mined out areas if they are not shipped to the mill. The compacted soil immediately below the ore stockpile areas is expected to have radioactivity levels above background. These soils would be surveyed for radiation and any material with elevated radiation levels would be excavated and placed in the mine. Afterwards, the ore stockpile areas would be regraded, ripped, covered with soil, and seeded.

2.2.7.3 Radiological Protection

No federal or State of Utah radiological standards exist for reclamation of the DRAs at uranium mine sites. The Nuclear Regulatory Commission (NRC) has specifically excluded natural ores from regulation under the Atomic Energy Act (Section 6.2 of the Atomic Energy Act - 42 United States Code [USC] 2092 and as set forth in 10 Code of Federal Regulations [CFR] 40.13(b)). However, despite the absence of federal or state standards, Energy Fuels proposes to voluntarily reclaim the DRAs to a standard dose of 100 millirem (mrem) or less above background to a person camping on or near a DRA for 14 days for its mines in Utah. This standard falls within the radiation protection concept of ALARA (As Low As is Reasonably Achievable). The 100 mrem standard is supported technically by recommendations from the National Council on Radiation Protection and Measurements (NCRP). In addition, the standard is consistent with the numerical public dose protection standard set by the NRC for uranium milling facilities as set forth in 10 CFR Part 20.1301, Subpart D.

The proposed inert material/soil cover on the development rock piles is expected to provide for compliance with this proposed reclamation standard at the Daneros Mine. A post-reclamation gamma survey and assessment of compliance with the voluntary reclamation standard would be conducted after mining and reclamation are complete.

2.2.7.4 Topsoil Placement and Revegetation

Topsoil would be placed over the regraded slopes and scarified on contour and seeded with the BLM and UDOGM approved seed mix(es). BMPs, such as silt fence, straw waddles, or hay bales, would be installed during reclamation to mitigate erosion until vegetation has been established.

Soil Material Replacement and Seed Bed Preparation. Compacted areas would be ripped to a minimum depth of 12 inches prior to the placement of topsoil over the regraded site. Stockpiled topsoil would be placed loosely over the inert material cover on the regraded DRAs and over other areas of the site. This would be accomplished using a dozer, front-end loader, and trucks. An average of six inches of topsoil would be placed over the regraded mine site except for the DRAs, which would be covered with an average of 18 inches of loose inert

material and topsoil. The depth of topsoil on the DRAs would be maximized based on available stockpiled soil volumes. Following the placement of topsoil, the surface would be scarified on contour prior to or during broadcast seeding in the fall to aid in water infiltration and retention of precipitation.

Seed Mixture. Table 8 provides a broadcast seed mix and rate that would be used for revegetation. The seed mix was approved by the BLM and UDOGM and would be certified or source-identified seed.

Table 8
Seed Mix

Common Name	***Species Name***	**Rate (lbs/ac)[1]**
Thickspike wheatgrass	*Elymus lanceolatus*	1.0
Western wheatgrass	*Elymus smithii*	1.0
Blue Grama	*Bouteloua gracilis*	1.0
Indian ricegrass	*Oryzopsis hymenoides*	2.0
Galleta	*Hilaria jamesii*	1.0
Palmer penstemon	*Penstemon palmerii*	0.5
Scarlet globemallow	*Sphaeralcea coccinea*	0.5
Black sagebrush	*Artemisia nova*	0.1
Mormon Tea	*Ephedra viridis or torreyana*	2.0
Shadscale	*Atriplex confertifolia*	1.0
4-wing saltbush	*Atriplex canescens*	2.0
Stansbury Cliffrose	*Purshia stansburiana*	1.0
Rubber Rabbitbrush	*Chrysothamnus nauseosus*	0.2
	Total	**13.3**

[1] Rate is recommended for broadcast seeding, pounds of pure live seed per acre (PLS).

Seeding Method. Seeding would be achieved with a broadcast applicator in late fall. This would allow for the advantage of a natural cold scarification of the seeds as well as sufficient moisture at the onset of germination. A flex or drag harrow, or similar method, would be used to lightly cover the seed with topsoil after broadcasting in reclaimed areas that are accessible by mobile equipment. Hand rakes would be used to cover seed with 1/8 to 1/4-inch of soil in small or steep areas where equipment access is limited.

Fertilizers or irrigation are not proposed to be used in the re-seeded areas. In conjunction with the reclamation activities described above, erosion control measures, such as silt fence, straw wattles, and riprap, would be installed in critical areas to minimize erosion. Straw mulch may also be applied in selected areas.

2.2.7.5 Drill Holes and Vent Shafts

Drill holes and vent shafts would be abandoned in accordance with UAC Rule R647-4-108. Holes that encounter groundwater would be plugged by placing a 50-foot cement plug immediately above and below the aquifer(s) or filling the hole from the bottom up with a high-grade bentonite/slurry mixture in accordance with UAC Rule R647-4-108.

Vent shaft abandonment would be generally similar to drill holes but some of the details depend on if the vent was only surface cased and grouted, cased and grouted due to dry but incompetent material, or cased and grouted due to intercept with a perched aquifer.

For all vent shafts, the vent surface casing would be removed to 5.5 feet below the ground surface, and placed inside the vent shaft. Approximately 3 inches of surface soil around the vent would also be placed within the vent shaft. Foam would be inserted into the vent opening as a

plug. Above the foam, an 18-inch thick reinforced concrete cap would be placed over and beyond the diameter of the vent to a width of 4 feet. The remaining depth to surface grade would be filled with soil and graded to drain away from the vent.

Surface Cased Vent Shaft. If the geologic formations below a vent shaft are competent, dry and do not require support during mining, the vent shaft may only be cased for the top 20 feet. Reclamation of these vent shafts would include backfilling with inert material from the mine workings to the base of the foam plug. The backfill material would create the bottom form for the foam placement.

Fully Cased Vent Shaft. The two vent shafts already installed at the Daneros mine are fully cased because the geologic formations are not sufficiently competent to remain stable over the life of the mine and could create a safety hazard for miners underground. Geologic conditions at future vent shaft locations are expected to be similar. Reclamation of these fully cased vent shafts would not include full backfill. The rest of the reclamation would follow the abandonment measures discussed above.

Fully Cased and Grouted Vent Shafts. If, during vent shaft development, perched groundwater is encountered, the vent shaft would be fully cased and grouted to 50 feet above and below the water bearing zone. During closure of this type of vent shaft, the shaft would be backfilled to 50 feet below the water-bearing zone with inert material. A low-permeability seal would be placed continuously to 50 feet above the water-bearing zone. The remainder of the shaft would be backfilled to the bottom of the foam plug. The backfill would be used as the base of the foam plug. The foam plug, concrete cap and soil cover would be installed as described above.

Additional details regarding planned vent shaft reclamation are provided in Figures 4-1, 4-2, and 4-3 of the MPOM.

Stockpiled topsoil from the vent shaft areas would be used during reclamation. Disturbed areas would be ripped to alleviate soil compaction and broadcast seeded in the late fall using the BLM and UDOGM approved seed mix.

2.2.7.6 Road Reclamation

Temporary roads would be used to provide access to mine facilities and vent shafts. Reclamation of temporary access roads would include:

- Re-grading any cuts and fills to re-establish approximate original ground contours and drainages;
- Ripping the roads to a minimum depth of 18 inches to alleviate soil compaction (if depth to bedrock allows);
- Placing up to six inches of loose topsoil in locations where topsoil was removed. Temporary access roads may have windrows of native soil that would be pushed back across the road; and
- Seeding the soil with the BLM and UDOGM approved seed mix(es).

Interim reclamation would be performed on any areas of road disturbance that are created during road construction that are not needed for regular use or maintenance. This includes cut banks and slopes, drainage ditches, berms, and other features adjacent to the roadway. These areas would be stabilized with erosion control measures where appropriate and seeded.

2.2.7.7 Post-Closure Management

After reclamation is completed, post-closure monitoring and maintenance would be anticipated to require 3 to 5 years. Success and progress of revegetation efforts would be dependent on seasonal growth patterns, precipitation, and weather patterns. Additional erosion control measures and seeding may be required during the post-closure period to meet the BLM and UDOGM reclamation standards. Revegetation success would be measured in accordance with UAC Rule R647-4-111 such that revegetation has achieved 70 percent of the pre-mining vegetative ground cover. In addition, the vegetation must survive three growing seasons following the last seeding. Revegetation would also be considered complete if the BLM and UDOGM determine that the site is stable and revegetation work has been satisfactorily completed within practical limits.

In accordance with UAC Rule R647-4-113, Energy Fuels is required to maintain a surety bond for reclamation until the BLM and UDOGM concur that reclamation is complete. Energy Fuels would notify the agencies to conduct an inspection upon completion of reclamation activities. A partial release of surety may be requested in the event that substantial phases or segments of reclamation such as demolition, backfilling, regrading, and/or vegetation establishment has been successfully performed and the residual amount of retained surety is determined adequate to insure completion of reclamation. Annual assessments and reporting would be conducted to inform the BLM and UDOGM of reclamation progress.

2.3 Alternative B – No Action

The BLM NEPA Handbook (H-1790-1) states that for EAs on externally initiated Proposed Actions, the No Action Alternative generally means that the proposed activity would not be approved. Pursuant to regulations at 43 CFR 3809.411(d)(3)(iii), the BLM may disapprove the proposed plan modification if it is determined that the proposed operations would result in unnecessary or undue degradation of public lands. Under this Alternative, the Daneros Mine could continue to operate in accordance with the terms of the approved MPO but the BLM would not approve the proposed modification to the MPO. The No Action Alternative does not equate to no mining. The No Action Alternative is presented for baseline analysis of resource impacts.

As noted in Chapter 1, the BLM approved the 2009 MPO in 2011 for the Daneros Mine. The BLM Utah State Director signed a FONSI/DR on June 28, 2011, subject to Conditions of Approval and Compliance and Monitoring Requirements (see Appendix A). The 2011 FONSI/DR approved the following:

- Production of up to 100,000 tons of uranium ore during a seven-year period of operation.
- Transportation of ore by truck on existing county and state roads to the White Mesa Mill, near Blanding, Utah.
- Construction and/or rehabilitation of two declines into the uranium ore body for purposes of ore haulage, mine ventilation and a secondary escape route.
- Construction of two 7-foot diameter mine ventilation boreholes.
- Drilling of 22 development drill holes to further delineate the ore body.
- Installation of a water supply well to support surface and underground activities.
- Construction and operation of surface facilities, which include a mine yard/portal area, office/shop area, ore stockpile area, development rock area (DRA), and two topsoil stockpile areas.

The 2009 MPO provided for a total of 4.5 acres of surface disturbance, the majority of which (3.5 acres) was located within areas of pre-existing mining disturbance. The following has occurred since the MPO was approved:

- The Daneros Mine operated from 2009 to October 2012. The site is currently on “care and maintenance” status.
- The two declines at the Daneros Portal were constructed and used for haulage, mine ventilation and as a secondary escape route.
- Two ventilation shafts were constructed.
- A water well was drilled and used to supply water for mining activities.
- Surface facilities were constructed and operated.

A reclamation bond is in place for the approved 2009 MPO. Based on the current plan and reclamation bond, development drilling and some limited additional mining could occur, but reclamation would then follow due to a lack of space to place development rock.

The Revegetation and Reseeding Plan (UEC, 2008: Item H) would be implemented as part of the approved 2009 MPO. Generally, areas disturbed under the small mine permit would be reclaimed, including those areas of pre-existing surface disturbance that were redisturbed by Daneros Mine operations. Areas previously disturbed by historic mining activities would remain if they were not redisturbed. Generally, disturbed areas would be ripped, covered with stockpiled topsoil, and seeded with the approved seed mix in the fall.

- Development rock would be left at a 2:1 slope. This material would be wheel-compacted, furrowed, covered with 1 foot of topsoil material and seeded.
- The ore stockpile area would be excavated to remove radionuclide-bearing rock with values above background. The rock would either be transported to the White Mesa Mill for processing or would be placed within the mine workings. The excavated ore stockpile area would be covered with 1 foot of topsoil material and seeded.
- At the completion of mining operations, all buildings and structures would be removed. The office/shop yard area would be reclaimed at a 2:1 slope and seeded.
- The portals of the declines would be reclaimed by placing waste rock backfill from 30 feet inside each decline to the portal. Backfill would be placed and contoured to appear natural and similar to the surrounding talus slopes. A minimum of 12 inches of topsoil would be spread over the backfilled surface, pocked with a backhoe or excavator, and seeded by hand.
- The drill holes would be reclaimed concurrent with operations. Dry holes would be filled with the cuttings to within 5 feet from the surface and then plugged to the surface with a cement plug. If groundwater were encountered, then the hole would be plugged in the subsurface to prevent aquifer contamination in accordance with Utah Division of Oil, Gas and Mining Rule R647-2-108. Mud pits would be allowed to dry out and would then be backfilled, graded, and seeded.
- The two vent shafts would be sealed with 6 feet of foam and then capped with a minimum of 6 inches of reinforced concrete. The areas near the vent shafts would be covered by backfill and soil and then seeded.
- County road D0029 would be reopened to public use.

Some general improvements to the reclamation plan are included in the MPOM. A few differences include:

- Disturbed areas would be regraded to a 3H:1V slope.
- An average of 18 inches of loose, inert material and topsoil would be placed over the DRAs.
- Vent shaft reclamation would be more robust.

2.4 Alternatives Considered but Not Analyzed in Detail

2.4.1 Reclamation Alternative

One reclamation alternative was identified, examined and not carried forward for further analysis. Under this alternative Energy Fuels would place (i.e., gob) 100 percent of the development rock back underground, rather than reclaim it in place on the surface. In contrast, the Proposed Action provides for placing approximately 60 percent of the development rock underground during mining, while reclaiming the remaining 40 percent on the surface.

At some underground uranium mines, almost all of the development rock (or waste rock) is gobbed back underground during mine operations and reclamation rather than being reclaimed in the DRAs on the surface. This reclamation technique is implemented at uranium mines located in northern Arizona, an area known as the Arizona Strip. These mines extract high grade uranium ore from volcanic pipes that are accessed by deep production and ventilation shafts. The underground disposal of development rock is successful at those mines because the mines have a low development rock to ore ratio. In addition, some of the inert rock mined during shaft development (typically limestone) is utilized for road base on access roads and is not placed back underground. The broken waste rock mined within the pipes is gobbed in mined-out vertical stopes that can be filled close to 100 percent with rock. When mining is finished, the development rock stored on the surface from shaft and drift development to the pipes is dumped down the production and ventilation shafts. Because the ore body has been mined out, the shafts are no longer needed for resource access and placement of the rock in the shafts also allows for placement of concrete and bentonite seals to prevent infiltration of perched water from upper geologic formations into the mine workings.

The Daneros Mine ore deposit is different as it follows the course of old stream channels instead of vertical pipes. These types of ore deposits are lower grade but extend over a much larger area. The Daneros Mine was developed with declines that angle gently down to the ore zone which is then mined within horizontal stopes. Because the ore seam is discontinuous and relatively thin, there is a much higher development rock to ore ratio, typically 2:1 or higher. This development rock originates from the main drifts located between ore stopes and within the ore stopes themselves where 30 to 50 percent of the working face may be ore and the remainder consists of development rock that must be removed to allow for the passage of underground equipment. Gobbing of some development rock in previously mined voids during ongoing mining is possible, and is included in the Proposed Action, but it is not technically feasible to place all of it back underground during reclamation for the following reasons.

- The production stopes at the Daneros Mine are typically about 7 feet high, but they can be only filled to a height of about 4 or 5 feet with development rock by placing the rock in the stope and pushing against the rock pile with an underground loader.
- The broken development rock has a volume approximately 40 percent greater than the in-place rock prior to mining. Accordingly, the broken rock takes up a correspondingly larger volume.

- Although the mine portals and vent shafts are closed during reclamation, some stopes and almost all development drifts are left open to allow for future access to lower grade resources in the mine that may be economical to mine in the future. The development drifts may also provide access to additional resources that could be discovered by future exploration activities.

2.4.2 South Portal Area Alternative

An alternative layout design for the South Portal Area was examined and not carried forward for further analysis. Under this alternative, the facilities at the South Portal Area would be reconfigured to avoid all lands having wilderness characteristics. This would require a substantial reduction (7 acres) in the footprint of the proposed surface facilities located south of County Road B258. The proposed surface facilities south of the county road (approximately 12 acres) would be condensed 58 percent into an area totaling roughly 5 acres in order to avoid lands with wilderness characteristics. It is not practicable to confine the essential surface facilities into a small 5-acre area due to insufficient space to support and maintain the utility of the necessary mine infrastructure. Alternatively, the proposed area north of County Road B258 would be increased approximately 7 acres to compensate for an equal reduction in acres south of the county road. However, the surface topography north of the county road is a limiting factor for expanding the proposed surface facilities in that direction. The area north of the county road lacks sufficient functional space to accommodate anticipated future mine development. For this reason, expanding the South Portal Area further to the north is also impracticable.

Energy Fuels' initial MPOM, submitted to the BLM in March 2013, included 37 acres of total surface disturbance at the South Portal Area. In June of 2013, the BLM and the UDOGM met on site with Energy Fuels to review the proposal. Consequently, Energy Fuels submitted a revision in December of 2013 for the South Portal layout (Proposed Action). The revision reduced total surface disturbance at the South Portal Area to 21 acres; a 16-acre or 43 percent reduction in the proposed disturbance area south of County Road B258. The revision minimized potential impacts to visual resources and lands with wilderness characteristics by reducing the overall footprint and downsizing and relocating the development rock pile to the north side of the county road.

As described in Appendix C of this EA, 8.3 acres of non-WSA lands with wilderness characteristics could potentially be affected by the Proposed Action. This would result in only nominal impacts to the nearly 25,000-acre Upper Red Canyon A inventory unit. Furthermore, in its Record of Decision for the 2008 Monticello Field Office RMP, the BLM did not select lands within the Upper Red Canyon A unit and carry them forward in the approved RMP for "protection, preservation or maintenance of wilderness characteristics". Instead, the BLM made these lands available to the public for other resource uses which were determined to have a higher priority (RMP-ROD, pgs. 37-38).

2.4.3 Mitigation Alternative

An alternative for BLM-added mitigation of the Proposed Action was examined and not carried forward for further analysis. The MPOM includes a thorough list of design measures which are aimed at avoiding or minimizing environmental impacts. These built-in mitigation measures are an integral part of the Proposed Action. There was no needed mitigation measures identified which was not already included in the Proposed Action.

Through environmental analysis documented in this EA, the BLM has determined that the design measures incorporated into the Proposed Action would effectively mitigate potential environmental impacts and are sufficient to avoid undue and unnecessary degradation as defined at 43 CFR 3809.5 and 3809.415. Based on the environmental analysis documented herein, a separate alternative to consider additional mitigation is not merited (see section 4.2.4).

2.5 Summary Comparison of Environmental Impacts

This section provides a summary of the impacts discussed in detail in Chapter 4. It is intended to assist the reader and the decision maker. Table 9 presents a summary of the impacts from each Alternative.

Table 9
Summary of Impacts to Resources from Each Alternative

Resource or Issue	Alternative A: Proposed Action	Alternative B: No Action
Air Quality	The Daneros Mine would be considered a PSD minor source based on emissions calculated for the Proposed Project. Mitigation and design measures have been proposed in the MPOM which minimize impacts to air quality. Impacts to air quality as a result of mine operations and ore transportation would be less than National Ambient Air Quality Standards (NAAQS) and the Proposed Project would not degrade visibility in any Class I or Class II areas (i.e., Natural Bridges National Monument). Radon emissions from proposed vent shafts and portals could result in minor air quality impacts. However, in the open air, the radon gas dissipates rapidly and does not pose a health risk in this relatively remote area. Emissions from fossil fuel combustion would contribute a minor incremental increase in greenhouse gases but impacts would be offset by the comparatively low air emissions of the nuclear power generation industry. The processing of ore from the Proposed Project at the White Mesa Mill would have no appreciable indirect impacts and would not result in a violation of the NAAQS.	Development of the Bullseye Portal and South Portal areas and expansion of the existing Daneros Portal area would not occur under the currently proposed MPOM. The Daneros Mine would continue to operate as allowed under its existing permits. As concluded in the 2011 EA, with implementation of control measures, the project would not result in exceedances of the NAAQS and would not degrade the visibility in Class I areas. Processing of project ore at the White Mesa Mill would have no appreciable indirect impacts to air quality and would not result in a violation of the NAAQS.
Water Quality	Few potential surface water and groundwater impacts are anticipated because of the small scale of the Proposed Project, the physical setting, and the proposed mitigation and design measures. The surface water system is made up of ephemeral drainages, and the mitigation measures include implementing the drainage plan (MPOM - Attachment C) and SWPPP (MPOM - Attachment G). These plans are designed and sited to avoid the 100-year floodplain and to minimize adverse impacts by diverting offsite stormwater and containing surface water runoff from a 24-hour/100-year storm event. The groundwater system includes a shallow, perched aquifer 200 to 300 feet above the proposed activities, and a deeper aquifer which is about 1,300 feet below the proposed activities. The existing spring and well in the shallow, perched aquifer were not impacted by	Development of the Bullseye Portal and South Portal areas and expansion of the existing Daneros Portal area would not occur under the currently proposed MPOM. The Daneros Mine would continue to operate as allowed under its existing permits. The 2011 EA concluded that any effects to water quality would be minimal through adherence to the SWPPP and compliance with the permit conditions regulating stormwater as well as compliance with the State of Utah's water well permit and the Utah Division of Oil, Gas and Mining Rule R647-2-108. Indirect effects to water quality due to ore

Resource or Issue	Alternative A: Proposed Action	Alternative B: No Action
	previous mining activities, and no impacts are anticipated from the Proposed Action. Information collected during recent installation of a well in the deeper aquifer indicates that the completion interval of the well is isolated from the proposed activities by low permeability formations. The information also indicates that the aquifer is capable of sustaining the proposed, combined pumping rate of less than 10 gpm from the Daneros Well and another well, proposed at the South Portal, to be installed in the same deep aquifer. Project design features for protection of the groundwater include use of proper vent shaft and drill hole abandonment procedures, well installation techniques and well abandonment procedures. Water level and water quality monitoring will also be conducted at the shallow aquifer spring and well to verify that the actual impacts are not substantially different from the anticipated impacts. The White Mesa Mill would comply with its groundwater discharge permit number UGW370004 which would minimize impacts to water quality from ore milling. The processing of Daneros ore at the White Mesa Mill would have no appreciable indirect impact to water quality.	processing at the White Mesa Mill would be negligible because of compliance with existing permit requirements and the small amount of Daneros ore in relation to overall mill production.
Human Health and Safety Concerns	The impact to human health and safety from radiation exposure and transportation is expected to be minimal based on the design and mitigation measures described in the MPOM. The public would not be permitted to pass over the DRAs or ore pads during the life of operations. Prior to reclamation, all ore material containing elevated radiation levels would be stripped from the ore pads and either shipped to the mill or interred within the abandoned mine workings. The DRAs would be covered by inert rock material and topsoil. Workers would be protected through compliance with MSHA regulations. Reclamation would achieve a standard dose of 100 mrem or less above background to a person camping on or near a reclaimed mine site for 14 days. The additional traffic created would not measurably affect traffic flow and patterns for State Highway 95 or State Highway 191. The processing of additional ore at the White Mesa Mill would have negligible indirect impacts to human health from radiation exposure.	Development of the Bullseye Portal and South Portal areas and expansion of the existing Daneros Portal area would not occur under the currently proposed MPOM. The Daneros Mine would continue to operate as allowed under its existing permits. The 2011 EA concluded that with implementation of protective measures (i.e., reclamation of the development rock pile), impacts to public health from radiation exposure would be minimal. Ore processing at White Mesa Mill would result in negligible indirect effects through compliance with existing permit conditions and regulatory oversight and due to the relatively small amount of Daneros ore in relation to overall mill production. Recreation users would still be prohibited from entering the current mining site and the D0029 road would remain closed until the mine is reclaimed. The 2011 EA concluded that additional traffic created by the project would not measurably affect traffic flow and patterns.

CHAPTER 3 – AFFECTED ENVIRONMENT

3.1 Introduction

Title 40 CFR Chapter 5, Council on Environmental Quality, dictates that agencies shall reduce excessive paperwork by discussing only briefly issues other than significant ones (40 CFR 1500.4 (c)). In response, the Utah NEPA Guidebook allows for use of an Interdisciplinary Team Checklist to discover which resources: (1) are not present in the proposed project area; (2) are present but would not be impacted to a degree that requires detailed analysis; or (3) would require detailed analysis. This checklist becomes the basis for screening issues and resources so that the discussion of issues and concerns is commensurate with the potential impacts, and impacts are discussed within the EA in proportion to their significance. A checklist was prepared for this Proposed Action and is included as Appendix C.

This chapter presents the affected environment (i.e., the physical, biological, social, and economic values and resources) of the proposed Project Area as identified in the Interdisciplinary Team Checklist (see Appendix C). This chapter provides the baseline for comparison of the impacts and consequences described in Chapter 4.

3.2 General Setting

The region surrounding the proposed Project Area is characterized by mesas cut by deep canyons. There are narrow benches on the mesa shoulders in some areas, and near-vertical, 500-foot cliffs in other areas. Elevations range from 5,800 feet to approximately 6,800 feet above mean sea level. The area is semiarid (7–9 inches annual precipitation) with stands of piñon-juniper in rocky soils, along with sage and other brush, forbs, and grasses.

3.3 Resources Eliminated from Further Analysis

The Interdisciplinary Team Checklist (see Appendix C) is the basis for screening issues and resources so that the discussion of issues and concerns is commensurate with the potential impacts (1500.4 (c)) and impacts are discussed in proportion to their significance. Resources which are not present in the Project Area, as noted in Appendix C, were not brought forward in this EA for detailed analysis. Those resources include: Areas of Critical Environmental Concern; unique or prime farmlands; threatened, endangered or candidate plant species; wild and scenic rivers; wilderness areas; and natural areas. Resources potentially present in the Project Area, but that would not be impacted by the Proposed Action to a degree that detailed analysis is required, include: cultural resources; environmental justice; floodplains; invasive, non-native species; Native American religious concerns; threatened, endangered or candidate animal species; wastes (hazardous or solid); wetlands/riparian zones; livestock grazing; rangeland health standards; woodlands; fire/fuels; vegetation including Special-Status Plants other than candidate or listed species; fish and wildlife including Special-Status Animals other than candidate or listed species; desert bighorn sheep; soils; recreation; visual resources; mineral resources/potential energy production; paleontology; lands/access; socioeconomics; lands with wilderness characteristics; noise emission; and climate change. The rationale for not bringing these resources forward for detailed analysis in the EA is provided in Appendix C.

3.4 Resources/Issues Brought Forward for Analysis

The general setting and current condition of the resources of concern (as identified in Appendix C) that require further analysis follow. These resources or topics are air quality, water quality, and human health and safety.

3.4.1 Air Quality

Air pollution can affect human health and reduce visibility. Air quality in southeast Utah is affected by various factors. Industrial point sources such as power plants in the Four Corners region, the White Mesa Uranium Mill, mines, and oil and gas extraction activities may contribute to local and regional air emissions. Urbanization and tourism may create emissions known as area sources that affect air quality over a wider area. These area sources include wood smoke, motor vehicle exhaust, dust from unpaved roads, and the de-icing of paved roads in winter. Air pollutants generated by motor vehicles in southeast Utah include tailpipe emissions and dust from travel over dry, unpaved road surfaces. Wildfires and controlled burns are also an air quality concern when smoke inundates communities and other sensitive areas. In some communities where wood burning is a primary source of heat, smoke can create elevated respirable particulates under stagnant atmospheric conditions.

3.4.1.1 Regulatory Setting

The Clean Air Act (CAA) is the foundation for air quality regulation in the U.S. The MPOM would be subject to the CAA along with the extensive regulatory framework that supports it.

3.4.1.1.1 Federal Clean Air Act

The 1990 CAA amendments contain a goal of improving visibility within Prevention of Significant Deterioration (PSD) Class I areas. The Clean Air Act outlines different levels or classes of air quality protection. Generally, Class I areas are the most pristine, and any substantial emission sources located in or near them have strict limits set by regulatory agencies. Class I areas include national parks and federal wilderness areas that are 5,000 acres or greater in size and designated as such before August 5, 1977. These areas have the most stringent degree of protection from emission sources that can cause air quality degradation. Under the CAA, federal agencies generally have an affirmative responsibility to protect the air quality-related values within a Class I area. These responsibilities focus on protecting views and expansive vistas, and subsequently, human health, through lessened respirable particulates and other pollutants (such as sulfur dioxide [SO_2]).

Any area that is not designated Class I is by default considered Class II. In Class II areas, regulators set emission limits to meet or maintain the criteria pollutant standards (discussed further in the next section). The Project Area and much of the surrounding region are categorized as Class II. There are several Class I areas within 200 kilometers of the Project Area, as well as several areas designated as Sensitive Class II, which are Class II areas that are afforded special protection from air quality-related impacts and are identified by the affected agency on a case-by-case basis for special management through an air quality MOU between the Federal Management Agencies (USDA, USDOI, and EPA, 2011). While Sensitive Class II areas carry no additional regulatory requirements and the National Park Service has not requested that PSD be addressed for the Proposed Action; air quality was identified as a potentially impacted resource. Based on the emissions from the Proposed Action a modeling analysis has been conducted to assess impacts to the Natural Bridges National Monument and can be found in Appendix G. The Class I and Sensitive Class II areas within 200 kilometers of

the Project Area are listed in Table 10, and their locations are shown on Figure 10 (see Appendix B).

Table 10
Federal Air Quality Classifications within 200 km of the Project Area

Federal Classification	Geographic Area
Class I areas	Canyonlands National Park Capitol Reef National Park Arches National Park Mesa Verde National Park Bryce Canyon National Park Grand Canyon National Park
Sensitive Class II areas	Glen Canyon National Recreation Area Hovenweep National Monument Natural Bridges National Monument Colorado National Monument
Note: Data from National Park Service (NPS, 2005).	

3.4.1.1.2 Regulatory Environment

The Daneros Mine expansion (MPOM) would be a minor source under the Federal Clean Air Act. Project emissions would be less than the emissions thresholds established for New Source Review (NSR) Prevention of Significant Deterioration (PSD) permit requirements set forth in 40 CFR 52.21, indicating that the Proposed Project would be a minor source under NSR and not subject to PSD permitting. The Project would be classified as a Title V Area Source due to the applicability of certain NESHAPs; however, project emissions would be less than the Title V permit threshold of 100 tons per year (tpy) of any regulated pollutant, and 10 tons per year of any single hazardous air pollutant (HAP) or 25 tons per year of total HAPs for stationary sources. As a result, the Proposed Project would not be required to submit a Title V operating permit under Part 70 of the Federal Clean Air Act and UAC R307-415.

The mine would be subject to a number of other federal and state regulations. Potentially applicable federal regulations and selected applicable state regulations are discussed below. Any regulatory applicability determination would be the ultimate responsibility of the state or federal administrating authority.

40 CFR 61, Subpart B – Underground Uranium Mining. Federal law regulates radon emissions from uranium mines. Particularly relevant are National Emission Standards for Hazardous Air Pollutants (NESHAP) Part A and NESHAP Subpart B, National Emission Standards for Radon Emissions from Underground Uranium Mines (40 CFR 61.20 contains the relevant sections). Mine operators are responsible for identifying and meeting the regulations that apply specifically to their operations and activities. The State of Utah Division of Air Quality is responsible for regulating radon emissions at the Daneros Mine.

The NESHAP's Subpart B regulations, "National Emission Standards for Radon Emissions from Underground Uranium Mines," apply to an underground uranium mine that "(a) Has mined, will mine or is designed to mine over 100,000 tons of ore during the life of the mine; or (b) Has had or will have an annual ore production rate greater than 10,000 tons, unless it can be demonstrated … that the mine will not exceed total ore production of 100,000 tons during the life of the mine." For any mine meeting this definition, the mine operator must comply with the emission standard for radon-222 as required at 40 CFR 61.22 and is subject to the annual NESHAP Subpart B reporting requirements as outlined at 40 CFR 61.24. "Emissions of radon-222 to the ambient air from an underground uranium mine shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr (40 CFR 61.22)." The Proposed Project would produce more than 100,000 tons of ore

during the life of the mine so ambient air radon tests and annual radon reporting would be required per 40 CFR Part 61 subpart B.

40 CFR 60 Subpart IIII – Compression Ignition ICE. 40 CFR 60 Subpart IIII is applicable to manufacturers, owners, and operators of stationary compression ignition (CI) internal combustion engines (ICE). The four 455-kW generators and the 140-kW generator at the Daneros Mine would be subject to this regulation because they were manufactured after April 1, 2006. These generators are certified Tier 4 interim-compliant.

40 CFR 63 Subpart ZZZZ – Stationary RICE. 40 CFR 63 Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines) applies to diesel generators, and would apply to the Proposed Project generators. Pursuant to §63.6590(c)(1), the 455-kW generators and the 140-kW generator would meet the requirements of the Stationary RICE rule by meeting the requirements of 40 CFR Part 60, Subpart IIII.

Utah Administrative Code (UAC) R307-201-3. Visible Emissions Standards. This state standard limits visible emissions to 20 percent opacity, except as otherwise provided in these rules. Section II.B.1.c of State of Utah Approval Order No. DAQE-AN144920002-14 for the Daneros Mine further limits opacity at the mine site, with visible emissions on haul roads and within operational areas limited to 15% opacity. Diesel engines and all other sources are limited to 20% opacity.

UAC R307-205-4. Fugitive Emissions. This state standard limits fugitive emissions to 20 percent opacity.

UAC R307-205-7. Mining Activities. This state standard defines fugitive dust control provisions for the mining industry.

UAC R307-401. Permit: New and Modified Sources. This rule establishes the application and permitting requirements for sources located in the State of Utah. The mine previously met certain emissions threshold criteria established in R307-401-9 which exempted it from Approval Order requirements given in R307-401-5 through 8. Under the MPOM, the mine would emit pollutants in quantities greater than these small source exemption thresholds; therefore an Approval Order would be required pursuant to R307-401. Approval Order No. DAQE-AN144920002-14 was issued to Energy Fuels Resources (USA) Inc. for the Proposed Project on July 8, 2014 (Utah Division of Air Quality – UDAQ, 2014a). Note that emissions associated with off-site transport would not be permitted or regulated under this section.

3.4.1.2 Regulated Air Pollutants and Air Quality Related Values (AQRV)

3.4.1.2.1 Air Quality Standards

The National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access. All of San Juan County is designated as “attainment” (UDAQ, 2014b). Criteria pollutants for which NAAQS exist include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in effective diameter (PM_{10}), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). Lead emissions from Proposed Project sources are negligible and, therefore, the lead NAAQS is not addressed in this analysis. The NAAQS are summarized in Table 11.

Table 11
National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None	
	35 ppm (40 mg/m^3)	1-hour[1]		
Lead	0.15 µg/m^3[2]	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	
	100 ppb	1-hour[3]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour[4]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	12 µg/m^3	Annual[5]	15.0 µg/m^3	Annual[5]
	35 µg/m^3	24-hour[6]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour[7]	Same as Primary	
Sulfur Dioxide	None		0.5 ppm	3-hour[1]
	75 ppb	1-hour[8]	None	

Note: Data from EPA (2014a); µg/m3 = micrograms per cubic meter; ppm = parts per million.
1 Not to be exceeded more than once per year.
2 Final rule signed October 15, 2008. Quarterly standard of 1.5 µg/m^3 remains in effect until one year after an area is designated for the 2008 standard.
3 To attain this standard, the three-year average of the 98th percentile of 1-hour daily maximum concentrations must not exceed 100 ppb.
4 Not to be exceeded more than once per year on average over three years.
5 To attain this standard, the three-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed the standard.
6 To attain this standard, the three-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
7 To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
8 To attain this standard, the three-year average of the 99th percentile of 1-hour daily maximum concentrations must not exceed 75 ppb. The annual and 24-hour standards were revoked in the June 2, 2010 rule; however, they remain in effect until one year after an area is designated for the 2010 standard.

3.4.1.2.2 NAAQS Pollutant Concentrations

Data collected from a recent assessment of air quality in National Parks around the country found that ozone concentrations have remained under the NAAQS and are similar across the entire western region. These data are included in Tables 12 and 13.

Table 12
Monitoring Locations with 3-Year Average 4th Highest 8-Hour Ozone Concentration Greater Than or Equal to 60 ppb (2008)

Park	3-Year Average 4th Highest 8-Hour Ozone Concentration (ppb)
Canyonlands National Park	71
Grand Canyon National Park	70
Great Basin National Park	72
Mesa Verde National Park	71
Yellowstone National Park	66
Zion National Park	71
National Park Service, Air Quality in National Parks, 2009 Annual Performance and Progress Report (NPS, 2010).	

Table 13
Long-term Trends in Annual 4th Highest 8-Hour Daily Maximum Ozone Concentration (2008)

Park	Slope (ppb/year)	P-value	Number of Valid Years	First Year of Data	Last Year of Data
Canyonlands National Park	0.32	0.18	16	1993	2008
Grand Canyon National Park	0.00	0.48	16	1993	2008
Great Basin National Park	0.17	0.22	15	1994	2008
Mesa Verde National Park	0.50	0.04[(a)]	14	1994	2008
Yellowstone National Park	-0.05	0.27	12	1997	2008
National Park Service, Air Quality in National Parks, 2009 Annual Performance and Progress Report (NPS, 2010).					

Ozone concentrations in Class I areas of the western states have shown increases in the past decade and are approaching the NAAQS level. High winter ozone concentrations have been measured in western Wyoming and in the Uinta Basin region in rural eastern Utah, both where extensive oil and gas production is occurring. In April 2012, the EPA designated Sublette County, Wyoming and parts of northeastern Lincoln and northwestern Sweetwater Counties in Wyoming as nonattainment under the 2008 75 ppb ozone standard. Measurement campaigns, emission inventory development, and modeling studies are underway with the aim of improving the understanding of the processes that contribute to winter ozone formation in Wyoming and Utah.

Fine particulate concentrations are not directly monitored in the Project Area; however, the National Park Service operates an Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring site at Canyonlands National Park, which measures $PM_{2.5}$ concentrations to determine their contribution to visibility reduction in the park. Based on a review of particulate mass concentrations monitored at the IMPROVE site, $PM_{2.5}$ concentrations in the region are well under the applicable NAAQS concentrations both for the 24-hour standard and the annual standard.

The Project Area is designated as attainment or unclassifiable by the EPA, which means the area meets the NAAQS or insufficient data exists to make a determination of attainment status and the area is regulated as an attainment area under the CAA.

3.4.1.2.3 Visibility

Visibility is "the clarity with which distant objects are perceived" (EPA, 2001) and is affected by pollutant concentrations, plume impairment, regional haze, relative humidity, sunlight, and cloud characteristics. Visibility can be expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, about a 10 percent change in light extinction. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored. These daily values are then ranked from clearest to haziest and divided into three categories to indicate: the Mean visibility for all days (Average); the 20 percent of days with the clearest visibility (20 percent clearest); and the 20 percent of days with the worst visibility (20 percent haziest).

The IMPROVE site nearest to the Project Area, at which visibility data are collected, is Canyonlands National Park; no visibility data is collected at the Natural Bridges National Monument. IMPROVE monitoring data indicate that the mid-range days have visual distances of 94 to 132 miles and show an improvement over the period of 1990 to 2013 of approximately 30 percent. The least-impaired days have visibility ranges from 132 to 178 and demonstrate improvements over the period of approximately 23 percent (Cooperative Institute for Research in the Atmosphere – CIRA, 2014). The most visibility-impaired days in Canyonlands National Park exhibit visual distances between 62 and 90 miles and show improvements over that 18-year period of approximately 35 percent.

The visibility trend data from 1990 to 2008 are available from NPS for the Canyonlands National Park (NPS, 2010), and indicate that the improvement trend in visibility has continued through 2008. While some visibility impairments are the result of natural sources such as windblown dust and soot from wildfires, which cannot be controlled, manmade sources of pollution can also impair visibility. These include motor vehicles (organic carbon), electric utility and industrial fuel burning (sulfates and particulate), and manufacturing operations (sulfates and fine particulate matter). Visibility in Canyonlands National Park is most influenced by sulfates, fine particulate matter (i.e., dust), and organic carbon. The implementation of state and federal stationary and mobile source regulations are expected to contribute to improvements in visibility (NPS, 2010).

Table 14 below, provides long-term trends in annual deciview (dv) on clearest and haziest days summarized using statistical metrics “slope” and “p-value” parameters. Significant trends are defined as those having a 95% probability of the trend slope being correct (i.e., defined as having a p-value ≤ 0.05). A park is considered to have improving air quality if the p-value is ≤ 0.05. All parks indicated a statistically significant improving air quality trend on the clearest days (p ≤ 0.05), and Canyonlands also indicated an improving air quality trend on the haziest days.

Table 14
Long-term Trends in Annual Deciview (dv) on Clearest and Haziest Days

	Clearest Days		Haziest Days				
Park	**Slope (dv/year)**	**P-value**	**Slope (dv/year)**	**P-value**	**Number of Valid Years**	**First Year of Data**	**Last Year of Data**
Bryce Canyon National Park	-0.10	<0.01	0.03	0.11	18	1990	2008
Canyonlands National Park	-0.16	<0.01	-0.10	<0.01	19	1990	2008
Great Basin National Park	-0.15	<0.01	0.04	0.23	16	1993	2008
Mesa Verde National Park	-0.08	<0.01	0.02	0.44	18	1989	2008
Yellowstone National Park	-0.10	<0.01	0.16	0.22	11	1997	2008

National Park Service, Air Quality in National Parks, 2009 Annual Performance and Progress Report (NPS, 2010).

3.4.1.2.4 Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and is reported as the mass of material deposited on an area (kilogram per hectare) per year. Atmospheric deposition can cause acidification of lakes and streams. One expression of lake acidification is change in acid neutralizing capacity (ANC), the lake's capacity to resist acidification from atmospheric deposition. Acid neutralizing capacity is expressed in units of micro-equivalents per liter (µeq/l).

Wet deposition refers to air pollutants deposited by precipitation, such as rain and snow. One expression of wet deposition is precipitation pH, a measure of the acidity or alkalinity of the precipitation. There are five National Atmospheric Deposition Program (NADP) stations in Utah: Logan, Murphy Ridge, Green River, Bryce Canyon National Park, and Canyonlands National Park. The NADP stations in Bryce Canyon National Park and Canyonlands National Park have assessed precipitation chemistry since 1985 and 1997, respectively.

Dry deposition refers to the transfer of airborne gaseous and particulate material from the atmosphere to the Earth's surface. The Clean Air Status and Trends network (CASTNet) has measured dry deposition of ozone (O_3), sulfur dioxide (SO_2), nitric acid (HNO_3), sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4), in the United States since the late 1980s. There is one CASTNet station in Utah at Canyonlands National Park.

Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition. Total nitrogen deposition is calculated by summing the nitrogen portion of wet and dry deposition of nitrogen compounds, and total sulfur deposition is calculated by summing the sulfur portion of wet and dry deposition of sulfur compounds. Total deposition has been measured at Canyonlands National Park from 1995 through 2009 (CASTNet, 2012). Total nitrogen deposition has ranged from 1.44 to 2.92 kg/hectare-year since 1996 (EPA, 2014b). Total nitrogen deposition of 3 kg/hectare-year represents the total pollution loading where acidification is unlikely and "below which a land manager can recommend a permit be issued for a new source unless data are available to indicate otherwise" (Fox et al., 1989).

Table 15 below provides long-term trends in wet-deposition concentration using similar statistical metrics to measure air quality trends as presented in Table 14. Bryce Canyon and Canyonlands National Parks indicated a statistically significant degrading air quality trend for ammonium concentrations, while Bryce Canyon, Grand Canyon, Great Basin, and Mesa Verde all indicated a statistically significant improving air quality trend for sulfate concentrations.

Table 15
Long-term Trends in Wet-Deposition Concentration

Park	Ammonium		Nitrate		Sulfate		Number of Valid Years	First Year of Data	Last Year of Data
	Slope (meq/ liter/yr)	P-value	Slope (meq/ liter/yr)	p-value	Slope (meq/ liter/yr)	P-value			
Bryce Canyon National Park	0.33	0.04	-0.13	0.14	-0.42	<0.01	14	1989	2008
Canyonlands National Park	0.64	0.02	0.05	0.43	-0.05	0.36	10	1998	2008
Grand Canyon National Park	0.15	0.10	-0.03	0.45	-0.18	0.05	16	1989	2008
Great Basin National Park	0.13	0.30	-0.24	0.08	-0.26	<0.01	13	1990	2008
Mesa Verde National Park	0.16	0.05	0.06	0.31	-0.58	<0.01	19	1990	2008
Yellowstone National Park	0.20	<0.01	-0.00	0.45	-0.12	0.07	19	1989	2008
National Park Service, Air Quality in National Parks, 2009 Annual Performance and Progress Report (NPS, 2010).									

3.4.1.2.5 Hazardous Air Pollutants

Hazardous Air Pollutants (HAPs) are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental impacts. The EPA has classified 187 air pollutants as HAPs. Examples of HAPs associated with fossil fuel combustion include formaldehyde, benzene, toluene, ethyl benzene, isomers of xylene (BTEX) compounds, and normal-hexane (n-hexane).

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

3.4.1.3 Regional Emission Sources – Criteria Pollutants and Visibility

A number of primary fine particulate matter (PM_{10}) and nitrogen oxides (NOx) emission sources exist in the southeast Utah/northeast Arizona region. Emissions can roughly be divided into human-caused (or anthropogenic) and natural sources. Anthropogenic emissions vary according to the season. In colder months, residential wood smoke is a large source of PM_{10} near settlements and campgrounds. Because of winter meteorological conditions wood smoke tends to stay near the emissions source. In drier summer months, motor vehicles can emit exhaust pollutants and stir up dust on dirt roads that can travel for long distances. Natural sources of PM_{10} and NOx include wildfires and dust storms.

In addition to PM_{10} and NOx, vehicle emissions include hydrocarbons and carbon monoxide. Travel on unsurfaced roads can substantially increase local atmospheric concentrations of fine particulate matter unless those roads are treated for dust abatement. Surfaced roads usually emit very little particulate, but where cinders and sand are applied to facilitate traction during icy conditions, significant short-term dust can occur once the roads dry out. This is usually a short-term condition but worthy of control (e.g., sweeping) in settled areas.

Non-anthropogenic sourced pollutants in southeast Utah fall into two broad categories: fine particulate that reduces visibility and may affect health and non-particulate sources. Fine particulate generally comes from naturally-occurring fires (e.g., started by lightning) and wind-blown soil and dust (that may include ash). Non-particulate sources usually are complex organic molecules emitted by vegetation (such as terpenes from conifer trees). The Proposed Action’s contribution to emissions that can create regional haze (i.e., NOx) is minimal and is addressed in the impact section of this EA.

In the region, monitoring studies have been conducted to evaluate air pollutants that reduce visibility. These are summarized for the two National Park Service units closest to the Daneros Mine site, as shown in Table 16. These parks are approximately 100 miles (Mesa Verde National Park) and 34 miles (Canyonlands National Park) from the Project Area.

Table 16
Sources of Visibility-Reducing Compounds in Class I Areas near the Proposed Mine

Compound	Sulfates	Crustal Materials (soil dust)	Elemental Carbon (soot)	Organic Carbon	Nitrates
Sources	**Utility and Industrial Boilers**	**Roads, Construction, and Agriculture**	**Combustion of Wood, Diesel, and Other Materials**	**Autos, Trucks, and Industrial Processes**	**Motor Vehicles and Industrial Boilers**
Mesa Verde National Park	46%	23%	7%	18%	6%
Canyonlands National Park	38%	29%	8%	17%	8%
Note: Data from National Park Service (2012).					

3.4.2 Water Quality

Water pollution can affect human health and the chemical, physical, and biological integrity of affected waters, resulting in reduced beneficial uses of the water. Water quality in southeast Utah is affected by various factors. Industrial point sources of discharge, such as power plants in the Four Corners region, White Mesa Mill, mines, and oil and gas extraction activities, may contribute to local and regional water pollution. Nonpoint source discharges often result from urbanization and industrialization as well as naturally-occurring mineralization, and may affect water quality over a wider area. Nonpoint sources include runoff from stormwater or snowmelt, agricultural irrigation, and drainages from abandoned mines. Drainages from active mines are considered point sources and are regulated by state and federal laws.

3.4.2.1 Regulatory Setting

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States (EPA, 2014c). It does not address groundwater or general water quantity. The tools provided by the CWA are designed to limit and reduce direct discharges of pollutants into the waters of the U.S. and to manage polluted runoff. The UDEQ's Water Quality Board and Division of Water Quality, and the Utah Drinking Water Board and Division of Drinking Water, are responsible for the protection of the state's water quality. Pursuant to UAC R317-2-14, numeric criteria have been established for domestic, recreational, and agricultural uses. The maximum dissolved concentration limit is 30 micrograms per liter (µg/L) for uranium and 5 picocuries per liter (pCi/L) for Ra-226 plus Ra-228.

3.4.2.2 Surface Water

There are no perennial or intermittent watercourses on or within the Project Area. Two ephemeral drainages collect storm runoff from the slopes of Wingate Mesa above the Project Area. One of the drainages, Bullseye Canyon, extends along the northwest side of that portion of the mesa which is within the Project Area, and the other, unnamed, drainage extends along the southeast side (see Figure 11 in Appendix B). The Daneros and Bullseye portals are located in Bullseye Canyon, and the South Portal is located near the unnamed drainage. These drainages are tributaries to the North Fork of Red Canyon, which is in turn a tributary to Red Canyon. Red Canyon drains northwest to the Colorado River, which is the nearest perennial water, approximately 28 miles from the proposed mine operations. No records of flow or stream gauges exist through this distance (U.S. Geological Survey [USGS], 2014), with the exception of two flow measurements in 1980 at the mouth of Red Canyon (EPA, 2014d). However, it is reasonable to expect that flow occurs in the drainages only during significant precipitation events.

3.4.2.3 Groundwater

Groundwater in southeast Utah is yielded primarily from fractures in consolidated rocks such as basalt, limestone, and sandstone. This part of the state is generally an area where groundwater is not significantly developed (Utah Division of Water Resources, 2014) because of the low population in San Juan County; there are roughly two persons per square mile according to the U.S. Census Bureau (2014). There is limited irrigation development for agricultural and livestock, but other water-intensive commercial development in the area is generally absent. However, commercial mining and processing for uranium has existed in the county since at least the 1940s (State of Utah, 2001). In the remote areas of San Juan County, uranium mining has become the principal water-demanding industry, although very few wells have been drilled in the region (Utah Division of Water Rights [UDWR], 2014a). Between 1989 and 1998, less than 3,000 acre-feet per year of groundwater was developed in the Blanding area of southeast Utah (State of Utah, 2001). Little data are available for this area, but the State estimates annual groundwater pumping to be at or below annual recharge values.

Figure 12 (see Appendix B) shows the overall site topography, drainages and the locations of groundwater use. A conceptual geological cross section including groundwater intercepts is shown on Figure 13 (see Appendix B). Alluvial materials in the drainages in the Project Area are limited or absent, and groundwater flow is not associated with the drainages. Groundwater does occur in the geologic strata of the Wingate Mesa between the drainages, above the elevation of the proposed underground mining activities. Bullseye Spring and Bullseye Well both produce water from a shallow, perched aquifer in the Wingate Mesa. The Mesa rises about 800 feet above the Daneros Portal. Bullseye Spring is located about 0.27 mile east of the Daneros Portal at an elevation of 5900 feet, which is about 250 feet in elevation above the portal. Bullseye Well is located about 0.40 mile southeast of the Daneros Portal. The elevation at the top of the well is about 6,100 feet and it is reported to be 200 feet deep thus making the bottom of the well about 310 feet above the potential mining zone. According to the UDWR, there are water rights associated with the spring (99-118) and the well (99-64). The well was originally drilled in the 1970s, and the water rights for both the well and spring were originally issued in the 1970s for mining-related purposes. Both of these sources are currently used seasonally for livestock watering.

The perched water table that supplies the spring and well results from meteoric waters moving downward from the area of recharge on Wingate Mesa through unsaturated strata comprising permeable sandstones of the Kayenta and Wingate Sandstone Formations. A low-permeability layer in the Chinle Formation is believed to intercept the downward movement of water, causing water to accumulate on top of the low-permeability layer as a small, perched zone of saturation. Water in the perched water table moves laterally above the low-permeability layer until it discharges at the outcrop in Bullseye Canyon. Spring flow rates measured quarterly since July 2009 indicate the rate is less than 0.5 gallon per minute (gpm), and there is limited apparent seasonal variation. The well is still in periodic use by the rancher.

The Bullseye Spring and Well were sampled on April 22, 2014. The results of that sampling effort are summarized in Table 17.

Table 17
Bullseye Spring and Well Sample Results (April 22, 2014)

Analyte (Unit)	Spring	Well	State Numeric Criteria	
			Domestic Use	Agricultural Use
DATA QUALITY				
Total Dissolved Solids (mg/L)	456	292		1200
FIELD PARAMETERS				
Conductance	780	499		
Flow Rate (GPM)	0.33	10		
pH (s.u.)	8.02	7.25	6.5-9.0	6.5-9.0
Redox Potential Eh (mV)	372	377		
Temperature (oC)	14.79	13.35		
Turbidity (NTU)	2.4	29.8	10	
Depth to Water (Ft)	NA	20.4		
MAJOR IONS				
Alkalinity (as CaCO3) (mg/L)	351	218		
Ammonia (as N) (mg/L)	<0.0500	<0.0500		
Bicarbonate (as CaCO3) (mg/L)	261	198		
Calcium (mg/L)	1.2	15.2		
Carbonate (as CaCO3) (mg/L)	89.5	19.7		
Chloride (mg/L)	17.9	18.7		
Fluoride (mg/L)	1.41	0.467	1.4-2.4	
Magnesium (mg/L)	<1.00	8.74		
Nitrate/Nitrite (as N) (mg/L)	0.384	0.783	10	
Potassium (mg/L)	2.11	1.81		
Sodium (mg/L)	175	82.7		
Sulfate (mg/L)	45.8	23.4		
METALS – DISSOLVED				
Aluminum (mg/L)	0.0675	<0.0500		
Antimony (mg/L)	<0.00100	<0.00100		
Arsenic (mg/L)	0.0328	0.0149	0.01	0.1
Barium (mg/L)	<0.100	0.1	1.0	
Beryllium (mg/L)	<0.00100	<0.00100	<0.004	
Cadmium (mg/L)	<0.00100	<0.00100	0.01	0.01
Chromium (mg/L)	<0.0100	<0.0100	0.05	0.10
Copper (mg/L)	<0.0100	<0.0100		0.2
Iron (mg/L)	<0.0300	<0.0300		
Lead (mg/L)	<0.00500	<0.00500	0.015	0.1
Manganese (mg/L)	<0.0100	<0.0100		
Mercury (mg/L)	<0.00100	<0.00100	0.002	
Molybdenum (mg/L)	<0.00500	<0.00500		
Nickel (mg/L)	<0.0100	<0.0100		
Selenium (mg/L)	0.00791	<0.00100	0.05	0.05
Silver (mg/L)	<0.00500	<0.00500	0.05	
Thallium (mg/L)	<0.00100	<0.00100		
Uranium (mg/L)	0.00706	0.00267	0.03	
Vanadium (mg/L)	0.113	0.11		
Zinc (mg/L)	<0.0100	<0.0100		
RADIOCHEMISTRY - DISSOLVED				
ALPHA (pCi/L)	4.17	4.83	15	15
ALPHA Precision (±) (pCi/L)	0.440	0.488		
BETA (pCi/L)	<2	2.43	4	
BETA Precision(±) (pCi/L)	0.218	0.236		
Radium-226 (pCi/L)	1.36	1.77	5[1]	

Analyte (Unit)	Spring	Well	State Numeric Criteria	
			Domestic Use	Agricultural Use
Radium-226 Precision(±) (pCi/L)	0.315	0.337		
Radium-228 (pCi/L)	<1	<1	5[1]	
Radium-228 Precision(±) (pCi/L)	0.169	0.156		
NA = Not Applicable				
[1] Combined Radium 226 and 228				

As discussed in the 2011 EA (BLM, 2011), groundwater has not been detected in the Shinarump Member of the Chinle Formation, which is the strata being mined. However, groundwater does occur in the geologic strata underlying the Project Area as demonstrated by the successful drilling and pumping of the Daneros Water Well. Little development of groundwater resources has taken place in the area (UDWR, 2014a), but based on regional geologic information (Utah Geological Survey, 1964) and the data gathered from drilling the Daneros Well, Figure 13 (see Appendix B) was produced, showing a conceptual cross section of the area.

The Shinarump Conglomerate Member, is located towards the bottom of the Chinle Formation. Below the Chinle is the Moenkopi Formation, which is made up of low-permeability layers and shares a distinct unconformable border with the Chinle Formation above it (Thaden, 1964). The Moenkopi Formation rests unconformably on the Organ Rock Shale which consists of alternating beds of siltstone, silty sandstone and sandstone. Below the Organ Rock Shale is the Cedar Mesa Sandstone. The Cedar Mesa Sandstone is part of the Cutler Group and is estimated to start at a minimum of 600 feet below the mine level. Below the Cedar Mesa Sandstone, but within the Cutler Group, are the lower Cutler beds. Towards the bottom of the thick Cutler Group is a water-bearing zone.

When the Daneros Well was drilled in 2009, the driller first found water at a depth of 1,240 feet below the surface (fbs). The well was drilled to a total depth of 1,660 fbs and the last 20 feet were drilled in the Honaker Trail Formation. The well is screened from 1,360 to 1,660 fbs. The well intake was placed at 1,660 fbs in order to achieve the necessary flows. Static water level measurements taken in 2010 indicated a depth to water of 1,560 fbs.

The perched aquifer in the Chinle Formation and the water bearing zone in the lower Cutler beds are likely hydrologically separated. This conclusion is based on evidence that: the two aquifer systems are 1,450 feet apart vertically; the Chinle and Moenkopi Formations are quite thick; have low permeability and transmissivity; and little if any faulting is evident (Howells, 1990).

The UDWR issued a water right (09-2315) for the Daneros Well for up to 5.73 acre-feet per year. Based on the testing during well completion, the well can produce up to 20 gallons per minute.

The results from sampling the Daneros Well on August 26, 2009 are provided in Table 18.

Table 18
Daneros Well Sample Results (August 26, 2009)

Analyte (Unit)	Result	State Numeric Criteria	
		Domestic Use	Agricultural Use
PHYSICAL PROPERTIES			
Oxygen Demand, Chemical (COD) (mg/L)	>5		
pH (s.u.)	7.79	6.5-9.0	6.5-9.0
Solids, Total Suspended TSS @ 105 C (mg/L)	>4		
Depth to Water (Ft) (after well development on 7/3/2009)	1,240		
MAJOR IONS			
Nitrogen, Ammonia as N (mg/L)	>0.05		
METALS – TOTAL			
Arsenic (mg/L)	>0.001	0.01	0.1
Uranium (mg/L)	0.0029		
Zinc (mg/L)	0.02		
RADIONUCLIDES - DISSOLVED			
Radium 226	0.48	5[1]	
Radium 226 precision (±)	0.20		
Radium 226 MDC	0.23		
RADIONUCLIDES - TOTAL			
Radium 226	0.41		
Radium 226 precision (±)	0.17		
Radium 226 MDC	0.20		
[1] Combined Radium 226 and 228			

3.4.3 Human Health and Safety Concerns

Mining was historically hazardous work; however, modern mine safety practices and regulatory requirements have significantly improved worker health and safety. Worker health and safety at mining and mineral processing operations in the United States are strictly regulated by the Mine Safety and Health Administration (MSHA). The mission of MSHA is to administer the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act) and to enforce compliance with mandatory safety and health standards as a means to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the Nation's mines.

Historically, uranium mine workers suffered many health issues resulting from the inhalation of high levels of uranium decay products. The problems were exacerbated by poor mine ventilation and smoking cigarettes in the mines. Uranium mine safety has improved substantially since the late 1960s when state and federal regulations for mine ventilation were first implemented. Unlike the early days of uranium mining, the industry now has extensive knowledge of the dangers of unprotected inhalation of uranium dust, exposure to radon gas, and the mechanics of radiation. Thorough ventilation is now required in uranium mines and smoking is prohibited within the mines.

3.4.3.1 Radiation

Radioactive exposure at uranium mine sites is typically measured by a quantity called the roentgen, which is a measurement of the ionization of molecules in a given mass of air by gamma rays or x-rays. A unit called the roentgen equivalent man (rem) is used to relate the radiation exposure to potential live tissue damage since different kinds of radioactivity can cause different effects even for the same amount of absorbed radiation. The rem is often expressed in terms of millirem (mrem), which is one thousandth of a rem.

The annual natural background radiation exposure to U.S. residents varies by location and elevation but is about 310 mrem per year (mrem/yr) (NRC, 2014). The average natural and manmade radiation dose for the state of Utah is 267 (mrem/yr) (EPA, 2005). Table 19 presents a summary of radiation doses reported by the U.S. Department of Energy (DOE, 2014a) from natural background for the nation and representative doses for the region. The Project Area doses would be similar to the regional doses but may be assumed to be a little higher than those shown in Table 19, as these measurements were made near Blanding, Utah. An increase in elevation correlates to an increase in the exposure to cosmic radiation. The cosmic and terrestrial radiation in the Project Area is expected to be greater than that observed at Blanding due to its higher elevation and proximity to uranium-bearing geologic formations, respectively.

Table 19
U.S. and Daneros Mine Project Area Regional Natural Background Radiation Doses

Radiation Source (Exposure Pathway)	**U.S. Average Natural Background Radiation Dose[1] (mrem/yr)**	**Daneros Mine Project Area Regional Natural Background Radiation Dose (mrem/yr) Near Blanding, Utah**
Cosmic and cosmogenic radioactivity[2] (External radiation)	30	68[3]
Terrestrial radioactivity[4] (External radiation)	30	74[3]
Internal radioactivity[5] (Food ingestion)	30	30[6]
Radon and airborne particulates (Inhalation)	230	260[7]
Rounded Total	**310**	**430**

Data from DOE (2014).
[1] Source: NCRP, 2009.
[2] Radiation from cosmic rays from outer space filtered by the atmosphere.
[3] Based on data for Blanding, Utah.
[4] Radiation from radioactive materials in soils, primarily the uranium and thorium decay series.
[5] Radiation from radionuclides (mainly K-40) deposited inside human bodies through food ingestion.
[6] Assumed to be about the same as the national average.
[7] Source: IUC, 2003.

The average U.S. resident also receives additional radiation exposure from manmade sources such as medical tests and consumer products. Table 20 compares various radiation exposures from activities and exposure thresholds.

Table 20
Comparative Doses of Radiation

Activity or Limit	Dose
Annual natural background radiation in U.S.	310 mrem
Flying 3,000 miles	3 mrem
Chest x-ray	10 mrem
CT scan	200 – 1,000 mrem
Annual whole body limit for workers	5,000 mrem
Annual thyroid limit for workers	50,000 mrem
Radiation sickness (Acute Radiation Syndrome)	100,000 mrem whole body
Erythemia (skin reddening)	500,000 mrem to skin
Sources: NRC, 2014 and BLM, 2013.	

Uranium is a naturally-occurring radioactive material in rocks and soils in the vicinity of the proposed Project Area. During the mining process, development rock and protore (uranium ore not rich enough to meet market demand and price) are removed to allow extraction of the uranium ore. Most of the natural radioactivity is derived from the uranium-238 and uranium-235 decay chains. One of the products in the uranium-238 decay chain is radium-226 (Ra-226), which is the principal radionuclide of concern for characterizing the distribution of radioactivity in the environment. Ra-226 decays to radon, an invisible, odorless gas.

Background levels of Ra-226 are normally present in soil in trace concentrations of about 1 picoCurie per gram (pCi/g); however, background concentrations within ore-bearing formations in Utah may be as high as ten thousand pCi/g. Baseline gamma surveys were conducted at the existing and proposed facilities at the Daneros, Bullseye, and South Portal areas. The Daneros Portal Area was surveyed for gamma radiation during active operations in 2012. The Bullseye and South Portal areas, which contain historic development rock areas, were also surveyed. The survey was completed using a grid sampling approach. At each of the grid sampling locations, a gamma reading was gathered at the waist level and then on contact with the soil. In addition, four background survey locations were monitored. Active ore stockpiles at the Daneros Mine were not surveyed as part of this investigation because the ore is only present in the stockpiles for a short period of time prior to being hauled to the White Mesa Mill.

The gamma survey data showed that rock with gamma radiation above background levels is present at both the Bullseye and South Portal areas, in addition to the active areas at the Daneros Portal Area (see Figures 14 and 15 in Appendix B). The detailed survey methods are provided in Attachment E to Energy Fuels' MPOM. Background gamma radiation in the Daneros Mine area is approximately 5 microroentgen (µR/hr). Areas containing development rock from historic or recent mining activities exhibit higher gamma activity with values of up to 370 µR/hr present in localized areas. Historic development rock present in the South Portal Area, from previous operations, exhibits gamma radiation values of approximately 50 to 100 µR/hr.

The EPA requires monitoring and annual reporting of radon emissions from mine ventilation shafts. EPA's regulations limit the emissions of Radon-222 to the ambient air from an underground uranium mine to an amount that would not cause any member of the public to receive an annual incremental dose of 10 mrem above background levels. EPA's regulations do not require monitoring of other radon emissions at uranium mines due to their relatively low levels compared to the emissions from underground ventilation systems. Based on studies at multiple uranium mines in the southwestern U.S., the radon emissions from surface facilities, including ore stockpiles, development rock piles, and ore loading, are so small in comparison to emissions from vents (specifically, "insignificant when compared with the overall uncertainty in estimated total emissions"), that they can be ignored in estimations of total radon emissions from a mine site (EPA, 1985). Such other sources were determined to constitute only between

two and three percent of a mine's total radon emissions. That is why the radon emission standards in 40 CFR Part 61 Subpart B are limited to radon emissions from mine vents.

EPA (1991) reports that background concentrations of Ra-226 in mine-waste rock piles typically average 23.7 pCi/g. In March 2014, Energy Fuels completed a report evaluating the radiological characteristics of uranium mine waste rock at five mine sites in western Colorado and eastern Utah, including the Daneros Mine. Samples were collected and analyzed over seven years. The report details the methods and modeling used and is provided as Appendix E. The report reached the following conclusions:

- Initial waste rock generated during mine development included low levels of radionuclides (see Table 5.2 in Appendix E, which lists the Ra-226 and thorium-230 [Th-230] activity levels from quarterly sampling of the waste rock pile at the Daneros Mine). During development of the declines through relatively inert rock, the Ra-226 activity levels ranged from 3.9 to 15.5 ρCi/g and averaged about 8.3 ρCi/g. Once the mine advanced into the ore body and commenced full production, the Ra-226 activity levels ranged from 32.4 to 59.3 ρCi/g with an average of 42.3 ρCi/g. Th-230 activity levels closely approximated Ra-226 levels, indicating that the mined material is in radioactive equilibrium (see Table 5.2 in Appendix E). Similar levels were found at two other mines in the area (see Table 5.3 in Appendix E).
- Waste rock at uranium mines in the region contained substantially lower metal concentrations and radionuclide activity levels than the ore (e.g., approximately 40 ρCi/g Ra-226 for waste rock compared to 700 ρCi/g Ra-226 for ore).

3.4.3.2 Mine Rock – Acid and Other Deleterious Leachate Generation

Attachment D to Energy Fuels' MPOM provides a detailed analysis of the geochemical characteristics of the mine rock within the Proposed Action. The analysis results concluded the following:

- Uranium mineralization at Daneros is hosted by sandstones and conglomerates of the Shinarump Member of the Chinle Formation, and uranium mineralization is spatially associated with accumulations of fossilized wood and pyrite mineralization.
- The potential for development rock produced from the Shinarump Member to generate acid varies, but overall, the average characteristics of Shinarump Member development rock indicate that it does have potential to generate acid. Seven of the 10 samples collected from the underground mine and all of the multi-increment samples of Shinarump Member development rock exhibited negative net neutralization potential based on acid base accounting analyses.
- The acid potential of the Shinarump Member development rock varies over short distances within the underground mine. Therefore, segregation of acid generating and non-acid generating development rock from the Shinarump Member during mining is likely to be difficult.
- Both Shinarump Member development rock and ore have potential to generate deleterious leachate if sufficient water is present to cause percolation through the rock piles. Ore, which is only stored on site for a short time period, has the potential to generate leachate containing elevated levels of antimony, arsenic, nitrate, thallium and uranium. Development rock has the potential to generate leachate containing elevated levels of arsenic, nitrate and uranium.

3.4.3.3 Transportation

Ore extracted from the Daneros Mine would be hauled to the White Mesa Mill near Blanding, Utah for processing using CR B258 and CR D0029 and State Highways (SH) 95 and 191. Both county roads are unpaved, with a partial gravel surface, and both state highways are paved. An independent contractor would transport the ore according to USDOT regulations (CFR Title 49, Transportation), and in accordance with Energy Fuels' "Transportation Policy for Shipments of Colorado Plateau Uranium Ores to the White Mesa Uranium Mill" (MPOM – Attachment N).

According to the Utah Department of Transportation's (UDOT) annual average daily traffic (AADT) counts, traffic on segments of State Highways 95 and 191 that are part of the access route has decreased in recent years. Reported AADT on SH 95 between SH 261 and SH 191 decreased from 555 vehicles in 2007 to 420 vehicles in 2010 and to 405 vehicles in 2012. Reported AADT on SH 191 increased from 2,505 vehicles in 2007 to 2,525 vehicles in 2010 and decreased to 2,450 vehicles in 2012. Overall, between 2007 and 2012, AADT decreased 27 percent on SH 95 and 2 percent on SH 191 (UDOT, 2014). Traffic counts are not available for CR B258 or D0029 (Franklin, 2014).

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The environmental consequences of the implementation of each Alternative described in Chapter 2 are presented for each of the resources and potential issues of concern identified in Chapter 2 as requiring detailed analysis. The analysis focuses on air quality, water quality and human health and safety.

4.2 Direct/Indirect Impacts Alternative A – Proposed Action

Potential impacts to the resources identified by internal and external scoping are analyzed below for the Proposed Action.

4.2.1 Air Quality

Air quality impacts from mine development and operation would result from fugitive dust generation, diesel engine exhaust, and radioactive dust and gases released into the atmosphere. These potential impacts would be created by mine operations and truck travel on unpaved roads. The approved BLM MFO RMP contains Management Actions intended to meet and comply with federal, state, and local air quality laws and regulations (BLM, 2008a: 57-58). The Proposed Action would adhere to the applicable management actions specified in the RMP.

To implement these Management Actions, Energy Fuels would be required to control emissions as required by the UDAQ Approval Order (UDAQ, 2014a) and State of Utah regulations. The State of Utah requires that mining operations limit dust to 20 percent opacity on site and 10 percent opacity at the property boundary. In this case, the boundary would be the mine portal areas. UDAQ approval order DAQE-AN144920002-14 for expansion of the Daneros Mine further limits fugitive dust emissions from on-site haul roads and operational areas to 15%. These limits give inspectors an objective tool to determine compliance with particulate control measures. Energy Fuels would also be required to use clean fuels and diesel engines with EPA-approved emission controls to minimize exhaust impacts. Ambient air radon tests and annual radon reporting would be conducted to ensure that public and worker health is protected. The MPOM – Attachment O includes a Fugitive Dust Control Plan that details the methods that would be employed to meet UDAQ's regulations and the conditions of the Daneros approval order.

The above measures, which have been incorporated in the Proposed Action, are designed to control dust generated by mining and ore transportation, minimize NOx and other pollutant emissions from diesel engines, reduce worker exposure to radon, and prevent radioactive material from being spread by wind or during transport. With adherence to these built-in mitigation measures, operation of the Daneros Mine would not result in exceedances of the NAAQS (see Table 11) or radiological standards (established by EPA, MSHA, and UDAQ). As described below, impacts to air quality as a result of mine operations and ore transportation would be minor and would not cause a violation of state or federal air quality standards or degrade any Class I area in the region. Natural Bridges National Monument, a Sensitive Class II Area, is about 8 miles from the mine and impacts to that area are also described below.

4.2.1.1 Underground Air Emissions Sources – Mine Ventilation

Energy Fuels' existing ventilation plan would be updated as needed to conform to changing conditions and MSHA regulations. As described in Section 2.2, the area of the two existing Daneros portals would be used for access, ventilation, and a secondary escape route. The Bullseye Portal Area would be re-opened as a ventilation and haulage portal. Two new portals would be developed at the South Portal Area, with one portal used for primary access and ore haulage and the other used for ventilation. Two existing vent shafts and up to eight new vent shafts (between 6 and 10 feet in diameter) installed during mine development would provide air intake or exhaust. Fans, in combination with vent tubing and ventilation doors, would be used to direct fresh air through the mine wherever workers are present. The combination of declines, vent shafts, and fans would maintain adequate ventilation for worker safety in accordance with MSHA requirements.

Criteria pollutants emitted underground would be exhausted through mine exhaust portals and vents. Underground emissions sources would include fugitive dust and gaseous emissions from blasting and diesel exhaust from mining equipment and ore haul trucks. Under the Proposed Action, annual PM_{10} from underground sources would total 1.3 tons per year and annual NOx from underground sources would total 48.7 tons per year (see Appendix F). Visible emissions at the surface from underground mine exhaust may not exceed 20 percent opacity, in accordance with UAC R307-205-4.

Radon is a health concern in confined spaces where it can accumulate without adequate ventilation due to its tendency to sink and concentrate, which is why the EPA has mounted a concerted effort to have people test their homes for radon and take action if necessary. Radon emissions from the Project Area could result in air quality health concerns for workers if radon became concentrated in the underground mine workings or in buildings used by mine staff. The MPOM positions all buildings well away from the vent shafts to protect worker health. Additional discussion regarding radon and worker health is provided in Section 4.2.3.1.2.

As a result of radon's propensity to dissipate very quickly in open air, the amount of radon gas at areas accessible to the public is very small and does not pose a health risk (Health Canada, 2012). This would be verified by monitoring of the mine exhaust in accordance with 40 CFR, Part 63, Subpart B. This federal regulation, which is enforced by UDAQ, limits emissions of radon-222 to the ambient air from an underground uranium mine to an amount that would not cause any member of the public to receive an annual dose exceeding 10 mrem. Therefore, no effects (or immeasurable effects) to air quality from radon would occur at greater distances, such as at the nearest residence to the mine, at Natural Bridges National Monument, or along the haul route between the mine and mill.

Based on the planned life-of-mine uranium ore production rate being greater than 100,000 tons, the Proposed Project would be subject to Subpart B of the NESHAP for underground uranium mines and 40 CFR Part 63, Subpart A, General Provisions and Subpart B, Underground Uranium Mines. As a result, the mine would be subject to annual radon monitoring and recordkeeping requirements. Radon emissions from the mine exhaust vents would be monitored and controlled in accordance with standards implemented under UDAQ and EPA's regulations. The measured exhaust flow rate (cubic meters per second) and the radon concentrations within the exhausts would be utilized to calculate an annual radon emission rate. The annualized emission rate data, the physical parameters of the mine exhaust, and the location of the nearest resident are entered into EPA's computer model (Comply-R) or an equivalent, EPA-approved model. The model output is compared against the 10 mrem/yr standard to determine compliance or the need for further radon control. The results are reported annually to UDAQ when the mine is ventilating. These annual requirements would verify that public and worker

health are protected. The mine was closed and put on standby status on October 19, 2012. The modeled results of the 2012 Annual Compliance Report, filed by Energy Fuels with UDAQ in March 2013, showed that the mine was in compliance for emissions of radon-222 with a total dose to the nearest resident of 0.2 mrem/yr.

4.2.1.2 Surface Air Emissions Sources

The Proposed Action would result in pollutant emissions from a variety of mining-related activities. Emissions would include fugitive dust and diesel combustion emissions from vehicle travel; particulate emissions from material handling; wind-blown fugitive dust from ore, development rock, and topsoil stockpiles; diesel storage tank vents; and diesel exhaust from generators and ore haul trucks. These mine activities are discussed in Section 2.2.

As required by Utah State Air Quality Rule R307-400, a Notice of Intent (NOI) was submitted to UDAQ in October 2012 to obtain an Approval Order (AO) for the Daneros Mine expansion. The NOI document was based on a maximum annual operating scenario at an annual production rate of 72,000 tons per year, which varied from this EA, which analyzes an average annual scenario at an annual production rate of 25,000 tons per year. The NOI provided all required documentation pursuant to UAC Rule R307-401, including a Best Available Control Technology (BACT) analysis. That analysis reviewed air emissions controls proposed for the generators, material handling, storage piles, on-site road dust fugitives, and storage tanks to confirm that the facility was utilizing the most appropriate and effective environmental controls within the limits of cost and technology. The proposed BACT included Tier 4i compliance diesel engines, dust suppression, minimizing drop height for material handling sources, covering truck beds during ore transport, stabilizing storage piles with fast-growing seed, and reducing road dust on-site by limiting speed and applying water and chemical dust suppressants.

Four 455-kW (approximately 610 horsepower [hp]) diesel electricity generators would provide electric power. Two of these generators would be located at the Daneros Portal Area, one at the South Portal Area, and the fourth generator would initially be located at the Bullseye Portal Area. After underground workings have advanced to connect the Daneros and Bullseye Portal areas, the fourth generator would be relocated to the South Portal Area. The BACT analysis, conducted for the NOI, dictates that the generators would meet strict Tier 4i EPA emissions standards. Assuming the four 455-hp engines would operate year-round, annual NOx emissions would total 61.3 tons/year (see Table A-2 in Appendix F), about 54 percent of the Proposed Action's total NOx emissions.

Uranium mining impacts are generally similar to those of other metallic mineral mines (i.e., dust and engine exhaust). Radioactive dust and gases (e.g., radon) from mining uranium ore require some special management, in addition to the general environmental controls of any mine. Mining of uranium releases radon into the atmosphere. Underground mines potentially pose a higher radon risk to both the public and workers because radon tends to sink and concentrate inside the mine. Conversely, open-pit and in-situ mining sites have been monitored by federal agencies and found to pose a low risk to the public due to rapid dissipation of radon in the atmosphere.

In addition to mine ventilation discussed in Section 4.2.1.1, other sources of radon include the ore stockpile and DRAs. As with radon gas vented to the surface from the underground mine, radon emission at the ore stockpile and DRAs would dissipate very quickly in open air and would not be an air quality concern. Project design features to further reduce radon exposure levels include concurrent reclamation of portions of the site, minimal on-site stockpiling of ore, and restricting access to the public during mine operations.

The ore from the Proposed Action would be trucked approximately 65 miles on public roads and highways to the White Mesa Mill in Blanding, Utah. There is a potential for ore dust to blow out of the haul trucks and, over the 20-year life of the Proposed Project, spread uranium ore along public roads and adjoining areas. This was a common occurrence historically when ore trucks were not covered. Dust control measures, including tarpaulin covers and tailgate closure requirements for haul trucks, are now required by the USDOT and the Utah Department of Transportation (UDOT) to avoid spreading ore in transport. The required radiation control measures are detailed in the Transportation Policy for Shipments of Colorado Plateau Uranium Ores to the White Mesa Uranium Mill (MPOM – Attachment N).

4.2.1.3 Mine-Wide Project Air Emissions

Air pollutant emissions of criteria pollutants (PM_{10}, $PM_{2.5}$, CO, SO_2, NOx, lead), CO_2, and hazardous air pollutants (HAPs – benzene, toluene, ethylbenzene, xylene, n-Hexane, arsenic, manganese, barium, rubidium, strontium, titanium, uranium, zirconium, radionuclides) were calculated for on-site and off-site air emissions sources. Emission sources within the mine permit boundary as described and shown in the Notice of Intent for the UDAQ AO #DAQE-AN14492002-14 AO were classified as on-site sources, and included surface and underground mining activities and support equipment. Similarly, emission sources outside the mine permit boundary were classified as off-site sources, and included ore haul on Radium King Road to the White Mesa Mill. Emissions were based on site-specific information, such as fuel consumption, length of travel on dirt roads, silt content of the dirt roads, the type of vehicles, and speed of vehicles, and calculations were performed using engineering design specifications and standard emission calculation equations, such as EPA's AP-42 (EPA, 1995). The detailed information and assumptions used in the emissions inventory are provided in Appendix F.

Appendix F documents emissions calculations for two operating scenarios; a maximum annual case at a production rate of 72,000 tons per year and an average annual case at a production rate of 25,000 tons per year. Similar on-site mine activity parameters and equipment specifications were utilized for both production scenarios, resulting in very similar emission rates for the two production scenarios for sources at the mine site. The primary difference in calculated emission rates for the two production scenarios occurred from the difference in off-site haul truck travel. A greater number of haul truck trips to the White Mesa Mill were required to transport 72,000 tons of ore than were required for 25,000 tons of ore per year, which resulted in higher annual emission rates for off-site transport under the maximum annual operating scenario.

Annual criteria air pollutant emissions for the average annual operating case at a production rate of 25,000 tons per year are summarized in Table 21. The remainder of this section discusses issues specific to inventoried pollutants PM_{10}, $PM_{2.5}$, CO, SO_2, NOx, lead, CO_2, and sulfuric acid.

PM_{10}. A total of 16.5 tons/year of PM_{10} would be emitted by the Proposed Project within the mine permit boundary, the vast majority of which would be fugitive dust from vehicle travel on the dirt road and equipment use on the mine site. Permitted stationary sources account for 1.8 tons/year of total PM_{10}. Tier 4i-compliant generators are specified for the Proposed Project which limits PM_{10} emissions. An additional 7.5 tons/year is calculated to be emitted from mobile sources operating off-site, primarily haul trucks travelling to the White Mesa Mill via Radium King Road (see Appendix F).

Particulate matter is the main source of haze that reduces visibility. Some dust is unavoidable from motor vehicle travel over unpaved roads. Energy Fuels would employ control measures and operating procedures to minimize fugitive particulate emissions into the atmosphere, as specified by UAC R307-205-7 and as required by UDAQ AO DAQE-AN144920002-14 (UDAQ

2014a). The UDAQ AO limits visible emissions from haul road and mobile equipment fugitive dust within the mine permit boundary to 15 percent opacity, limits vehicle speed to 15 mph, and requires all regularly-travelled unpaved roads or other unpaved areas to be water sprayed and/or chemically treated to control fugitive dust.

The UDAQ AO pertains to the mine area only, whereas the Fugitive Dust Control Plan (MPOM – Attachment O) specifies procedures for reducing fugitive dust emissions resulting from mine sources on and off site. Access to the mine area by haul trucks and other vehicles requires travel for 12.5 miles one-way on unpaved County Road B258 (Radium King Road). The road is owned and maintained by San Juan County but impacts to the road and dust generated by mine activities would be mitigated by Energy Fuels. Dust generation by mine vehicles on this county road would be reduced using a combination of speed control, dust palliatives and water application as needed.

Table 21
Proposed Project Criteria Air Pollutant and HAP Emission Rates Average Annual Operating Case (tons/year)

Pollutant	On-Site Stationary Source Emissions	On-Site Fugitive and Mobile Source Emissions	Off-Site Fugitive and Mobile Source Emissions	Total Project Emissions for Average Annual Operating Case
SO_2	0.12	4.03	0.02	4. 3
NOx	61.3	52.7	6.2	120.2
PM_{10}	1.8	14.7	7.5	24.0
CO	61.8	100.6	22.8	185.2
Lead	Negligible	8.4E-04	Negligible	8.4E-04
$PM_{2.5}$	1.8	3.3	1.7	6.8
Benzene	2.56E-02	2.05E-04	--	2.58E-02
Toluene	1.12E-02	1.64E-04	--	1.14E-02
Ethylbenzene	--	2.55E-05	--	2.55E-05
Xylene	7.82E-03	1.04E-05	--	7.83E-03
Hexane	--	4.47E-04	--	4.47E-04
Antimony		8.2E-06		8.2E-06
Arsenic	--	1.7E-03	--	1.7E-03
Beryllium		8.2E-06		8.2E-06
Cadmium		8.7E-06		8.7E-06
Chromium		5.2E-05		5.2E-05
Manganese	--	3.8E-04	--	3.8E-04
Mercury		1.6E-06		1.6E-06
Nickel		5.4E-04		5.4E-04
Selenium		8.2E-06		8.2E-06
Uranium	--	2.1E-03	--	2.1E-03
Vanadium	--	9.7E-05	--	9.7E-05
Radionuclides	--	2.2E-03	--	2.2E-03

The beginning stretch of County Road B258, just after turning off Highway 95, is generally straight and level and a speed of 25 miles per hour (mph) would be allowed for mine-related traffic. Once the road turns to the west and heads up the side of the mesa, vehicle speeds would be limited to 15 mph. Per Sanders, reducing vehicle speeds from 30 mph to 20 mph for a three-minute duration reduced dust production by over 60 percent (e.g., 4.2 g at 30 mph vs. 1.6 g at 20 mph) (Sanders 2008). The Fugitive Dust Control Plan includes spraying the unpaved haul roads with water as needed. Dust palliatives (e.g., magnesium chloride) would also be applied to the roads, as needed, to bind soil particles and lessen the demand for water application. Allowing greater vehicle speeds on the straight section of Radium King Road will increase the potential for dust generation, therefore this stretch of road may be treated more regularly.

Implementation of the Fugitive Dust Control Plan would help control PM_{10} to protect human health and minimize impacts on visibility in the region. Emissions from the Project are primarily low-level and mechanically-generated. Federal Land Managers recognize that for these types of emissions, almost all PM_{10} drops out within 36 km of the source (Countess et al., 2001). Based on these findings, PM_{10} from the Proposed Project would not degrade visibility at Canyonlands National Park, the nearest Class I area, because it is located approximately 54 km from the mine.

$PM_{2.5}$. A total of 5.1 tpy of $PM_{2.5}$ would be emitted on-site by the Proposed Project. The same source categories that emit PM_{10} would emit $PM_{2.5}$. There is no guidance from FLAG or the UDAQ recommending modeling thresholds for $PM_{2.5}$ emissions. Some level of secondary $PM_{2.5}$ formation would be anticipated to result from NOx emissions; however the source's minor source status suggests those quantities would be small. Mine-wide SO_2 emissions are quite small at 4.2 tons per year, and their contribution to secondary $PM_{2.5}$ would be minimal. Impacts to Canyonlands National Park visibility are assumed to be negligible given the small amount of $PM_{2.5}$, NOx, and SO_2 emitted, and the distance and undulating terrain between the National Park and the mine.

Carbon Monoxide. Carbon monoxide (CO) disperses rapidly in the atmosphere. National average CO concentrations decreased 83 percent between 1980 and 2012, and CO concentrations in the southwest U.S. decreased 61 percent between 2000 and 2012 (EPA, 2014e). All parts of the U.S. now attain the CO standard except for Clark County, Nevada (Las Vegas). Ambient levels are so low in most of rural Utah that CO monitoring was discontinued. For the Proposed Project, 162.4 tpy of CO would be produced on-site by diesel engines (stationary generators and mobile sources) and in the blasting process. CO emissions (22.8 tpy) would also be produced by diesel ore haul trucks operating predominantly off-site. These emissions would be dispersed over the length of that trip and diluted by local air movements.

Sulfur Dioxide. The Proposed Action would emit an estimated 4.2 tons/year of SO_2 on-site, with 4.0 tons/year of that total produced from combustion of ammonium nitrate and sulfur-containing fuel oil in the blasting process. The Q/D ratio (described in Section 4.2.1.4) includes SO_2 emissions, and is well below the accepted guideline, indicating that no air modeling is required to protect air quality related values (AQRVs - visibility and acid deposition). Energy Fuels would comply with clean engine standards and utilize low-sulfur diesel fuel for all mine equipment and generators to limit sulfates that could degrade visibility.

Nitrogen Oxides. The Proposed Action would emit a total of 114.0 tons per year of NOx on-site. As shown in Table 21, stationary sources account for 61.3 tons/year of that NOx emissions total. A total of 24 tons/year of NOx are attributed to fugitive emissions from blasting, and diesel combustion in mobile sources contributes 28.7 tons per year to the total. The Q/D calculation (see Section 4.2.1.4) included NOx emissions and determined that impacts to visibility are likely to be negligible.

Lead. There are NAAQS for lead as a gas or particulate. Airborne lead was once a wide-spread problem because it was in gasoline. Lead was found as a particulate in the air, and also as a deposit on surfaces and in soil throughout the U.S., especially in areas with high traffic volumes. Since leaded gasoline was phased out in the late 1970s, the only major sources now are lead smelters or other large stationary sources that use or process lead. There are no impacts from lead associated with the Proposed Project.

Carbon Dioxide. Carbon dioxide is a greenhouse gas. Approximately 14,335 tons/year of CO_2 emissions would be generated on-site primarily by diesel fuel combustion. An unknown amount of CO_2 would also be generated by blasting activities (there are no EPA emission factors for CO_2). The amount of CO_2 from the Proposed Project would be small and dispersed over a large

area. From a regulatory standpoint the Project is considered a relatively minor source of air emissions. Project emissions of greenhouse gases (CO2) do not rise to the level that would require a detailed analysis in the EA (see Appendix C).

Sulfuric Acid. Sulfuric acid (H_2SO_4) is formed in the atmosphere when SO_2 combines with water vapor. No impacts would occur from H_2SO_4 as the amount would be undetectable based on the negligible amount of SO_2 emitted from the Proposed Project (see Table 21).

4.2.1.4 Direct Impacts

UDAQ has established emissions thresholds above which air dispersion modeling is required for a new or modified emission source, given in Table 1 of UDAQ's Emissions Impact Assessment Guidelines (UDAQ, 2011a). The quantity of criteria pollutant emissions from Daneros Mine sources under the maximum production case is compared to these thresholds in Table 22. The Proposed Project emission rates exceeded the thresholds for criteria pollutants PM_{10} and NOx, indicating that, at a minimum, air modeling would be required for those pollutants for the air quality permitting process. Air dispersion modeling has been completed by Energy Fuels as part of a NOI submitted to UDAQ, and the results of that analysis are discussed later in this section.

Table 22
Proposed Project Emissions Comparison to UDAQ Modeling Thresholds – Maximum Production Case (tons/year)

Pollutant	Modeling Threshold	Daneros Project Stationary Source Emissions	Daneros Project Fugitive and Mobile Source Emissions
SO_2	40	0.1	4.0
NOx*	40	61.3	53.5
PM_{10}*	5 fugitive / 15 non-fugitive	1.8	17.6
C0	100	61.8	101.6
Lead	0.6	Negligible	Negligible
$PM_{2.5}$	n/a†	1.8	3.6

* Modeling required by UDAQ
† Not a listed value

Guidelines from FLAG considers a source located greater than 50 km from a Class I area to have negligible impacts with respect to Class I AQRVs if its total SO_2, NOx, PM_{10}, and H_2SO_4 annual emissions (in tons per year), divided by the distance (in km) from the Class I area is 10 or less (FLAG, 2010). This criterion is referred to as the Q/D ratio, and if the value is 10 or less, no further Class I AQRV impact analyses would be requested from the source. Based on total emissions from the Proposed Project shown in Table 21 and the distance to the nearest protected viewshed (Canyonlands National Park Class I area), the Q/D ratio is calculated as 2.5, which is well below the threshold value of 10. As a result, no Class I AQRV analyses are conducted.

UAC R307-410-5 requires that HAP emissions be assessed and reviewed in an NOI, and requires an emission threshold value (ETV) be calculated for each emitted HAP to determine if dispersion modeling is required. ETVs were calculated for each HAP to be emitted from the Daneros Mine and were compared to the estimated HAP emissions. No HAP emissions exceeded the associated ETV. As a result, no dispersion modeling was required for HAP emissions.

Air dispersion modeling assessed emissions of PM_{10}, NOx, and CO to predict impacts from maximum production at the Daneros Mine (72,000 tons per year) and was prepared as part of the NOI submittal to UDAQ. While the emissions inventory conducted for the BLM included an estimate of emissions from off-site transport of ore to the White Mesa Mill, dispersion modeling conducted for the Utah NOI did not assess air quality impacts from off-site transport. Supplemental dispersion modeling analysis was conducted to assess potential impacts from

travel on dirt roads between the mine and SH 95. This is discussed in section 4.2.1.6 and Appendix G.

Four scenarios were analyzed and documented in two separate reports. The original NOI submittal (Energy Fuels, 2012) included two modeled scenarios assessing PM_{10} and NOx impacts: 1) surface operations under the Proposed Action with the fourth generator located at the Bullseye Portal, and 2) surface operations under the Proposed Action with the fourth generator at the South Portal. A supplement to the NOI (Energy Fuels, 2014) analyzed NOx and CO impacts from surface and underground operations that included both previously modeled scenarios plus blasting emissions released from the mine exhaust vents. Although Daneros Mine CO emissions did not exceed modeling thresholds shown in Table 22, CO is one of the primary pollutants emitted during the blasting process and was analyzed.

The dispersion modeling study was conducted in accordance with UDAQ modeling guidelines (UDAQ, 2011a). The AERMOD model was used to predict PM_{10}, NOx, and CO concentrations from mine sources and utilized surface meteorological data from the National Weather Service (NWS) station located in Page, Arizona for the period January 1, 2005 through December 31, 2009 and upper air meteorological data from the Flagstaff, Arizona NWS station for the same period.

Regional ambient background concentrations representative of existing conditions in the area were added to modeled concentrations to arrive at a total pollutant concentration for comparison to the NAAQS. Table 23 summarizes these model results and compares them to the NAAQS. Each of the four scenarios demonstrates that operation of the Proposed Action would comply with applicable NAAQS.

Table 23
Dispersion Modeling Results Summary, PM_{10}, NOx, and CO

Scenario	Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)[a]	Total Concentration ($\mu g/m^3$)[a]	NAAQS ($\mu g/m^3$)[a]
Proposed Action – South Portal Generator	PM_{10}	24-Hour	70.2	45	115.2	150[b]
	NOx	1-Hour Annual	144.68 11.73	41.58 11.20	186.26 22.93	188[c] 100
Proposed Action – Bullseye Portal Generator	PM_{10}	24-Hour	70.2	45	115.2	150[b]
	NOx	1-Hour Annual	145.36 10.77	41.58 11.20	186.94 21.97	188[c] 100
Proposed Action incl. Blasting – South Portal Generator	CO	1-Hour 8-Hour	248.6 55.9	345 345	593.6 400.9	40,000[b] 10,000[b]
	NOx	1-Hour Annual	83.0 2.7	41.6 11.2	124.6 13.9	188[c] 100
Proposed Action incl. Blasting – Bullseye Portal Generator	CO	1-Hour 8-Hour	248.6 81.4	345 345	593.6 426.4	40,000[b] 10,000[b]
	NOx	1-Hour Annual	98.5 3.6	41.6 11.2	140.1 14.8	188[c] 100

[a] $\mu g/m^3$ = micrograms per cubic meter.
[b] Not to be exceeded more than once per calendar year.
[c] Based on the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations.
PM_{10} dispersion modeling results from (Energy Fuels, 2012).
NOx and CO dispersion modeling results from (Energy Fuels, 2014).

4.2.1.5 Indirect Impacts from Milling Operations

UDEQ permits and regulates the White Mesa Mill through its air quality permitting program, which places operational limits on the mill to ensure emissions from mill operations do not violate ambient air quality standards. In addition, the White Mesa Mill is subject to NSPS 40 CFR Part 60 Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units) and NESHAP 40 CFR Part 61 Subpart W (National Emission Standards for Radon Emissions from Operating Mill Tailings). Maximum Achievable Control Technology (MACT) regulations do not apply to this source, nor is a Title V operating permit required at the present time.

The White Mesa Mill is permitted by UDAQ AO No. DAQE-AN0112050018-11 (UDAQ, 2011b). The AO includes several provisions, requirements, and limitations that are designed to mitigate impacts to air quality from mill operations. Mitigation includes opacity limitations at sources of fugitive dust, application of water or chemical treatments to roads, fuel requirements for internal combustion engines, and limitations and testing procedures for specialized equipment.

The UDAQ AO authorizes the mill to process up to 720,720 tons per year (tpy). The mill receives uranium ore and alternate feed material from many sources. Based on current and past experience, the ore feed would be produced at, and transported from, mines in the Four Corners Area of Colorado, Utah, Arizona and New Mexico. The alternate feeds include uranium-bearing materials derived from uranium conversion, tantalum and other metal processing, and materials from U.S. government clean-up projects (USGS, 2011). The MPOM states that average ore production at Daneros would equal 25,000 tpy, or four percent of the maximum mill feed. The NOI submittal to UDAQ for the Proposed Action was based on maximum annual production of 72,000 tpy, or approximately ten percent of the total mill feed material. The UDAQ AO allows the mill to emit 34 tpy of PM_{10} (including 17 tpy $PM_{2.5}$), 40 tpy of NOx, 10 tpy of CO, 3 tpy of SO_2, and 4 tpy of VOCs. Table 24 compares the allowable White Mesa Mill criteria pollutant emissions to the emission totals attributable to the processing of Daneros ore at both the peak mine production and average mine life production.

Table 24
Comparison of Mill Emissions

Criteria Pollutant	Allowable Emissions from White Mesa Mill (tpy)	Mill Emissions Attributable to Daneros Ore Supply at Peak Mine Production (tpy)	Mill Emissions Attributable to Daneros Ore Supply at Average Mine Life Production (tpy)
CO	10	1.0	0.4
NO_2	40	4.0	1.6
PM_{10}	34	3.4	1.4
$PM_{2.5}$	17	1.7	0.7
SO_2	3	0.3	0.1

Compliance with the UDAQ AO ensures that the White Mesa Mill would not violate ambient air quality standards. The amount of criteria pollutant emissions that could be attributed to the processing of Daneros ore would equal the same percentage of total mill feed material as noted above and, therefore, would not cause or contribute to a violation of the NAAQS.

The US Geological Survey (USGS) prepared Scientific Investigations Report 2011-5231 titled “Assessment of Potential Migration of Radionuclides and Trace Elements from the White Mesa Uranium Mill to the Ute Mountain Ute Reservation and Surrounding Areas, Southeastern Utah” (USGS, 2011) to investigate windblown dust at the White Mesa Mill. The USGS report identified wind-blown contaminates originating from the vicinity of White Mesa Mill.

Concerns regarding these wind-blown contaminates were raised by the public during the public comment period for a subsequent Mill Radioactive Materials License Amendment. Responses

to those public concerns were prepared by the Utah Division of Radiation Control and appeared in a Public Participation Summary (DRC, 2014) and are summarized below:

- Seven off-site samples showed levels of sediment contamination above levels identified by USGS as background. USGS concluded that four of those samples have indications that they are from natural weathering rather than ore deposition. The seven sample results provide a basis for requiring additional sampling and analysis. They do not provide a basis for immediate response, using EPA guidelines. Further sampling and analysis will be required; that sampling and analysis will address the likely source of any off-site contamination in order to ensure an appropriate regulatory response.
- A sagebrush study showed that wind-blown dispersal of uranium ore had occurred, and there was a correlation between the direction of dispersal from the Mill indicated in that study and the increased levels of uranium in the sediment. This study is appropriate to use to evaluate plans for further study and analysis. A revised monitoring plan is being required in License Condition 11.9. One of the purposes of the license condition is to evaluate the source of the off-site deposition. It is not appropriate to use this study alone to make any determinations about the existence of off-site contamination. Completely eliminating blowing contaminants is not realistic for an industrial facility and it is not the regulatory standard.

The results of the USGS study indicate that contamination is limited. The Public Participation Response stated: “surface and airborne contamination does not pose a threat.” (DRC, 2014, Response to Comment 30). The White Mesa Mill license amendment approved by the Utah Division of Radiation Control in 2014 (UT 1900479) includes additional monitoring requirements followed by data analysis and potentially corrective action where radiation levels are elevated.

Historic White Mesa Mill production, through 2013, totals approximately 5 million tons of ore. The Daneros Mine produced up to 100,000 tons of ore between 2009 and 2012. All other factors being equal, it is estimated then that roughly 2 percent of total wind-blown dust originating from ore stockpiles at the mill through 2013 can be attributed to Daneros ore stockpile. Future wind-blown dust originating from Daneros ore stockpiles at the mill is expected to be less than four percent of total ore stockpile dust emissions based on maximum mill production of 720,720 tons/year and average mine production of 25,000 tons/year.

4.2.1.6 Impacts to Natural Bridges National Monument

Natural Bridges National Monument is a Sensitive Class II Area and is located 13 km east-northeast of the mine. Potential fugitive dust impacts from the mine operations would be minimal at the monument due to implementation of UDAQ AO mitigation measures and the Fugitive Dust Control Plan. Natural screening, resulting from the elevated topography between the mine and the monument, would also limit potential impacts. Potential fugitive dust impacts from mine-related travel on County Road B258 pose the most substantial possible impacts and were quantified using dispersion modeling analysis. A memorandum summarizing the modeling assumptions and results is included as Appendix G. This modeling was based on a maximum ore production of 72,000 tpy which is highly conservative since the average mine production is 25,000 tpy. The results of the modeling demonstrate that potential impacts from Daneros Mine operations will not have adverse impacts within the monument. Modeled impacts of CO, SO_2, and $PM_{2.5}$ at the monument were all below EPA’s Significant Impact Levels (SILs) which were established for these pollutants for the New Source Review permitting purposes. An emission source whose modeled impacts are below the SILs for a given pollutant are considered to be low enough that further evaluation for compliance with the NAAQS and/or PSD increments is not needed. Modeled impacts of NO_2 and PM_{10} were both slightly above the SILs meaning that further evaluation may be warranted. The next level of evaluation is to add them to background

concentrations and compare them with the NAAQS. As shown in Appendix G, Table 2, the sum of the Regulatory Modeled Impact and Background, also known as the "total concentrations" for, NO_2 and PM_{10} are significantly below the NAAQS as well as the Class I and II PSD increment values.

4.2.1.7 Summary of Air Quality Impacts

The Proposed Project includes mitigation and design control measures to mitigate impacts to air quality. These control measures include the use of BACT, low-sulfur diesel fuel, a dust control plan to achieve a reduction in dust emissions, and Tier 4i generators. Emission calculations for the Proposed Project show that, with these and other proposed control measures, the Proposed Project would be a minor source of criteria pollutants as defined by the CAA. Air dispersion modeling conducted in accordance with UDAQ guidelines demonstrates that the Proposed Project would comply with applicable NAAQS. FLAG screening methods indicate that Class I AQRV analyses are not required as impacts would be minor.

The processing of Daneros ore at the White Mesa Mill would have no appreciable indirect impacts to air quality and would not result in a violation of the NAAQS.

4.2.2 Water Quality

Water quality impacts from mine development and operation would be similar to those identified in the 2011 EA. Impacts during operations may include erosion, sedimentation, increased uranium concentration in soils, and changes in water quantity or quality of the shallow, perched aquifer and deeper, regional aquifer. All three proposed portal areas contain historic mine disturbance that may have had some impact on water quality. If the Proposed Action is implemented, those sites would be put back into operation and then reclaimed, thus reducing the potential for long-term impacts to surface and groundwater resources from those areas.

4.2.2.1 Surface Water

Similar to the area around the Daneros Portal, described in the 2011 EA (BLM, 2011), the areas around both the Bullseye and South portals were previously disturbed by historic mining activities (see Section 2.2). Also similar to the redevelopment of the area of the Daneros Portal, the redevelopment of the areas around the Bullseye and South portal areas would include construction of mine yards, upgrades to existing portals or construction of new portals, office/shop, ore stockpiles, DRAs, and topsoil stockpiles. The potential impacts are the same as those identified in the 2011 EA, including erosion, sedimentation, increased uranium concentrations in soils, and drainage from the DRAs (BLM, 2011). Therefore, the surface water mitigation and design measures put in place for the Daneros Portal (see Section 2.2 in the 2011 EA) would be extended to the Bullseye and South Portal areas, including drainage control, conformance with the provisions of the SWPPP (MPOM – Attachment G), and final reclamation (see Section 2.2). The site-specific potential impacts and design details for each portal area are described in the Drainage Report (MPOM – Attachment C). The SWPPP for the Proposed Action is required by the CWA and includes erosion control measures such as diversion ditches for all disturbed areas.

The CWA, under the National Pollutant Discharge Elimination System (NPDES) program, requires facilities that may discharge pollutants into waters of the U.S. to be covered either by an individual or general permit, which establishes pollution limits, and specifies monitoring and reporting requirements. EPA has the authority under the CWA (and other environmental laws) to regulate radioactive materials not specifically addressed under the Atomic Energy Act. With regard to the CWA, any regulated pollutant discharged from a point-source from uranium mines is subject to either water quality- or technology-based effluent limits developed by EPA (see 40 C.F.R § 440.30-34), unless a specific Total Maximum Daily Load (TMDL) study has been

completed or proposed for a specific waterbody or watershed in the state. In a TMDL scenario, the regulated source would need to meet the limits allocated to them. The State of Utah has not completed or proposed any TMDL study near Red Canyon. No point-source pollutants would be discharged directly into waters of the U.S. by the Proposed Project, thus no individual permit would be required. The required stormwater general permit for on-site activities has been obtained through UDEQ.

Acid-forming or deleterious materials are unlikely to affect surface water, because these facilities would be managed in accordance with the Drainage Report (MPOM – Attachment C) and SWPPP (MPOM – Attachment G). The mitigation measures discussed in the drainage report are designed to contain the surface water runoff from the areas containing acid-forming or deleterious materials in sediment detention ponds for all storm events up to the design storm event (the 24-hour/100-year storm). Although an episodic stormwater discharge from areas of the mine containing acid-forming or deleterious materials would be possible during storm events that exceed the design storm, very large volumes of stormwater from other unaffected areas would be present during these events. This water would dilute any potential discharge from the detention ponds effectively mitigating adverse effects to surface water quality. In addition, no perennial or intermittent surface waterbodies are present in the vicinity of the Daneros mine, and any discharge that occurred during these infrequent, very large storm events would be discharged into ephemeral drainages, which do not contain aquatic ecological receptors that would be adversely affected.

Fuel would be stored on site in aboveground self-contained fuel tanks. As discussed in the SPCC Plan (MPOM – Attachment I), these tanks would be double walled, designed for storage of petroleum products, and constructed in accordance with Underwriter Laboratories Inc. standards for aboveground storage tanks. Because the proposed aboveground storage tanks would be double walled with monitoring ports, additional secondary containment would not be required under federal regulations. However, Energy Fuels plans to install these tanks on concrete pads with concrete containment walls designed to contain the maximum capacity of the largest tank. The tanks would be leak tested prior to installation and would be maintained and monitored in accordance with the mine SPCC Plan. Other oils, lubricants, and chemicals would be stored in a partitioned and locked area within the shop. These containment measures, in addition to those incorporated into the SWPPP, would effectively contain any spilled fuel, lubricant, or chemicals and prevent these contaminants from migrating off site.

One potential impact discussed in the 2011 EA (BLM, 2011) was related to increased uranium concentrations in the on-site soils due to the use of water from Fry Spring for dust suppression. Based on the MPOM, the water from the supply well completed at the Daneros Portal would be used for dust suppression. The uranium concentration in the groundwater from the well, about 3 µg/L, is substantially less than that of the water from Fry Spring (over 50 µg/L) and the Utah's Division of Water Quality numeric standard of 30.0 µg/L for domestic use, further reducing any concern of increased uranium concentrations in the soils.

Another potential water quality impact discussed in the 2011 EA (BLM, 2011) related to drainage from the Daneros Portal DRA potentially affecting surface water quality. To determine the impact of the establishment of new DRAs at the Bullseye and South Portal areas and expansion of the DRA at the Daneros Portal, additional sampling of the DRA material was completed. Sampling of low-grade ore material was also conducted to help determine the potential impact of drainage from these stockpiles on surface water quality. The sampling results for the DRA material and the ore material are included in the Mine Rock Geochemistry Investigation (MPOM – Attachment D). As noted in Attachment D to the MPOM, the material in the DRAs has the potential to generate leachate containing arsenic, nitrate, and uranium; the ore material has the potential to generate leachate containing antimony, arsenic, nitrate,

thallium, and uranium. However, the development of any leachate requires sufficient moisture, which is not expected in this arid environment, as also noted in Attachment H to the MPOM. In addition, project design features to reduce the potential for moisture to collect in the DRAs and stockpiles would be implemented. Such measures during operations and temporary suspension include limits on stockpile capacities and protection from offsite stormwater drainage.

Reclamation plans for the portal areas include designs to mitigate potential long-term surface water impacts including: restoring drainages; regrading disturbed areas to achieve a stable, free draining land form; and placing inert material and soil on DRAs in a vertically zoned design prior to seeding (see Section 2.2). As noted in the 2011 EA (BLM, 2011), placement of the DRAs over historic, unreclaimed waste rock dumps also reduces the potential for post-reclamation drainage from the older waste rock. Leachate characteristics of the older waste rock from historic sites in the Project Area indicate constituents such as arsenic and uranium are present (USGS, 2007). In summary, with the implementation of the project design features, no adverse surface water quality impacts are anticipated.

4.2.2.2 Groundwater

As discussed in the 2011 EA (BLM, 2011) and in Section 3.4.2.3, there has been very limited development of any of the aquifers within several miles of the Project Area. The two aquifers which could be impacted by the Proposed Action include a shallow, perched aquifer in the Chinle Formation and the deeper, regional aquifer in the lower Cutler, as shown on Figure 13 (see Appendix B).

The local perched aquifer is present in the area of Bullseye Spring. A perched aquifer is an aquifer that is underlain by a low permeability, unsaturated rock layer which restricts downward movement of water in the subsurface. The specific low permeability layer that controls the perched aquifer in the area of Bullseye Spring is unknown, but it is likely an interbedded shale-rich unit within the Chinle Formation. The stratigraphic location of the perched aquifer is approximately 310 feet above the ore-bearing Shinarump Member of the Chinle Formation (see Figure 13 in Appendix B).

The shallowest regional aquifer in the area occurs within the Cutler Group. The Cutler aquifer is more than 1,400 feet beneath the underground mine. The Moenkopi Formation and the Organ Rock Shale, low permeability confining units, occur between the Shinarump Member of the Chinle Formation and the lower Cutler (see Figure 13 in Appendix B).

Perched Aquifer. In addition to mine workings that may intercept natural fractures and faults, other mining-related disturbance that may create pathways for water flow from the upper aquifer include: vertical openings such as drill holes and ventilation shafts which penetrate the perched aquifer and connect it with the underlying mine workings; and, bedrock fracturing from caving or subsidence of overlying strata as ground support is removed by mine excavation.

The proposed development drill holes would be plugged or cased and grouted. Holes that encounter groundwater would be plugged by placing a 50-ft cement plug immediately above and below the aquifer(s) or filling the hole from the bottom up with a high-grade bentonite/slurry mixture.

Operations and reclamation plans for existing and future vent shafts were designed to protect groundwater resources. In the event that a future vent shaft intercepts water, the shaft would be cased and grouted to prevent water from seeping into the mine. This casing would remain in place during reclamation. This approach is designed to prevent potential inflow of perched groundwater into the reclaimed vent shaft. There are two existing cased vent shafts in the area, both of which did not make any water during construction. The vents do not and have never

made water, thus indicating that the water source for the spring and well has not been impacted by these shafts.

The mine is located within a channel sandstone that would be worked to a width of approximately 100-feet. The position of the ore body within and beneath a sequence of massive sandstones, at depths of between 100 and 400 feet below surface, would provide a stable environment for operations. The mine would use a roof support system of random pillars of average 40-feet separation to prevent caving while working. If there is complete extraction from the mine, caving could occur to a maximum height above the mine of 25 feet. The caving height is based on broken rock expansion of 40 percent and a back (roof) height of 8 feet. Given that the mine workings would be approximately 310 feet below the aquifer, a collapse zone of 25 feet would not impact the perched aquifer. As part of mining, development rock would be gobbed (placed) into stopes, further reducing subsidence potential.

Mining activities could potentially cause sufficient disturbance to the bedrock formations that pathways for water flow would be established into the underlying mine workings from the upper perched aquifer via faults and fractures (Stilson, 2009). This could occur as mine openings below the upper aquifer intercept bedrock faults or fractures which are hydrologically connected to the overlying aquifer. If significant faults or fractures are encountered, the hydrodynamic balance of the aquifer system could be altered and downward flow paths from the upper aquifer could be established resulting in water drawdown from the upper aquifer and diminution of water flows feeding the spring and well.

The extent of fracturing or faulting, which could create downward flow paths for water, is difficult to ascertain from surficial geologic studies and field investigations. However, empirical data suggests that the degree of hydrologic connectivity between the mine and the upper aquifer through bedrock fracturing or faulting in the Project Area is minor. The Royal Mine, with underground workings terminating 350 feet northwest of Bullseye Spring, is at the same horizon as the Daneros Mine. There is a similar relationship between Bullseye Spring and the Daneros Mine, except that the Daneros Mine lies southwest of the spring. Information provided by the previous operator of the Royal Mine indicates that the Royal workings were dry, with no influx of groundwater into the mine (Jim Butt, 2009). The lack of groundwater in the Royal workings, coupled with the fact that Bullseye Spring continues to flow 30 years after cessation of mining, suggests: 1) an absence of bedrock fractures or faults; or 2) that these secondary pathways are not sufficiently connected to the overlying aquifer for mining to affect flow patterns.

The expansion of the activities at the Daneros Portal and the new development at the Bullseye and South portals would not impact the water quantity or quality in the shallow, perched aquifer, because of the lower elevation of the portals compared to Bullseye Spring and the Bullseye Well and lack of connection with the strata to be mined. For additional assurance, a water quality sampling plan (MPOM Attachment R) was developed to evaluate baseline flow and water quality conditions at the Bullseye Spring and Bullseye Well. Monitoring under this plan began in the first quarter of 2014. If the monitoring program reveals impacts to the spring or well as a result of mining, including subsidence, Energy Fuels would work with the water right holder to determine appropriate mitigation and/or compensation. Based on analysis and mitigation, the Proposed Action is not expected to affect existing water rights as a result of water drawdown from the upper aquifer and diminution of water flows feeding the spring and well.

Cutler Aquifer. The information from the Daneros water supply well, which was completed in the lower Cutler, over 1,400 feet below the proposed mine depth, confirms the limited potential for connection with the perched aquifer or with the mine. The well was also cased and sealed to prevent communication with surface water. In particular, comparison of the water quality of the supply well with the water quality of the spring and the Bullseye Well indicates different water

sources. The shallow groundwater is more mineralized than the deeper groundwater, based on the lower concentrations of arsenic, uranium, radium and zinc in the deeper groundwater.

The well log also indicates that the supply well is capable of sustaining a pumping rate of 18 gpm for 24 hours, in excess of that needed for mine use and dust suppression. The water right appropriation is for 5.73 acre-feet per year (less than 4 gpm). Metering of the amount of water pumped from the well is required in accordance with Utah State Engineer approval of the appropriation. Based on the well information, pumping of the Daneros water supply well is unlikely to interfere with pumping from an additional, similarly constructed water supply well if constructed at the South Portal, which is about 1.4 miles away.

4.2.2.3 Indirect Impacts from Milling Operations

There are no perennial surface water sources in the vicinity of the White Mesa Mill. The Dakota Sandstone and the Salt Wash and Westwater Members of the Morrison Formation are the only significant aquifers in the immediate vicinity of the mill. However, the Dakota Formation has been completely isolated by erosion so all recharge to this formation is limited to direct precipitation on the mesa (NRC, 1979).

The UDEQ DRC has primary regulatory authority over the mill. The DRC regulates the monitoring of groundwater and surface water at the mill site. The White Mesa milling operations are conducted in accordance with the terms and conditions of its current Radioactive Materials License (License No.UT1900479) and its Ground Water Discharge Permit (Permit No. UGW370004). These permit authorizations incorporate an extensive list of measures to protect groundwater and surface water at the mill site. These measures include: installation and maintenance of a network of groundwater monitoring wells, design and use of tailings management/disposal cells, leak detection systems, stormwater and wastewater management, reclamation standards, spill control and contingency plans, and sampling and reporting requirements.

Mill production and/or maintenance operations at the White Mesa Mill have continued since 1980. Historic mill production, through 2013, is approximately 5 million tons of ore (Roberts, 2014). The ore has originated from numerous mines in Colorado, Arizona, and Utah. If the Daneros production increased to 500,000 tons of ore during its 20-year mine life, it would be approximately 10 percent of the mill's total production through 2013 (this percentage would be considerably less with mill production figures updated through the life of the Daneros Mine).

The White Mesa Mill groundwater monitoring program includes 73 monitoring wells at the facility (Utah DRC, 2014). Samples are taken and analyzed for a large number of potential groundwater contaminants including heavy metals, nutrients, general chemistry analytes, radiologics, and volatile organic compounds (VOCs). Exceedances of standards found during monitoring programs are reported and then accessed in greater detail. If assessment determines there are potential impacts to groundwater from mill activities, then Energy Fuels works with DRC to design and implement mitigation or corrective actions. There are two circumstances where applicable groundwater standards, that are not associated with natural background, have been exceeded at the Mill. They are chloroform and nitrate contamination and neither of these circumstances appear to be related to discharges from milling activities. In both instances, corrective actions are currently being implemented under the direction of DRC.

Concerns were expressed by the Ute Mountain Ute Tribe (and others) regarding groundwater impacts resulting from operations at the White Mesa Mill. In response to these concerns, and those listed in Section 4.2.1.5 above, the US Geological Survey (USGS) prepared Scientific Investigations Report 2011-5231 titled "Assessment of Potential Migration of Radionuclides and Trace Elements from the White Mesa Uranium Mill to the Ute Mountain Ute Reservation and

Surrounding Areas, Southeastern Utah" (USGS, 2011). The primary groundwater concern raised by the USGS Report was with respect to periodic elevated levels of uranium in Entrance Spring. Entrance Spring is a seep on the east side of Highway 91, offsite from the Mill's property. It is considered to be a surface expression of groundwater (DRC, 2014).

Two of USGS's eight samples at Entrance Spring showed results that are greater than the maximum contaminant level of 30 ug/L. One of the last six Energy Fuels monitoring results also showed a level elevated above 30 ug/L. As the USGS Report indicated, these results could be due to nearby sediment contamination that is concentrated in the arroyo where the spring is located, or it could be due to groundwater contamination. The DRC agrees that these results indicate a need for continued monitoring. DRC does not agree that they suggest a need for corrective action at this time (DRC, 2014).

The Public Participation Response went on to state: "groundwater contamination is being appropriately addressed... DRC does not agree that there are significant risks to human health or the environment from the facility or that the surety for the facility is not adequate." (Response to Comment 30, DRC, 2014)

The indirect impacts to water quality from processing Daneros ore at the White Mesa Mill would be negligible because of the existing permit requirements to protect water quality, the regulatory oversight of mill operations, and the small percent (4 percent) of total cumulative mill production attributable to processing of average yearly quantities of Daneros ore.

4.2.2.4 Summary of Water Quality Impacts

Few potential surface water and groundwater impacts are anticipated because of the small scale of the Proposed Project, the physical setting, and the proposed mitigation measures. The surface water system is made up of ephemeral drainages, and the mitigation measures include implementing the drainage plan (MPOM – Attachment C) and SWPPP (MPOM – Attachment G). These plans are designed to prevent adverse impacts during mine operations by containing surface water runoff from a 100-year storm event. Concurrent and final reclamation includes regrading disturbed areas to achieve a stable, free draining land form, placing an inert material and topsoil cover over potentially deleterious material, installing erosion control measures and establishing a vegetative cover with topsoil and seeding. These reclamation practices would minimize the potential for post-mining impacts to surface water.

The groundwater system includes a shallow, perched aquifer 310 feet above the proposed mine workings, and a deeper aquifer that is over 1,400 feet below the proposed mine workings. The existing spring and well in the shallow, perched aquifer were not impacted by previous mining activities, and no impacts are anticipated from the Proposed Action. Information collected during recent installation of a well in the deeper aquifer indicates that the completion interval of the well is isolated from the proposed activities by low permeability formations. The information also indicates the aquifer is capable of sustaining the proposed, combined pumping rate of less than 10 gpm from the Daneros Well and another well to be installed in the same deep aquifer. Mitigation measures for protection of the groundwater include use of proper well installation techniques and drill hole abandonment procedures. Water level and water quality monitoring would also be conducted to verify that the actual impacts are not substantially different from the anticipated impacts.

The processing of Daneros ore at the White Mesa Mill would have no appreciable indirect impact to water quality.

4.2.3 Human Health and Safety Concerns

Uranium mining can create risks for mine workers and the public (mainly recreational visitors such as, campers, hikers, bicyclers, ATV riders, horse riders, etc.) due to potential exposure to elevated levels of radiation, contact with ore and development rock, storage and use of hazardous materials, and transportation of mine personnel and materials to and from the mine site. These risks are assessed below along with the potential for indirect health and safety impacts from milling the Daneros ore at the White Mesa Mill.

4.2.3.1 Radiation

Radiation exposure, primarily from radon-222 gas, and its daughter products, is a human health and safety concern at uranium mines. Studies have documented the increased risk of cancer and related mortality rates among uranium mine workers. Miners at the Daneros mine, and other uranium mines throughout the country, are protected through enforcement of MSHA regulations which establish maximum exposure levels of radon and radon-daughter products. The MSHA regulations and protection measures focus on properly ventilating underground mine workings because potentially harmful levels of radon are most likely to be found in those confined spaces.

The radon released from the mine's ventilation system could also represent a health concern to the public, but in the case of the Daneros Mine, there are no nearby residents that could be affected. This is verified though monitoring, dose modeling and annual reporting.

Radiological exposure at the surface was also modeled to determine the dose that could be received by the public at a reclaimed DRA over a period of 14 days (BLM 1992). Assorted soil cover depths were modeled to determine if the Proposed Action reclamation cover designs would be protective of the public. Exposure resulting from dust with elevated radionuclide concentrations emanating from vent shafts and settling into nearby soil was also evaluated. As discussed below, the risks to the public from increased radiation exposure would be similar to those identified in the 2011 EA (BLM, 2011) and would be mitigated during operations and long-term reclamation.

4.2.3.2 Radiation Exposure Data Studies

A significant number of uranium miners, that worked in the 1950s, later developed small-cell lung cancer. In part, the 1990 Radiation Exposure Compensation Act was passed to provide compensation to uranium miners, millers, and ore transporters who contracted cancer or other specified diseases as a result of exposure to high levels of radon. As understanding of the health risks grew, so did the applicable regulations. Today, the governing laws have decreased the health risks to uranium miners by requiring adequate ventilation and prohibiting smoking, among other requirements.

Studies of former uranium miners and millers in New Mexico and Colorado were completed specifically to investigate mortality in relation to exposure to uranium and vanadium during mining and milling activities. The studies, in general, found that uranium miners had a much higher incidence of lung cancer and other respiratory diseases. However, uranium mill personnel and nearby residents did not experience an increased risk of cancer-related mortality or other diseases compared to the national average. Summaries of several of these studies are provided below:

- A study of the population in Cibola County, New Mexico (i.e., location of the Grants Mineral Belt) found lung cancer mortality significantly increased among uranium miners (Boice, et al., 2010). Cancer mortality was evaluated between the years of 1950 and 2004 and cancer incidence between 1982 and 2004. The study results concluded that

there was no evidence to support an increased risk of adverse health effects among residents of communities where uranium has been mined or milled except for the lung cancer risk due to working underground in the mines.

- A cohort study of uranium miners and millers of Grants, New Mexico (1979-2005) found that increased mortality was seen among the 1,735 underground miners and was due to malignant and non-malignant respiratory diseases, cirrhosis of the liver, and external causes (Boice, et al., 2008). Among 718 mill workers, with the greatest potential for exposure to uranium ore, no statistically significant increase in any cause of death of a prior interest was seen (i.e., health effects typically linked to exposure to uranium such as cancers of the lung, kidney, liver or bone, lymphoma, non-malignant respiratory disease, renal disease, or liver disease).
- Researchers compared mortality rates between 1950 and 2000 in Montrose County, Colorado to those in five similar counties. They concluded that there was no evidence that residents in Montrose County experienced an increased risk of dying of cancer or other diseases because of environmental exposures associated with uranium and vanadium milling and mining activities (Boice, et al., 2007).

4.2.3.3 Radiation Effects

Mining. The short-lived decay products of radon-222 gas are the primary radioactive constituents of concern in a uranium mine. These “radon daughters” can accumulate in an enclosed space, and result in a potential increased risk of cancer. According to the EPA, indoor radon gas may be responsible for 21,000 deaths in the U.S. per year (EPA, 2013). EPA evaluated exposures from radon emissions for individuals located near uranium mines and found that for underground uranium mines, radon concentrations for nearby individuals (within 0.33 to 33 miles) ranged from 2.0×10^{-6} to 0.0031 working levels (EPA, 1989). Assuming that an individual was continuously exposed, this is equivalent to a probability of a latent cancer fatality of 5.5×10^{-8} to 8.5×10^{-5}, or about 1 chance in 20 million to 1 chance in 12,500. Over 10 years, the probability of a latent cancer fatality would range from 5.5×10^{-7} to 8.5×10^{-4}, or about 1 chance in 2 million to 1 chance in 1,250. For perspective, an individual has a lifetime probability of dying of cancer from all sources of about 1 in 5, or a risk of lung cancer of 1 in 17. (NIH, 2015)

The National Academy of Sciences (NAS) confirmed that exposure to indoor radon is the second leading cause of lung cancer in the United States and that it is a serious public health problem. The study explained that radon is a naturally occurring gas that seeps out of rocks and soil. Radon comes from uranium that has been in the ground since the time the earth was formed, and the rate of radon seepage is variable, partly because the amounts of uranium in the soil vary considerably. Radon flows from the soil into outdoor air and also into the air in homes from the movement of gases in the soil beneath homes. Outside air typically contains very low levels of radon, but it builds up to higher concentrations indoors when it is unable to disperse (NAS, 1998).

Potentially harmful levels of radon are most likely to be found in the confined space of the underground mine workings infrastructure, not in the open air outside of the mine workings. Because radon is the heaviest noble gas (8 times the density of our atmosphere), it would tend to sink to the lower portions of the mine rather than move to the top. The underground working environment, including air quality and radiation exposure, is regulated by MSHA. MSHA inspects and regulates the overall safety of mining operations. The mine is required by MSHA to monitor and control particulate and radiation exposure to workers at the mines. This program involves monitoring and control of dust, radon daughters, and gamma radiation within the working areas of the mine. Under MSHA safety requirements, the mine would be adequately

ventilated at all times during human occupancy. In addition, Energy Fuels maintains a health and safety plan for mine workers that includes respirator policies, an evacuation plan, evacuation tests, and 40-hour MSHA training.

Regardless of the setting, whether residential or industrial, radon gas emissions are typically mitigated by external venting. The radon ventilated from the mine would quickly disperse upon reaching exhaust shafts or portals. This has been verified at the Daneros Mine and other uranium mines through monitoring and modeling of ventilation rates and radon concentrations in accordance with 40 CFR 61 Subpart B of the CAA.

Workers are protected through MSHA regulations which establish maximum exposure levels of radon and radon-daughter products. Between 1985 and 1989, the average occupational radiation dose for uranium miners in the United States was 350 mrem/yr (United Nations Committee on the Effects of Atomic Radiation - USCEAR, 2000). This radiation dose is equivalent to a probability of a latent cancer fatality of 2.1×10^{-4}, or about 1 chance in 5,000. Over 10 years, the probability of a latent cancer fatality would be 2.1×10^{-3}, or about 1 chance in 500. Energy Fuels would be required to establish a radon-daughter monitoring program in accordance with 57 CFR §5037, in which exposure levels would be monitored and recorded. If radiation levels in a working area were found to be in excess of MSHA standards, the ventilation would be corrected immediately and more frequent monitoring would be required to verify compliance.

Underground uranium mines do not require licensing under NRC regulations and, therefore, mine operators are not required to meet the standard dose limit for the public specified at 10 CFR 20.1301(a)(1). However, the NRC standard (100 mrem/yr over background) is considered a guideline for the protection of human health and safety and is incorporated into the MPOM. The proposed inert material/soil cover on the development rock piles is expected to provide for compliance with this proposed reclamation standard at the Daneros Mine. A post-reclamation gamma survey and assessment of compliance with the voluntary reclamation standard would be conducted after mining and reclamation are complete.

Development Rock. Energy Fuels modeled a typical DRA (or waste rock pile) for the northern Colorado Plateau region (see Section 6.0 in Appendix E) to determine the radiological dose that could be received at a reclaimed (regraded with soil cover and vegetation) and un-reclaimed (i.e., no soil cover) DRA over 14 days (longest period that a person can legally camp on public lands managed by the BLM). The modeling results (see Table 25) indicated that a 100-mrem dose limit based on 14 days of exposure could be met without applying any soil cover. The modeling effort also evaluated the dose received by a person on the DRA for 2,000 hours per year. Under that scenario, a relatively thin soil cover would be needed to maintain the dose at less than 100 mrem/yr above background.

Table 25
Development Rock Dose Modeling Results

Cover Depth (inches)	1-year Dose (2,000 hours) (mrem)	14-day Dose (mrem)
0	107.9	17.75
3	45.54	7.49
4	34.32	5.64
6	20.51	3.37
9	9.67	1.59
12	4.71	0.77

The un-reclaimed DRA dose for a 14-day exposure was about 18 mrem, which is below NRC's 100-mrem-per-year above background limit for public exposure from mill sites. The 1-year (or 2,000-hour) scenario resulted in a calculated dose of 107.9 mrem. Approximately 95 percent of the dose was attributable to external gamma exposure from the waste rock with the remaining 5 percent attributable to the inhalation, soil ingestion, and radon pathways. More than 98 percent of the external gamma exposure was attributable to Ra-226. Th-230, Pb-210 and all uranium contributed less than 2 percent. This is due to the fact that Ra-226 decays by emitting many more gamma rays of higher energy compared to the other radionuclides.

Vent Shafts. Energy Fuels' report (see Appendix E) also included results of a study of soil around ventilation shafts at the La Sal Mines Complex, which is an underground uranium mine located near La Sal, Utah. The purpose of the study was to determine if air and dust emanating from vent shafts would settle into the soil near the vent and result in elevated radionuclide concentrations. Areas around the vents were checked with a gamma meter and soil samples were collected to determine the extent of radionuclide concentrations above background levels. Background gamma radiation levels in the general area ranged from 4 to 8 µR/hr with an average of 6 µR/hr. The maximum gamma levels reported around the three shafts for waist-level measurements were 34, 23, and 16 µR/hr. A marked reduction in gamma readings were observed as the distance from the vent shafts increased with background levels being present within 15 feet at two of the shafts and within 33 feet at the third shaft. Ra-226 activity levels in the surface soil samples ranged from 0.3 to 3.1 ρCi/g. Similar measurements would be expected for vent shafts associated with the Proposed Action.

UDAQ would require monitoring of radon gas from mine vents as per 40 CFR Part 61, Subpart B, which would result in an annual assessment of incremental radon exposure to nearby residents. Because of the Project Area's remote location, no impacts to the general public are predicted.

4.2.3.4 Radiation Mitigation Measures

To prevent or mitigate effects from radiation, Energy Fuels has proposed:

- Personnel working in radiation protection areas would be equipped with individual monitors and/or badges and would be required to participate in a routine bioassay program to further monitor exposure to radionuclides.
- Work areas subject to dusty conditions or chemical fumes, would be monitored through fixed instrumentation and/or routine testing as required. Engineering controls would be employed in such areas to minimize exposures to the extent practicable. If the levels could not be reduced sufficiently through engineering controls to meet regulatory requirements, then Personal Protective Equipment (PPE) would be required of persons entering or working in these areas.
- The mine would operate in accordance with federal regulations that are designed to protect the mine workers and the general public from radiation exposure.
- The miners would be protected through establishment of adequate ventilation and monitoring of radiation levels in the underground work areas in accordance with MSHA regulations.
- The general public would be protected by monitoring of radiation emissions from the mine using methods approved by the EPA and adhering to ore transportation regulations established by the USDOT.
- A radon-daughter monitoring program would be established at the mine in accordance with 57 CFR §5037 in which exposure levels would be monitored and recorded. If radiation levels in a working area were found to be in excess of MSHA standards, the

ventilation would be corrected immediately and more frequent monitoring would be implemented to verify compliance.

- The air emissions would be measured for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to UDAQ.
- Ore haul trucks would be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. If gamma readings are found to be elevated, the ore truck would be cleaned using a power wash or other method to meet appropriate radiation standards.
- All scrap metal and other recyclables would be checked with a gamma meter prior to leaving the mine site. If gamma readings were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.
- Reclamation of the mines would achieve a standard dose of 100 mrem/yr or less above background to a person camping on or near a reclaimed mine site for 14 days.
- The compacted soil immediately below the ore stockpile areas is expected to have radioactivity levels above background. These soils would be surveyed for radiation and any material with elevated radiation levels would be excavated and placed in the mine.
- Although radiation activity and metal levels are very low around the vent shafts, the top one inch of soil would be removed around the shafts during reclamation and disposed of in the shafts.

4.2.3.5 Mine Rock – Acid and Other Deleterious Leachate Generation

Both Shinarump Member development rock and ore have potential to generate deleterious leachate if sufficient water is present to cause percolation through the rock piles. Ore, which is only stored on site for a short time period, has the potential to generate leachate containing elevated levels of antimony, arsenic, nitrate, thallium and uranium. Development rock has the potential to generate leachate containing elevated levels of arsenic, nitrate and uranium.

The Daneros Mine is located in an arid environment so sufficient moisture is not expected to be present to cause significant percolation and associated acid rock drainage or discharge of other deleterious leachate. Percolation through the development rock was simulated using UNSAT-H modeling (Attachment H of the MPOM). The modeling results indicate that infiltration of precipitation followed by upward evaporative flux of water stored within the development rock piles would be the dominant mechanisms controlling the volume of percolation through the piles.

The BLM National Operations Center conducted a risk assessment review regarding the MPOM (BLM 2015). This review concurred with the assessment conducted in Section 3.6 and Attachment D of the MPOM (Energy Fuels, 2015) that the Shinarump Member development rock and ore could have the potential to cause direct contact risks related to arsenic to recreational visitors on federal lands and BLM workers. The BLM used EPA's risk calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search), an on-line interactive tool, to calculate screening levels for different chemicals in soil and other media.

Table 26 includes BLM's soil screening levels (SSLs) for recreational visitors, based on two different exposure paradigms:

1. a child exposed to site soil/rock for 14 days in a single year, and
2. an adult exposed to the site soil/rock for 14 days annually for 20 years (maximum project lifetime).

The BLM considers these two scenarios to be a conservative estimate of the exposure potential, and hence risk, at the site. To establish these SSLs, the BLM set the acceptable risk level for carcinogens to 1 x 10-6 (one in a million) and a hazard quotient of 1 for non-carcinogens.

Table 26
BLM Human Health Soil Screening Levels (SSLs)
for Commonly Found Metals at Mining Sites

Chemical	Child Recreational Visitor 14 day/year, 1 year SSL (mg/kg)	Adult Recreational Visitor 14 day/year, 20 years SSL (mg/kg)
Antimony	782	8,340
Arsenic	134 (82)[1]	66.8
Cadmium	1,760	17,000
Chromium (III)	NA	NA
Copper	78,200	834,000
Lead	400	400
Manganese[2]		
Mercury	236	236
Molybdenum	9,780	104,000
Nickel	38,600	369,000
Selenium	9,780	104,000
Silver	9,780	104,000
Strontium	NA	NA
Thallium	19.6	209
Uranium	5,840	59,900
Vanadium	9,830	102,000
Zinc	587,000	NA

[1] From EPA 2007.
[2] EPA does not recommend SSLs for manganese
NA = Not Applicable. Calculated concentration exceeds 100%.
Source: (BLM 2015)

As shown in MPOM Attachment D (Energy Fuels 2015), analytical results of composite and multi-increment samples taken of ore and development rock are well under the SSLs given for the chemicals above for both adults and children except for arsenic. The arsenic sample results for ore ranged from 75.2 to 153.0 (mg/kg). The arsenic sample results for development rock ranged from 41.5 to 110.0 (mg/kg).

Recreational visitors would have little or no opportunity for direct contact with ore because the ore would only be stored on site for a short time before being transported to the mill, and because public access on site would be restricted and actively monitored when the mine is operating. The reclamation plan eliminates recreational visitors' long term post-mine risk by placing low grade ore back into the underground mine workings and then covering the exposed development rock with sufficient inert material and topsoil to prevent direct contact. For these reasons recreational visitors would have minimal or no risk of having direct contact with mine rock and being exposed to arsenic during active mine operation and following mine reclamation.

The development rock and low grade ore piles would present limited direct contact risk to recreational visitors only during periods of temporary mine suspension. This lessens the likelihood of a 14-day annual exposure period throughout the course of the 20-year mine life (as assumed in the SSL calculations). Furthermore, there are abundant locations available to the public for camping on public lands in the vicinity (less than 5 miles) of the Daneros Mine which are not encumbered by old mine rock piles. These sites are equally, or more, accessible to recreational visitors and; are much more desirable campsites in contrast to the barren, hummocky, rocky, low grade ore and development rock piles. For these reasons the direct contact risk to recreational visitors during periods of temporary mine suspension would be minor.

This conclusion is further supported by an EPA study of abandoned uranium mines. The EPA report (EPA, 2007) discusses the health risk implications of abandoned uranium mines that often contain elevated levels above background of naturally occurring radioactive materials (NORM), and also risks from exposure to arsenic. Abandoned uranium mines generally have little to no reclamation cover on surface facility areas including development rock areas and ore pads. As a result, the EPA report also evaluates the risks of more current mine sites that may go through long periods of temporary suspension.

While arsenic is identified as a risk driver in the EPA report and the risk calculator, the limited duration of allowed use (14 days) and remoteness of most uranium mines in the 4-corners region of the US, among other factors, limits their actual impact on recreational public land users. The EPA concludes:

- In the recreation scenario short-term exposure to radium, uranium, and arsenic appears to create only minimal additional cancer risk. This additional risk is dominated by external gamma exposure associated with radium in the waste material.
- In general, the risks from these sites are primarily from occasional exposures and are likely to be minimal, even with conservative assumptions.
- For the occasional visitor to abandoned mines, the mine wastes typically do not produce a significant radiation risk. (EPA 2007)

For further perspective with regard to the minimal health risk of potential arsenic exposure, it is important to point out that soil samples in the EPA study have a much higher arsenic concentration (five times greater) than the highest concentration of arsenic sampled from Daneros mine rock. Specifically, the highest EPA study sample has an arsenic concentration of 769 mg/kg as compared to Daneros ore samples with a high of 153 mg/kg.

To further prevent or mitigate potential health effects from direct contact with mine rock and to prevent acid-generation, Energy Fuels has proposed a rock management plan which includes the following components (repeated from Section 2.2.1.4):

- To the extent practicable, development rock generated from the Shinarump Member would be placed into mined out voids within the underground mine, and would not be hauled to the surface.
- Development rock piles at the Daneros, Bullseye and South Portal areas would be constructed in a vertically zoned design. Development rock generated from the Shinarump Member would be placed in the lower zone of the piles. These potentially acid-forming or deleterious materials would then be covered with an upper zone composed of inert materials prior to reclamation. The upper zone is designed to serve as a buffer to prevent upwards migration of products of sulfide mineral oxidation into the soil layer during evaporation and/or transpiration.

- Ore would be managed within discrete stockpiles and would be hauled to the White Mesa Mill for mineral processing on a daily to weekly basis.
- Low-grade ore (ore-bearing rock that could be economical to process in the future) would be managed in the proposed stockpile area at the South Portal; if not processed by the end of the mine life, it would be hauled back underground during reclamation.
- In the event that acid-forming or deleterious materials are excavated from rock units other than the Shinarump Member, these materials would be managed as acid-forming or deleterious materials.
- In order to reclaim the DRAs and reduce the risk of acid drainage, Energy Fuels would stockpile inert material and topsoil. The inert material would be used during reclamation as cover material, applied evenly over the graded DRAs, prior to applying topsoil.

In addition to the rock management plan, a gate would be maintained across County Road D0029 to limit public access to the mine area. The gate would control access to the Bullseye Portal Area as well as the Daneros Portal Area. Signage would be maintained alongside the gate and at the South Portal Area to advise the public of the presence of the Daneros Uranium Mine.

4.2.3.6 Transportation

Project traffic would include up to 15 ore trucks and 10 additional employee and support vehicles traveling to the site per day. Most of the traffic would be expected to occur between Monday and Friday. Project-related traffic could result in direct impacts by increasing traffic volumes on regional roads, which could result in indirect impacts by increasing the potential for vehicle collisions and contributing to roadway deterioration and dust creation on unpaved roads (see MPOM – Attachment O). Based on 2012 AADT (UDOT, 2014), project traffic could result in traffic increases of 2 percent on SH 191 and 12 percent on SH 95 compared to 2012 traffic levels.

UDOT reports crash rates (average number of crashes per year per one million vehicle miles travelled) for functional classifications of urban and rural roads in the state (UDOT, 2013). Based on average crash rates for rural arterial and collector roads between 2007 and 2011, Project traffic could result in between 1 and 2 additional highway crashes per year. Based on highway fatality rates in Utah reported by the National Highway Traffic Safety Administration (NHTSA), approximately one accident every 14 years could involve a fatality (NHTSA, 2014).

Radioactive Material. The uranium ore and recycled materials such as scrap metal, batteries, and tires are the only radioactive materials that could leave the site and potentially affect the general public.

USDOT regulations require that the ore trucks be checked for radiation levels prior to leaving the mine site and the mill site on the return leg. In addition, Energy Fuels' transportation policy specifies that ore trucks must be covered at all times, with or without ore (except for loading and unloading), using a tarpaulin or other suitable mechanism. Each exclusive use truck and trailer would be marked with "RADIOACTIVE-LSA" and "FOR RADIOACTIVE MATERIALS USE ONLY." LSA is an abbreviation for "Low Specific Activity". These markings would remain on the trailer during the entire period of exclusive use, regardless of whether the vehicle was loaded with uranium ore or not. These markings would not be removed from the trailer until the vehicle had been cleaned and surveyed for unrestricted release at the White Mesa Mill, at which time the vehicle would be free to ship commodities other than uranium ore (see MPOM – Attachment N).

With regard to accidents and other incidents involving the spillage of uranium ore, Energy Fuels' policy states that the transportation contractor is responsible for handling the accident and that

the contractor must have an Emergency Response Plan in place in case of emergency. Emergency response crews from the White Mesa Mill would also assist in cleanup and confirmation sampling at a spill site. The spilled material and surrounding area would be cleaned up to background levels. Cleanup levels would be verified using a gamma meter or similar instrument.

Energy Fuels' company policies require that scrap metal and other recyclables be checked with an appropriate radiation meter prior to leaving the mine site. If radiation levels were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards prior to being transported offsite.

As provided in Section 2.2.3.3, it is, and would continue to be, the responsibility of Energy Fuels to ensure that the radiation levels associated with ore transportation fall within applicable limits. Based on the grade of the Daneros Mine uranium ore, the exposure rate would be less than 1 mrem/hr to recipients standing outside of the truck. The following USDOT requirements would be met:

- The requirements of 49 CFR 173.427(a)(1) that the external dose rate may not exceed a radiation level of 1,000 mrem/hr at 3 meters from the unshielded material; and
- The requirements of 49 CFR 173.427(a)(5) and 173.441(a) that under conditions normally incident to transportation,
    - The radiation level does not exceed 200 mrem/hr at any point on the external surface of the package
    - The transport index (TI) does not exceed 10. TI is a dimensionless number placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. TI is determined by multiplying the maximum radiation level in millisieverts (mSv) per hour at 1 meter (3.3 feet) from the external surface of the package by 100 (equivalent to the maximum radiation level in mrem/hr at 1 meter (3.3 feet)

It is expected that the average reading in the occupied space of each truck cab would not exceed the USDOT limit of 2 mrem/hr specified in 49 CFR 173.441(b)(4). In addition, Energy Fuels would perform and document gamma surveys on uranium ore shipments as appropriate in order to ensure that the regulatory standards are satisfied.

Waste. All hazardous or radioactive waste generated by the Proposed Action would be transported to licensed disposal facilities in accordance with applicable federal and state regulations. Non-radioactive solid wastes would be disposed of appropriately depending upon waste type. Non-radioactive hazardous materials would be transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR. Carriers would be licensed and inspected as required by UDOT and USDOT. Permits, licenses, and certificates would be the responsibility of the carrier. Title 49, Parts 71 and 171-180, of the CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and must include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, firefighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

Under the Proposed Action, the risk of accidents and impact to human health from transportation is expected to be minimal based on the mitigation and design measures incorporated into the Proposed Action.

4.2.3.7 Indirect Impacts from Milling Operations

UDEQ-DRC has primary regulatory authority over the White Mesa Mill operations and handling of materials containing uranium at the mill, including conventional ore and alternate feed material processing and the disposal of mill tailings. MSHA also regulates occupational safety at the mill.

White Mesa milling operations are conducted in accordance with the terms and conditions of its current Radioactive Materials License (License No.UT1900479). Radiation protection at the mill includes: standard operating procedures for all operational process activities involving radioactive materials that are handled, processed or stored; procedures for nonoperational activities including, plant and environmental monitoring, bioassay analyses and instrument calibrations; and, periodic review of all activity procedures by a radiation safety officer (RSO).

Radiological exposure at Energy Fuels' mines and mill are minimized using the principles of ALARA (as low as reasonably achievable). The Nuclear Regulatory Commission (NRC) strictly regulates the dose of radiation that may be received by mill workers and the general public. The Utah Department of Environmental Quality Division of Radiation Control (DRC) is responsible for enforcing the NRC rules for uranium milling in Utah. An important cornerstone of DRC's Radiation Program is to keep radiation doses, on and off-site, to levels that are ALARA. To meet ALARA requirements, Energy Fuels implements strict radiation controls and monitoring throughout the mines and mill site.

Numerous monitoring systems are present in the White Mesa Mill to identify potential radiation concerns and to verify that the work environment is safe. Area air monitors are located throughout the mill to monitor the concentrations of uranium dust in the mill. Workers involved in potentially dusty operations wear breathing-zone air monitors to monitor the air that they breathe. For those workers exposed to higher concentrations of uranium dust, urine samples are collected and analyzed to determine the total uranium that has been inhaled and ingested. Those workers exposed to the highest levels of gamma radiation wear gamma-monitoring badges, similar to what x-ray technicians and airline screeners wear. Other protections include regular power washing of equipment and vehicles, monitoring of the amount of time a worker is exposed to radiation, and implementation of good housekeeping and personal hygiene measures.

Operations at the White Mesa Mill is required to comply with NRC regulations and the standard dose limit for the public (i.e., 100 mrem/yr over background) specified at 10 CFR 20.1301(a)(1). The White Mesa Mill is licensed to produce up to 4,380 tons of yellowcake (U_3O_8) per year. The Proposed Project would produce an average of 25,000 tons of ore per year over its 20-year mine life. Assuming an average Daneros ore grade of 0.30 percent U_3O_8, the annual mill production of yellowcake from the processing of Daneros ore would be approximately 75 tons or roughly 2 percent of the maximum mill output.

The processing of Daneros ore at the White Mesa Mill would have negligible indirect impacts to human health from radiation exposure because of the existing permit requirements, regulatory oversight of mill operations, and because of the relatively small percentage of mill production that would occur from the Daneros ore.

4.2.3.8 Summary of Human Health and Safety Concerns

Potential radiological effects associated with the Proposed Action would be prevented or avoided through compliance with the applicable regulations and implementation of Energy Fuels' MPOM. Unanticipated effects resulting from accidental spills or transportation accidents would be mitigated through implementation of the SPCC Plan and the transporting contractor's Emergency Response Plan. The White Mesa Mill would operate in compliance with all

permit/license requirements so indirect impacts associated with milling would be within Federal and State regulatory thresholds. Furthermore, the indirect impacts from processing Daneros ore would be negligible because Daneros ore would contribute a small percentage (2%) to the mill's average annual production of yellowcake.

4.2.4 Mitigation Measures for the Proposed Action

No impacts have been identified that exceed statutory limits for water quality, air quality, or radiation exposure. The mitigation measures incorporated into the Proposed Action would effectively minimize impacts. It is expected that the built-in measures would be effective and that no residual impacts would result.

4.2.5 Monitoring and/or Compliance

The main purposes of NEPA-related monitoring are to: evaluate the quality of the NEPA document; ensure compliance with the NEPA decision; and measure the effectiveness or success of mitigation. There are three key issues: air quality, water quality, and human health and safety. Generally, monitoring focuses on these important issues brought forward for detailed analysis. However, other resources are also carefully monitored as necessary.

Monitoring includes inspections for compliance with the terms and conditions of the approved MPOM. Pursuant to 43 CFR 3809.600, the BLM would inspect operations, as needed, to ensure compliance with regulations at 43 CFR Subparts 3809 and 3715, including all conditions of approval. BLM would conduct compliance inspections on a routine basis and would coordinate its monitoring efforts with other agencies as necessary, including the UDOGM for compliance with permit terms and reclamation standards, the Utah Division of Water Quality (UDWQ) for water and UDAQ for air quality and MSHA for human health and safety.

Sampling data and project specific modeling of the affected environment indicate that impacts from the Proposed Action would be minor. Monitoring required by other agencies such as worker radiation exposure rates and Energy Fuels' proposed monitoring programs such as weed control and radon monitoring are incorporated into the Proposed Action. Although monitoring by itself is not mitigation, monitoring could result in additional mitigation if triggered by undesirable monitoring results that exceed preset levels or standards. If necessary, specific monitoring requirements would be prescribed by the BLM as conditions of approval.

4.3 Direct/Indirect Impacts Alternative B – No Action

Under the No Action Alternative the proposed MPOM would be denied but the Daneros Mine could continue to operate under the terms of the approved MPO. The No Action Alternative does not equate to no mining. The no action would also effectually result in Energy Fuels' inability to further develop and extract a valuable deposit of uranium from its mining claims once the DRA reaches capacity under the approved MPO and the available space for development rock disposal in underground workings is exhausted. As discussed in Chapter 1, the 2011 Decision Record (and 2009 MPO) provided for a total of 4.5 acres of surface disturbance, the majority of which (3.5 acres) was located within areas of pre-existing mining disturbance. The following has occurred since the 2009 MPO was approved:

- The Daneros Mine operated from 2009 to October 2012. The site is currently on "care and maintenance" status.
- The two declines at the Daneros Portal were constructed and used for haulage, mine ventilation and as a secondary escape route.

- Two ventilation shafts were constructed.
- A water well was drilled and used to supply water for mining activities.
- Surface facilities were constructed and operated.

The impacts for the No Action Alternative were previously analyzed in the 2011 EA under the "Proposed Action Alternative" in that document. Those impacts are summarized below for air quality, water quality, and human health and safety concerns.

4.3.1 Air Quality

As analyzed in the 2011 EA (BLM, 2011), the No Action Alternative includes control measures to mitigate impacts to air quality. These control measures include the use of low-sulfur diesel fuel, a dust control plan to reduce dust emissions, and a Tier 3 generator. Emission calculations show that, with the control measures, the No Action Alternative would be a small contributor of criteria pollutants. The No Action Alternative would not result in exceedances of the NAAQS and would not degrade the visibility in Class I areas. Screening protocols of the FLAG and guidelines of UDAQ indicated that dispersion modeling is not needed as impacts would be minor. Processing of ore at the White Mesa Mill would have no appreciable indirect impacts to air quality and would not result in a violation of the NAAQS due to existing license and permit requirements and because of the small percentage of mill production that would occur from processing Daneros ore.

4.3.2 Water Quality

As analyzed in the 2011 EA (BLM, 2011), effects to water quality from the No Action Alternative would not occur or would be minor and prevented through application of the Conditions of Approval (see Appendix A) and the SWPPP. The mined ore would be processed at the White Mesa Mill, where effects to water quality would be controlled through the existing permit requirements and regulatory oversight.

4.3.3 Human Health and Safety Concerns

As analyzed in the 2011 EA (BLM, 2011), effects under the No Action Alternative to human health from radiation exposure, hazardous waste exposure, or from the risks of transportation would be minimal based on implementation of the Conditions of Approval and the measures in the MPO as well as the relatively small volume of Daneros ore in relation to the overall production. Mineral processing at the White Mesa Mill would occur regardless of whether the proposed MPOM is approved, because the mill processes ore from numerous mines in the region. In addition, the mill is also licensed to process alternate feed materials to recover uranium. These alternate feeds include uranium-bearing materials derived from uranium conversion, tantalum and other metal processing, and materials from U.S. government clean-up projects (USGS, 2011).

4.4 Cumulative Impacts Analysis

Cumulative impacts are defined in the CEQ regulations (40 CFR 1508.7) as "...the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions." The cumulative effects analysis typically encompasses broader areas and timeframes than the analysis of direct and indirect effects. The actions and effects selected for analysis depend on access to reasonably available data.

4.4.1 Air Quality

Potential cumulative impacts to air quality in the project area and region are analyzed below.

4.4.1.1 Cumulative Impact Analysis Area

Cumulative impacts in the area of the Daneros Mine are limited by the remote nature of the area and the lack of industrial development. In order to evaluate air impacts to the area surrounding the project, a local cumulative impact analysis area (CIAA) was assessed. In order to evaluate project impacts against a regional air modeling study, a much larger, regional CIAA was also assessed.

Local CIAA. The Proposed Project is within the White Canyon Uranium Area, a 1,360-square mile area (Utah Geological Survey 2005) which is shown on Figure 16 (see Appendix B). The area extends from the northeast near State Highway 211 as it passes just north of Manti-La Sal National Forest, due south until it is directly west of Blanding, curving southwest to include the Red Canyon watershed, west to the Colorado River at Lake Powell, then north along the Colorado River to Gypsum Canyon where it heads due east.

Regional CIAA. As part of the adaptive management strategy for managing air resources within the BLM Grand Junction, Colorado Field Office and Uncompahgre Field Office planning areas, the BLM is conducting a regional air modeling study to evaluate potential impacts on air quality from future mineral development. The modeling study, Colorado Air Resources Management Modeling Study (CARMMS) (BLM, 2014a), includes emissions from other regional sources including oil and gas emissions throughout the modeling domain which encompasses all of Colorado, western Arizona, eastern Utah, and north-central New Mexico and extends into southern Wyoming, western Nebraska, western Kansas and northwest Texas. Figure 16 in Appendix B provides the CARMMS cumulative impact area, which includes the proposed Project Area.

4.4.1.2 Past and Present Actions

Local CIAA. Generally, past and ongoing activities (natural and man-made) that have affected and are affecting the air quality in the Local CIAA include but are not limited to the following:

- Mining;
- Mineral exploration

The White Canyon Uranium Area currently contains just one permitted uranium mine, the Daneros Mine. The area contains approximately 107 past producing mines and another 40 locations considered as prospects or occurrences of uranium (Utah Geological Survey 2005).

The Daneros Mine and several other old uranium mines occur within the watershed of Red Canyon. The three old uranium mines closest to the Daneros are also located in Bullseye Canyon. These are the Royal Mine and the McCarty–Coleman and Bullseye Declines of the Lark Mine. The historic Fry Canyon Mill is located within the White Canyon watershed approximately 3.5 miles northeast.

Air impacts from historic mines are limited because these historic mining disturbances are stabilized by volunteer vegetation or were reclaimed. The largest of these historic mines are the Happy Jack and Radium King, both of which were reclaimed; the remaining historic mines were typically small (i.e., less than 5 acres of surface disturbance).

When the market price of uranium rose in 2006 and 2007, the BLM MFO received Notices of Intent for uranium exploration drilling projects in the Red Canyon and White Canyon areas. Proposed surface disturbance was relatively small (i.e., a few acres per project) and consisted primarily of maintenance work on old roads to access project areas. Exploration operations were short term (a few months) and all but one of the notices is complete or has expired. The

only currently permitted exploration project is the Lark Royal (BLM number UTU-74631) which includes a total of 63 drill holes, 25 of which have already been drilled and reclaimed.

Regional CIAA. Generally, past and ongoing activities (natural and man-made) that have affected and are affecting the air quality in the Regional CIAA include but are not limited to the following:

- Mining;
- Mineral exploration and development;
- Uranium milling;
- Electrical power generation

Important large stationary sources of emissions in the region include the Coronado Generating Station near St. Johns, Arizona, and power plants near Shiprock, New Mexico (see Section 4.4.1.4).

Construction of the White Mesa Mill near Blanding, Utah began in 1979. The mill began operations in 1980 and has continued various levels of milling or maintenance operations until present. Air emissions are regulated by UDAQ under a minor source permit. As previously stated, mineral processing at the White Mesa Mill would occur regardless of whether the proposed MPOM is approved, because the mill processes ore from numerous mines in the region. In addition, the mill is also licensed to process alternate feed materials to recover uranium.

A number of permitted uranium mines exist outside the White Canyon Uranium District but within the Regional CIAA. These mines are located in southeast Utah, southwest Colorado, and northern New Mexico within the uranium mining areas plotted on Figure 16 (see Appendix B). The mines include the Tony M, La Sal Mines Complex, Energy Queen, Rim, and La Sal No. 2 in southeastern Utah, along with the Church Rock, Mount Taylor and Roca Honda in northwestern New Mexico. The New Mexico uranium mines do not require air permits. The Utah uranium mines have air permits with UDAQ or are conditionally exempt due to emissions being less than the regulatory thresholds for a minor source. The permitted emission levels vary based on the size of the ore deposit and access to line power. Some representative high and low emission levels are provided in Table 27. Although the La Sal Mines Complex has a higher production rate than the Daneros Mine, the Daneros Mine emission rates are higher because it is powered by diesel generators rather than electrical power lines as is the case for the La Sal Mines Complex.

Table 27
Representative Permitted Uranium Mine Emissions

	Total Potential to Emit (in TPY)	
Pollutant	**La Sal Air Permit (Approved 3/20/2012)**	**Daneros Air Permit (Approved 7/8/2014)**
PM10	11.50	18.99
PM2.5 (subset of PM10)	11.50	4.10
Nox	7.60	85.33
SO2	0.50	4.12
CO	1.64	140.18
VOC	0.80	7.06
HAPs	0.025	0.13

4.4.1.3 Reasonably Foreseeable Action Scenario (RFAS)

Local CIAA. Anfield Resources holds 29 claim groups in the Red Canyon Watershed which is within the Local Cumulative Impact Analysis Area. If uranium prices increased, it is possible that Anfield may permit and operate a mine in the area. However, Anfield Resources has not submitted any applications for exploration or mining and it would be speculative to believe that another mine would be permitted and started or reopened in the Local CIAA. No other large claim blocks exist within the Local CIAA. A future increase in the market price of uranium would likely trigger 6 to 12 new requests for uranium exploration permits with about 1 acre of disturbance associated with each drilling project. Air quality impacts from drilling programs are limited due to their small disturbance footprint and quick reclamation.

The BLM is currently evaluating plans to initiate remediation work at the Fry Canyon Mill Site. Plans include consolidating the old mill tailings and covering them with native material (E&E, 2014). Dust mitigation is incorporated into the remediation work plans.

The BLM is planning to conduct habitat improvements for desert bighorn sheep in the Red Canyon and White Canyon watersheds. This action would include conducting prescribed burns using a helitorch, drip torch or chainsaws and aerial seeding of approximately 6,268 acres on Wingate Mesa, near Jacobs Chair, Lone Butte, Fry Canyon and Gravel Canyon (BLM, 2014b). The proposed Fry Canyon burn area is on the portion of Wingate Mesa that is above the Daneros Mine. Arial burning and seeding would not occur from April 1-June 1 to avoid lambing season, April 1-August 31 to protect nesting raptors and from October 15-December 15 to avoid sheep rutting season. Smoke from these planned burns would impact air quality in the local area but the activities would likely only take place for one week.

Regional CIAA. The CARMMS 2021 high oil and gas development modeling analysis included future year 2021 projected federal and non-federal oil and gas emissions within the CARMMS modeling domain plus mining on federal lands in Colorado. This scenario includes future year oil and gas emissions from the 13 Colorado BLM planning areas plus the Mancos Shale area in Northern New Mexico, and emissions from the Piceance Basin (CO) and Uinta Basin (UT). The future year cumulative mining and oil and gas emissions are considered as reasonably foreseeable development (RFD) emissions for the Proposed Project.

If uranium prices increase, it is reasonable to assume that additional mines in the region would resume or start production. However, production would be limited to the maximum milling capacity in the region. Currently, only the White Mesa Mill with a maximum capacity of 2,000 tons of ore per day (tpd) is operational. This level of production could support up to 15 mines over the Colorado, Utah, and New Mexico area assuming mine production rates would range between 10,000 and 200,000 tons per year with an average mine production rate of about 50,000 tons per year. Although, it is conceivable that the Shootaring Mill near Ticaboo, Utah could be rehabilitated and relicensed and the proposed Piñon Ridge Mill near Naturita, Colorado could be constructed, that possibility is far too speculative at this time for meaningful analysis.

4.4.1.4 Cumulative Impact Analysis

Cumulative impacts of the Proposed Action are assessed using the incremental addition of past and present actions (which are expected to continue at present levels), reasonably foreseeable actions and the Proposed Action (as described in Sections 4.2.1.3 and 4.2.1.4), summarized for the Local CIAA and Regional CIAA below:

- Local CIAA
  - The Proposed Action – surface and underground mining activities and support equipment (potential impacts would be mainly PM_{10}, NOx, and CO)
  - Historic uranium mining
  - Currently permitted uranium mining
  - Mineral exploration
  - Remediation work at the Fry Canyon Mill Site
  - Prescribed burns on Wingate Mesa
- Regional CIAA
  - The Proposed Action – hauling ore to and processing ore at the White Mesa Mill
  - Historic uranium mining
  - Currently permitted uranium mining
  - Uranium milling
  - Electrical power generation
  - Oil and gas development

Local CIAA., The Proposed Action surface and underground operations include control measures to mitigate impacts to air quality. These control measures include the use of low sulfur diesel fuel, a dust control plan to reduce dust emissions, and Tier 4i generators to meet strict new source performance standards for emissions. Emission calculations show that, with these control measures, the Proposed Project would be a minor source of criteria pollutants. Dispersion modeling indicates that the Proposed Project would not result in exceedances of the NAAQS. Screening protocols of the FLAG indicate that impacts to AQRVs would be minor. Future actions, such as remediation work at the Fry Canyon Mill and habitat improvement for bighorn sheep, could result in short-term emissions. If mineral exploration activities in the Local CIAA were applied for and permitted, the associated surface disturbance could result in temporary dust emissions. No additional impacts from mining, livestock grazing, or other uses are foreseen within the Local Cumulative Impact Area at this time.

Regional CIAA. Point and fugitive emissions sources from the Proposed Action would produce a total of 114 tons of NOx emissions per year. This would be a negligible increase in regional emissions when compared to total annual emissions of NOx from the primary sources of emissions in southeast Utah and northeast Arizona. These primary emission sources include: motor vehicles; natural wildfires; industrial generators such as agriculture, mining, milling, oil and gas; and large stationary sources of emissions including the Coronado Generating Station near St. Johns, Arizona and power plants near Shiprock and Farmington, New Mexico. These coal-fired power plants emit SO_2, NOx, and fine particulate that, under some atmospheric conditions, impair visibility over a wide area (hundreds of miles). In accordance with a 2008 settlement with EPA, the Coronado Generating Station is currently installing new pollution control technology which, when complete, will reduce combined SO_2 and NOx emissions by more than 21,000 tons each year. The Four Corners Power Plant located near Shiprock, New Mexico shut down three high-emitting units in 2013 and will commence installation of new pollution control technology on two existing units in 2014 under a BART (Best Available Retrofit Technology) implementation strategy. The San Juan Generating Station near Farmington is

expected to undergo similar changes in future years. All of these improvements are expected to improve visibility, reduce ozone smog potential, and protect human health in southeast Utah.

CARMMS uses the Comprehensive Air-quality Model with extensions (CAMx) photochemical grid model (PGM) model to estimate air quality and AQRV impacts for both a base case year (2008) and future year 2021. Both anthropogenic and natural sources are included in the CAMx modeling. CARMMS predicts impacts on air quality and AQRVs from projected increases in oil and gas development and projects oil and gas development up to a maximum of 10 years in the future to reflect realistic estimations of development projections and technology improvements (BLM, 2014a).

As part of CARMMS, future year 2021 emissions estimates were developed for three development scenarios for the 13 Colorado planning areas. These include year 2021 high, medium, and low oil and gas development scenarios. Modeling results for the CARMMS 2021 high oil and gas development scenario have been completed (BLM, 2014c), and these results are applicable for use in estimating potential regional ozone formation in the vicinity of the Proposed Project and for estimating air quality and AQRV impacts at the nearby Class I area, Canyonlands National Park.

The Proposed Project emissions are not specifically included in the study; however, from just the 8 western Colorado BLM planning areas included in the study, the total NOx and VOC emissions from future year cumulative mining and oil and gas sources are 57,231 and 95,478 tons per year, respectively, whereas the Proposed Project NOx and VOC emissions are 114 and 9.5 tons per year.

If uranium mine production were to increase to the maximum foreseeable levels commensurate with the maximum milling capacity at White Mesa (2,000 tons per day), the cumulative impact of operating the additional uranium mines on air quality would be relatively small because the emission rates of the individual mines are low and the mines are spread over a three-state area as shown on Figure 16 (see Appendix B). The processing of Daneros ore at the White Mesa Mill would have no appreciable indirect impacts to air quality and would not result in a violation of the NAAQS. The mill capacity is 2,000 tons per day and the UDAQ Approval Order authorizes the mill to process up to 720,720 tons per year (tpy). These annual or daily limits on mill production would not be exceeded with the Daneros ore supply or with an aggregate supply of ore from all mines. Therefore, the milling of Daneros ore would not result in an incremental increase in regional air emissions when combined with reasonably foreseeable mine production.

Regional Ozone Formation. The CARMMS future year regional ozone impacts for the 2021 High Development Scenario indicated areas of ozone exceedances of the NAAQS (75 ppb) in Denver and Salt Lake City with a maximum 79.3 ppb northwest of Denver. In the vicinity of the Proposed Project there were no predicted exceedances of the NAAQS, and the maximum ozone contributions due to cumulative RFD emissions in the vicinity of the Project Area is less than 1.0 ppb. Given that the cumulative mining and oil and gas emissions from the western Colorado BLM planning areas alone include 57,231 tpy NO_x and 95,478 VOC and that the maximum future year emissions from Proposed Project sources include 114 tpy NO_x and 9.5 tpy VOC, the contribution to regional ozone from the Proposed Project sources would be minimal.

Air Quality and Air Quality Related Values. The CARMMS included air quality and AQRV impact assessments at 55 PSD Class I and sensitive Class II areas, and at 58 lakes throughout the modeling domain. For this cumulative assessment, CARMMS impacts are presented for the closest PSD Class I area included in the analysis area, Canyonlands National Park.

Modeled concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ at Canyonlands National Park resulting from the 2021 High Development scenario are provided in Table 28**.** All values are well below the PSD Class I and Class II increments.

Table 28
Cumulative Pollutant Concentrations
(CARMMS 2021 High Development Scenario)
at Canyonlands National Park (µg/m^3)

Pollutant	Averaging Time	Modeled Concentration	PSD Increment
NO_2	Annual	0.075	2.5
SO_2	3-hour	0.072	25
	24-hour	0.031	5
	Annual	0.002	2
PM_{10}	24-hour	0.249	8
	Annual	0.032	4
$PM_{2.5}$	24-hour	0.178	2
	Annual	0.021	1

Table 29 displays the cumulative visibility results from CARMMS for the Cumulative Emissions Scenario and RFD sources for worst 20% and best 20% days at Canyonlands National Park. For the worst 20% days, visibility is estimated to improve in Canyonlands National Park from the 2008 current to 2021 future year, and for the best 20% days visibility is estimated to degrade. Table 29 also provides the contribution from cumulative RFD sources to future year visibility impacts. For the worst 20% days RFD emissions contribute a maximum of 0.29 dv to the future year visibility impacts and for the best 20% days RFD sources contribute 0.14 dv.

Table 29
CARMMS Cumulative Visibility Results (Δdv) for Worst 20% and Best 20% Visibility Days at Class I Areas for Current Year (2008) and 2012 High Development Scenario All Emissions and Contributions from RFD Sources, Canyonlands National Park

Days	IMPROVE Site	2008 Base	2021 High	2021 High Improvement from 2008	Contribution from RFD
Worst 20% Days	CANY1	11.02	10.63	0.39	0.29
Best 20% Days	CANY1	2.86	2.97	-0.11	0.14

Potential atmospheric deposition impacts within Canyonlands National Park were calculated for cumulative RFD sources and are shown in Table 30. The maximum direct total (wet and dry) N and S deposition are predicted to be well below the cumulative analysis thresholds of 1.5 kilograms per hectare per year (kg/ha/yr) for nitrogen and 3 kg/ha/yr for sulfur.

Table 30
Cumulative RFD Nitrogen and Sulfur Deposition Impacts
(CARMMS 2021 High Development Scenario)
at Canyonlands National Park

Maximum N Deposition (kg/ha/yr)	Maximum S Deposition (kg/ha/yr)
0.1963	0.0044

Total CO_2 produced from the Proposed Project was calculated to be 14,335 metric tons per year. The relation of these emissions to regional GHGs and their potential impacts are discussed in Section 4.2.1.3. Total CO_2 emissions from the Proposed Project may contribute to cumulative rises in global CO_2 levels. However, the uranium produced would be used to generate electricity through low-CO_2-producing nuclear fuel technologies that would indirectly result in a beneficial reduction of CO_2 levels globally.

4.4.2 Water Quality

Potential cumulative impacts to water quality in the project area and surrounding watersheds are analyzed below.

4.4.2.1 Cumulative Impact Analysis Area

The CIAA for the cumulative effects analyses for surface water quality and groundwater quality are shown on Figure 17 (see Appendix B). Both CIAAs were based on the arid climate, the lack of near surface aquifers, and other hydrologic conditions in the vicinity of the project.

Surface Water. The Daneros mine portals are located entirely on the southwest side of Wingate Mesa, towards the headwaters of the North Fork Red Canyon. The CIAA for surface water is focused on the Red Canyon watershed as shown on Figure 17 (see Appendix B). This 195-square mile watershed is made up of ephemeral drainages that flow only during storm events or with snow melt from the sides and top of Wingate Mesa. The major ephemeral drainages include Bullseye, near the Daneros and Bullseye Portals, Blue Canyon, Rainbow Canyon, and Mahon Canyon. These drainages tend to flow from northeast to southwest then into Red Canyon which drains towards the northwest into the Good Hope Bay of Lake Powell. From the Daneros Mine in Bullseye Canyon, down through the North Fork Red Canyon and Red Canyon, all of the drainages are ephemeral and meander for the 27 in-stream miles to the Bay. The South Portal Area drains directly to the North Fork Red Canyon and the in stream length is only slightly shorter.

Groundwater. Groundwater impacts are limited to the two known aquifers in the vicinity of the project. On the southwest side of Wingate Mesa there is a local, perched aquifer, as shown by the presence of the Bullseye Well and Spring. The only other known aquifer in the region is the water-bearing portion of the lower Cutler including the Cedar Mesa Sandstone. The lower Cutler is the source of the Daneros Well and proposed South Portal Well. The groundwater CIAA is based on a 5-mile radius around the Daneros and South Portal areas as shown on Figure 17 (Appendix B). This area encompasses the portion of the Wingate Mesa that contains the perched aquifer. Based on regional geologic mapping, the aquifer in the lower Cutler is likely quite large but anticipated groundwater flow rates and drawdown due to pumping indicate that impacts would be limited to a localized area, not more than five miles in any direction.

Based on local geologic information (Thaden, 1964) and data gathered during the drilling of the Daneros Well, a radius of influence was estimated for the Daneros Well which would apply also to the proposed South Portal Well. “The lithology of the Cedar Mesa, so far as exposures provide evidence, does not change across the area. It is dominantly a light-colored fine-grained poorly sorted calcareous quartz sandstone” (Thaden, 1964). Based on this description, the aquifer towards the base of the Cedar Mesa Sandstone likely has a low transmissivity. The water level drawdown during pumping of the Daneros Well is estimated to be only 20 feet at a distance of 1,000 feet from the well, assuming the well would be pumped continuously at 4 gpm for a year (corresponding to the annual appropriation of 5.73 acre-feet per year). However, it is unlikely the well would be pumped continuously, and pumping at a higher rate for shorter periods of time would reduce the drawdown at that distance. As noted previously, metering of the amount of water pumped from the well is required in accordance with Utah State Engineer approval of the appropriation.

4.4.2.2 Past and Present Actions

San Juan County has a rich mining history which may have resulted in impacts to water quality because many mines were developed prior to environmental rulemaking that required bonding and cleanup. The UDEQ, Division of Water Quality prepared a Nonpoint Source Management Plan for Abandoned Mines in Utah (UDWQ, 2012). In this plan, 684 abandoned mine features

(primarily focusing on shafts, adits, prospects, trenches and pits) in San Juan County, were inventoried by the Abandoned Mines Reclamation Program (AMRP). Sites of most pressing concern to the State of Utah were listed and the BLM used this list to develop priority watershed projects in the Utah State Office Abandoned Mine Land Workplan Period: FY2007-2013 (BLM, 2006). Red Canyon is included on the list of 10 highest priority watershed projects in the state. It is assumed to contain 160-200 openings.

Daneros Mine is the only permitted or proposed mine in the surface water and groundwater CIAAs. The only currently permitted exploration project is the Lark Royal (BLM number UTU-74631) which includes a total of 63 drill holes, 25 of which have already been drilled and reclaimed.

Surface Water. There is limited surface water in the surface water CIAA and limited use of what water is available. The Utah Division of Water Rights maintains a database of water right points of diversion. Based on that data, 25 approved water rights, with a total of approximately 34 points of diversion, exist within the Red Canyon watershed. (UDWR, 2014b). The bulk of those points of diversion apply to springs emanating from perched groundwater aquifers within the Wingate Mesa and are located in other tributaries to Red Canyon, similar to and including the Bullseye Spring (Figure 17, Appendix B). Only a couple of the water rights apply to surface water catchments. Most of the use is (and has been) for ranching. A few of the water rights reference mining-related uses, but these mines operated sporadically and have not operated for many years. Surface water quality is variable, due to the natural setting, including mineralization and sediment transport during storms, and has been affected at some locations by human activities.

Groundwater. Use of groundwater from both the shallow, perched aquifer and the deeper aquifer in the Cedar Mesa Sandstone is limited within the groundwater CIAA. The Bullseye Well is the only well completed in the shallow, perched aquifer. All other uses of this and similar shallow, perched aquifers rely on the naturally-occurring springs, such as Bullseye Spring (Figure 17). The perched aquifer above the Daneros Mine workings is hydrologically isolated from the springs located to the west of Bullseye Canyon (Figure 13, Appendix B). Within the groundwater CIAA there are six approved water rights and seven underground points of diversion. The Daneros Well and Bullseye Well are among those listed. The other wells are located in Fry Canyon, upgradient of the Proposed Action. Based on geologic mapping, the Fry Canyon wells are completed in the Cedar Mesa Sandstone. Two of those wells are referred to as non-production test wells and are likely associated with the former Fry Canyon Mill site. The remaining three wells are greater than 3.4 miles upgradient and are owned by a local rancher, the Fry Canyon Store and the State of Utah School and Institutional Trust Lands.

4.4.2.3 Reasonably Foreseeable Action Scenario (RFAS)

Reasonably foreseeable actions are considered to be limited to those for which some formal notice or permit application has been made and does not include potential developments which are speculative. Levels of surface disturbance are used as best estimates for total impacts to the human environment. The rationale is that levels of surface disturbance are among the most comprehensive and readily determined impacts and because disturbance to the surface results in direct and indirect effects to many analyzed resources. Reasonably foreseeable actions are the same for the surface and groundwater CIAAs.

BLM completed an RFD Scenario for locatable minerals development including related surface disturbance within the BLM MFO RMP Planning Area, and impacts were analyzed and documented in the MFO RMP/FEIS, dated August 2008 (BLM, 2008b). BLM projected 360 acres of new surface disturbance from mining within the MFO Planning Area over the life of the RMP. This information is found in the FEIS under Summary of Locatable Mineral RFD and

Salable Mineral RFD (BLM 2008b:4–113). The Daneros Mine (2011 EA) was the first mining operation following approval of the RMP in 2008, with a total surface disturbance of 4.5 acres, most of which was previously disturbed, and well below the planned-for 360 acres of disturbance. The Proposed Action adds 41.8 acres of disturbance, 5.6 of which were previously disturbed. The MPOM proposes concurrent reclamation, where possible, which would reduce the impact of disturbed mining areas at any given time. Additional mining-related surface disturbance has taken place since the RMP was approved, most of which related to exploration drilling and has been reclaimed. A future increase in the market price of uranium, similar to temporary increases that have occurred in the past, would likely trigger 6 to 12 new requests for uranium exploration permits with about 1 acre of disturbance associated with each drilling project. Assuming the maximum drill requests and approximately 1 acre of disturbance acreage per exploration project, the total mining-related disturbance within the surface and groundwater cumulative impact areas would potentially increase to 53.8 acres.

There are no other mine operations proposed at this time within the CIAAs that would contribute to cumulative surface or groundwater impacts. Any future mines would be subject to design standards that require protection from a 100-year storm event. Several abandoned or decommissioned uranium milling facilities in San Juan County have been listed in the Comprehensive Environmental Response and Liability Act (CERCLA, also known as Superfund) derived site database, CERCLIS. The EPA CERCLIS is used to track activities at sites considered for cleanup under the CERCLA. Old uranium mills sites contain low-level radioactive wastes and other hazardous substances that can potentially migrate to surrounding soil, groundwater, and/or surface water, and emit radon gas. The listed site nearest to the Project Area is at the Fry Canyon Mill (approximately 3.5 miles northeast). The BLM is currently evaluating plans to initiate remediation work at the Fry Canyon Mill Site. Plans include consolidating the old mill tailings and covering them with native material (E&E, 2014). These efforts are intended to reduce future surface and groundwater impacts.

4.4.2.4 Cumulative Impact Analysis

Cumulative impacts of the Proposed Action are assessed using the incremental addition of past and present actions (which are expected to continue at present levels), reasonably foreseeable actions and the Proposed Action (as described in Sections 4.2.2.1 and 4.2.2.2), summarized for the surface water and ground water below:

- Surface water
    - The Proposed Action – construction of mine yards, upgrades to existing portals or construction of new portals, office/shop, ore stockpiles, DRAs, and topsoil stockpiles (potential impacts may include erosion, sedimentation, increased uranium concentrations in soils, and drainage from the DRAs)
    - Historic uranium mining
    - Currently permitted uranium mining and possible additional future mining
    - Currently permitted mineral exploration and possible additional future exploration
    - Surface water use
- Ground water
    - The Proposed Action – surface and underground mining activities (potential impacts may include contamination or dewatering of a local perched aquifer and potential contamination of a deeper aquifer in the Cutler Formation)
    - Ground water use

- Uranium milling

Existing water use in the area is limited, and continuation of on-going ranching and mineral exploration activities are unlikely to increase water use demands appreciably or result in water quantity or quality impacts. There are no RFAS that would impose substantial demands on the water quantity and quality of the area. As noted in the 2011 EA (BLM, 2011), placement of the DRAs over historic, unreclaimed waste rock piles reduces the potential for post-reclamation drainage from the older waste rock. In addition, the proposed handling of materials in the DRAs, including sampling and drainage control, reduces the potential for increased cumulative impacts.

Surface Water. The area surface water quality may be impacted by exploration drilling and the surface disturbance necessary to conduct that drilling. Up to 12 acres of surface area within the CIAA may be disturbed by future uranium exploration activity if the price increases sufficiently to trigger industry interest. However, individual exploration projects would generally result in small areas of surface disturbance (approximately 1 acre) and would be of short-term duration (less than 3 months). Proper construction and reclamation of drilling roads and pads would minimize those impacts. Future water quantity use could increase by a small amount if the uranium market improves and new exploration drilling projects are permitted because water would be used to support the drilling process. The BLM's efforts to remediate the Fry Canyon Mill site would result in improvements to long-term surface water quality.

Groundwater. The perched aquifer above the Daneros Mine workings is hydrologically separated from several springs located to the west of Bullseye Canyon so underground mining activity at the Daneros would not impact those springs. Impacts to shallow perched groundwater could result from exploration drilling in the area, as the drill holes could intercept these perched zones prior to their completion in the Chinle Formation. However, proper drill hole abandonment would be required by the BLM and UDOGM, which would minimize those impacts. Cumulative Impacts to the deep Cutler Aquifer would be negligible given the limited upgradient use of the aquifer, the absence of current or foreseeable downgradient uses, the relative large saturated thickness of the aquifer, the aquifer's limited transmissivity and the fact that future exploration drilling into the Shinarump Member would not penetrate the much deeper Cutler Group.

4.4.3 Human Health and Safety

Potential cumulative impacts to human health and safety in the project area, and in the region, are presented below. Impacts are assessed for radiation and transportation only because impacts from mine rock and wastes are localized to the mine portal areas and are assessed in previous sections or in Appendix C. Radiation impacts to miners could result from exposure to radon in underground mines. Radiation impacts to the public could result from radon exhausted from mine vent shafts and portals, from trucks carrying uranium ore and from active uranium processing mills.

4.4.3.1 Cumulative Impact Analysis Area

Radiation. Cumulative impacts from radiation are assessed for the BLM MFO RMP Planning Area as shown on Figure 18 (see Appendix B). This area encompasses 7,161 square miles and includes all but the northeast corner of San Juan County as it begins to rise towards the La Sal mountains. It follows the Utah state line to the east, the Arizona state line to the south and the Colorado River to the west.

Transportation. The cumulative impacts of the Proposed Action and other uranium mining operations in the region could impact traffic from the junction of County Road B258 and SH 95

to the White Mesa Mill including a small stretch of SH 191, as shown on Figure 18 (see Appendix B). This is a distance of approximately 53 miles.

4.4.3.2 Past and Present Actions

Radiation. The radiation CIAA contains two permitted uranium mines, the Daneros Mine and the Rim Mine, both of which are not currently operating. The historic Fry Canyon Mill is located within the White Canyon watershed approximately 3.5 miles northeast. The only currently permitted uranium exploration project is the Lark Royal (BLM number UTU-74631) which includes a total of 63 drill holes, 25 of which have already been drilled and reclaimed.

Many historic mines exist in the area but they are not venting radon from underground, which is the major source of radiation released to the environment at uranium mine sites (see Section 4.2.3.1.2). The radius of potential impact of historic uranium mines, where portals and vent shafts are generally sealed, is limited to a small area. Given this small area of potential impact and the sparse population in this area of southeast Utah, radiation from past mines is not assessed further.

The White Mesa Mill is the only permitted uranium processing mill in the area and it is operating.

Transportation. According to the Utah Department of Transportation's (UDOT) annual average daily traffic (AADT) counts, SH 95 between SH 261 and SH 191 decreased from 555 vehicles in 2007 to 420 vehicles in 2010 and to 405 vehicles in 2012. Reported AADT on SH 191 increased from 2,505 vehicles in 2007 to 2,525 vehicles in 2010 and decreased to 2,450 vehicles in 2012. Overall, between 2007 and 2012, AADT decreased 27 percent on SH 95 and 2 percent on SH 191 (UDOT, 2014). Currently, transportation levels remain minimal in the area due to the remoteness of the area and the inactive status of the mines in the area.

4.4.3.3 Reasonably Foreseeable Action Scenario (RFAS)

Radiation. BLM completed an RFD Scenario for locatable minerals development including related surface disturbance. Associated impacts were analyzed and documented in the MFO RMP/FEIS, dated August 2008 (BLM, 2008b). BLM projected 360 acres of new surface disturbance from mining in the BLM MFO RMP Planning Area over the life of the RMP. The Daneros Mine (2011 EA) was the first mine operation to be permitted in the MFO Planning Area following approval of the RMP in 2008, with a total surface disturbance of 4.5 acres, most of which was previously disturbed. The Proposed Action adds 41.8 acres of disturbance, 5.6 of which were previously disturbed. A small amount of exploration activity has taken place in the MFO Planning Area since the RMP was signed but Daneros is the only Mine Plan of Operations to be filed or amended since the RMP was signed.

The BLM is currently evaluating plans to initiate remediation work at the Fry Canyon Mill Site. Plans include consolidating the old mill tailings and covering them with native material (E&E, 2014).

If uranium prices increased considerably, it is reasonable to assume that additional mines in the region would resume or start production, as discussed in Section 4.4.1.3. Based on historic mining and uranium deposits in the radiation cumulative impact area, as many as 10 mines might operate (including Daneros), most of them producing small amounts of ore and having disturbance areas smaller than the Daneros Mine. These mines could include the Velvet, Dunn, Sage and Calliham Mines shown on Figure 18.

Transportation. As discussed in Section 4.2.3.4, the Proposed Action is expected to result in a two percent increase in traffic on SH 191 and a 12 percent increase in traffic on SH 95 compared to 2012 traffic levels. If the market price of uranium increased, other permitted mines west of Daneros could restart operations, thus compounding the increase in traffic on the roads

to the White Mesa Mill. Garfield County contains a number of uranium mining properties, including the Tony M mine, that would likely restart. The Tony M mine holds a current permit to mine and is owned by Energy Fuels so it would ship ore to the White Mesa Mill. Based on the assumption that the existing Tony M mine and one other, similarly sized mine in the area would be permitted and would ship ore to the White Mesa Mill, an additional 40 haul trucks per day could travel on SH 95 and SH 191. These vehicles would result in a 3 percent increase in traffic on SH 191 and a 20 percent increase on SH 95. Combined with the Proposed Action, cumulative traffic impacts could include a 5 percent increase in traffic on SH 191 and a 32 percent increase on SH 95 compared to 2012 traffic levels. There are additional uranium mines that are located in San Juan County that are likely to ship ore to the White Mesa Mill since it is the only active mill that is currently permitted to operate. These mines may include the Energy Queen, the La Sal Complex and the Rim Mine, all of which are permitted to mine and are currently on temporary suspension. With an increase in the market price of uranium, two out of three of these mines may restart and would haul ore south on SH 191 to the White Mesa Mill. Based on existing permits and expectations, operating two of these mines would add an additional 40 haul trucks per day to the existing traffic on SH 191. These vehicles would result in an additional 3 percent increase in traffic on SH 191 resulting in a cumulative 8 percent increase in traffic compared to 2012 levels.

4.4.3.4 Cumulative Impact Analysis

Cumulative impacts of the Proposed Action are assessed using the incremental addition of past and present actions (which are expected to continue at present levels), reasonably foreseeable actions and the Proposed Action (as described in Sections 4.2.3.1, 4.2.3.2, and 4.2.3.3), summarized below:

- Radiation
    - The Proposed Action – surface and underground mining activities releasing radon-222 gas and its daughter products, including development rock areas and ventilation (potential impacts may include increased risk of radiation exposure to workers and the general public)
    - Historic uranium mining
    - Currently permitted uranium mining and possible additional future mining
    - Currently permitted mineral exploration and possible additional future exploration
    - Remediation work at the Fry Canyon Mill Site
- Mine rock
    - The Proposed Action – surface stockpiling of development rock (potential impacts may include direct contact risks related to arsenic)
    - Ground water use
- Transportation
    - The Proposed Action – increasing traffic volumes on regional roads (potential impacts may include indirect impacts by increasing the potential for vehicle collisions and contributing to roadway deterioration and dust creation on unpaved roads)
    - Currently permitted uranium mining and possible additional future mining
- Uranium milling

Radiation. Little mining disturbance has taken place or been proposed since the RMP was approved, limiting the present cumulative impact of mining operations, and uranium mining in particular, on the BLM MFO RMP Planning Area. Radiation impacts to miners could result from exposure to radon in underground mines. Radiation impacts to the public could result from radon exhausted from mine vent shafts and portals, from trucks carrying uranium ore and from active uranium processing mills.

In the RFAS discussed above of increased uranium price and production in the area, it is possible to estimate that the uranium mining industry would employ an additional 40 underground miners per mine, resulting in a total of 400 underground miners. Radiation impacts at each of these mines would be regulated by MSHA which requires adequate ventilation for underground uranium miners to reduce their exposure to radiation and radioactive materials to acceptable levels. While these measures reduce radiation exposure, they do not reduce it to background levels so some increased radiological impacts would be sustained by underground miners in the BLM MFO RMP Planning Area. Between 1985 and 1989, the average occupational radiation dose for uranium miners in the United States was 350 mrem/yr (United Nations Committee on the Effects of Atomic Radiation - USCEAR, 2000). This radiation dose is equivalent to a probability of a latent cancer fatality of 2.1×10^{-4}, or about 1 chance in 5,000. Increasing the number of miners from 40 to 400 would increase the probability of latent cancer fatalities.

Radiation impacts to the public could result from radon exhausted from mine vent shafts and portals. The EPA limits the incremental dose to the public from mine ventilation emissions to 10 mrem/yr. This dose is similar to the dose an individual would receive on two round trip airplane flights per year from New York to Seattle (Friedberg and Copeland 2003). The Application for Approval of Construction or Modification for the Daneros Underground Uranium Mine (Denison 2012) was submitted to the Utah DAQ in 2012 and included radon dose modeling performed using EPA's COMPLY-R model. The results of this radon dose modeling can be used to estimate typical uranium mine ventilation emissions for other mines that could be operated in the area since the climate, topography, mine size and ore grade would likely be similar. Modeling for the Daneros Mine was performed using calculations based on actual radon monitoring results from the mine and also by applying emission factors developed by the EPA that relate cumulative tons of ore mined to annual radon emissions. The latter emission factors were obtained from the EPA's Background Information Document, Standard for Radon-222 Emissions from Underground Uranium Mines, published in 1985 (EPA 1985). The nearest modeled receptors to the existing Daneros Mine ventilation sources (vent shafts and/or portals) were approximately 3.0 miles to the northeast. The modeled dose at that receptor based on actual monitoring results was 0.2 mrem/yr. The modeled dose was also calculated at that receptor based on the EPA emission factors and incorporated the following conservative assumptions:

- The entire ore body of the mine was mined out at the outset of mining, meaning the maximum possible mine workings were releasing radon;
- Ventilation out of only 4 sources rather than the 16 sources currently proposed, meaning the exhaust emanated from fewer source locations resulting in an increase in concentration at each source; and
- Using the average ore grade for the Daneros Mine of 0.30% as opposed to the 0.18556% estimate used by the EPA to develop its emission factors.

The calculated dose to the nearest resident resulting from application of the EPA emission factors and the conservative assumptions listed above was 4.7 mrem/yr.

The emission dose resulting from use of the monitoring results, and use of the conservative EPA emission factors, are quite small when compared to the background radiation exposure in the area of 430 mrem/yr (see Table 20). At a distance of 3 miles from the mines, doses to the public from similar area mines would be expected to be well under the permissible EPA incremental dose to the public from mine ventilation emissions of 10 mrem/yr. Thus, the very localized impacts from additional mines in the region would create negligible cumulative impacts.

Radiological impacts to the public would also occur as a result of exposure to low levels of radiation near the haul trucks transporting ore to the White Mesa Mill. Regulatory limits (49 CFR 173.441 and 10 CFR 71.47) were established to protect the public and limit exposure to 10 mrem/hr at 6 feet from the sides of the haul trucks (see MPOM Attachment N). The U.S. Department of Transportation (USDOT) also requires that ore shipments be covered, placarded, and monitored for gamma radioactivity levels at specified distances from the trailer. The Uranium Leasing Program Programmatic Environmental Impact Statement estimated the average external dose rate for uranium ore shipments to be approximately 0.1 mrem/h at 6.6 feet from the truck, two orders of magnitude lower than the federal regulatory maximum (DOE, 2014). The Uranium Leasing Program Programmatic Environmental Assessment (PEA - DOE, 2007) contains additional discussion of the risks to the public from uranium haulage traffic. Section 5.2.2.3 of the PEA discusses radiological transportation impacts assuming an average of 30 to 50 haul trucks per day delivering uranium ore. As discussed above, if the uranium price increased and mines to the west were reopened, approximately 40 additional haul trucks may add to the 15 Daneros haul trucks that are included in the Proposed Action, resulting in a total haul truck volume of 55 trucks hauling ore one way. Table 31 presents the estimated radiological dose to truck drivers and the public from haul trucks transporting uranium ore.

Table 31
Radiation Doses for the Public from Ore Shipments

Scenario	Radiation Dose	Latent Cancer Fatalities
Haul truck driver	14 mrem/yr	8.4×10^{-8}
Individual in traffic jam	0.026 mrem	1.6×10^{-8}
Individual passing vehicle	7.4x10-6 mrem	4.4×10^{-12}
Individual in vehicle at intersection	1.5x10-5 mrem	9.0×10^{-12}
Nearby resident*	0.074 mrem/yr	4.4×10^{-8}

Source: DOE 2007 5-20 modified
*The nearby resident is assumed to live 33 feet from a road used by haul trucks. This individual would be exposed to all shipments of uranium ore over the course of a year.

The limited increases in exposure from ore shipments compared to the natural background radiation dose in the Daneros region of 430 mrem/yr results in negligible cumulative impacts to haul truck drivers and the public. For perspective, an individual has a lifetime probability of dying of cancer from all sources of about 1 in 5, or a risk of lung cancer of 1 in 17.

Uranium mills are required to comply with NRC and Agreement State regulations, which establish a standard dose limit for the public (i.e., 100 mrem/yr over background) specified at 10 CFR 20.1301(a)(1). In addition, the NRC and state radiation programs require that radiation doses at mill sites be reduced to levels that are “as low as reasonably achievable” (ALARA) through the use of modern technology and monitoring instruments. Through the strict application of ALARA, actual incremental radiation exposure from the mills is typically far less than the 5 rem/yr dose limit (10 CFR 20.1201(a)) for mill workers (typically 100 to 200 mrem/yr). USDOT requires that shipments of yellow cake from the mills to the conversion plants be below their established radiation limits, packaged in leak-tight containers, and that the containers be free of any surface contamination. As discussed in section 4.2.3.5 above, the processing of

Daneros ore at the White Mesa Mill would have negligible indirect impacts to human health from radiation exposure because of the existing permit requirements, regulatory oversight of mill operations, and because of the relatively small percentage of mill production that would occur from the Daneros ore. No other uranium processing mills are permitted or proposed within the radiological cumulative impact study area.

Transportation. Up to 15 ore trucks per day would travel from the Project Area to the White Mesa Mill. Assuming that an additional 40 haul trucks per day would travel from other mines located northwest of the Project Area to the White Mesa Mill, traffic could increase by approximately 32 percent on SH 95 and 5 percent on SH 191. Based on highway crash statistics for rural arterial and collector roads in Utah (UDOT, 2014), the cumulative increase in traffic is estimated to result in four to five additional traffic accidents per year. Based on highway fatality rates in Utah (NHTSA, 2014), estimated cumulative highway crashes are associated with approximately one accident-related fatality every six years. Although highway crash and fatality data specific to state highways 95 and 191 are not available, impacts to the public from increases in haul truck traffic on public roads would be minimal when compared to non-mining related public road use.

The processing of ore from the Proposed Project at the White Mesa Mill would result in negligible indirect impacts and, therefore, would cause no cumulative impacts when combined with the minor direct impacts of the mine operation.

4.4.4 Cumulative Impacts Analysis Summary

Cumulative impacts in the area of the Daneros Mine are limited primarily by the remote nature of the area and the lack of residential and industrial development. Little expansion of current land uses, primarily livestock grazing and recreation, are anticipated in the region. If uranium prices increased considerably, it is reasonable to assume that additional mines in the region would resume or start production. However, production would be limited to the maximum milling capacity in the region. The milling of Daneros ore and potential ore from additional mines in the region would not result in an incremental increase in regional air emissions because mill production cannot exceed the current mill capacity or the annual production limit imposed by the AO.

Cumulative impacts to air quality would be limited due to a lack of existing industrial development in the local area, and due to mitigation measures that would be required for future development. No additional impacts from livestock grazing, recreation, mining or other uses are foreseen at this time.

Cumulative impacts to water quality are limited in extent due to the arid climate, lack of near surface aquifers, and other physical conditions in the vicinity of the project. There are no other mine operations proposed at this time that would contribute to cumulative surface or groundwater impacts. Existing water use in the area is limited, and continuation of on-going ranching and mineral exploration activities are unlikely to increase water use demands appreciably or result in water quantity or quality impacts.

Cumulative impacts to human health and safety could result from radiation exposure and increased haul truck traffic. A minor amount of uranium exploration surface disturbance has taken place in the MFO Planning Area since the RMP was approved but Daneros is the only Plan of Operations to be filed or amended since the RMP was approved. Little mining disturbance has taken place or been proposed since the RMP was approved, limiting the present cumulative impact of mining operations, and uranium mining in particular, within the BLM MFO RMP Planning Area. At a distance of 3 miles from the mine, dose to the public from similar area mines would be well under the permissible EPA incremental dose to the public from

mine ventilation emissions of 10 mrem/yr. Thus, the very localized impacts from additional mines in the region create negligible cumulative impacts. The limited increases in exposure from ore shipments compared to the natural background radiation dose in the Daneros region of 430 mrem/yr also results in negligible cumulative impacts to haul truck drivers and the public. Impacts to the public from increased traffic due to commuting workers and haul trucks could include a 5 percent increase on SH 191 and a 32 percent increase on SH 95 compared to 2012 traffic volumes.

CHAPTER 5 - CONSULTATION AND COORDINATION

5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. Appendix C provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public and agency involvement process described in Sections 5.2 and 5.3 below.

5.2 Persons, Groups, and Agencies Consulted

As part of the EA scoping process, the public was notified of the Proposed Action by posting on the BLM MFO web page, the BLM Utah State Office Environmental Notifications Bulletin Board, publication in local newspapers, and letters sent to State of Utah agencies and interested parties. The BLM MFO received 9 comment letters and 2,045 form letters during the scoping period. Scoping contacts are summarized in Table 32. Appendix D provides responses to the individual comments.

Table 32
Summary of Scoping Contacts and Response Submittal

Name	Description	Response
Michael Okuniewicz	Supervisory Inspector, U.S. Department of Labor, Mine Safety and Health Administration	No Response Submitted
Howard Cantor	Acting Regional Administrator, U.S. EPA Region 8	Letter Received
Jim Dougan	Superintendent, Natural Bridges National Monument	Letter Received
Todd Brindle	Superintendent, Glen Canyon National Recreation Area	No Response Submitted
Bruce Adams	Chairman, San Juan County Commission	No Response Submitted
Marc Stilson	Regional Engineer, Utah Division of Water Rights, SE Regional Office	No Response Submitted
Rusty Lundberg	Director, Utah Division of Radiation Control	No Response Submitted
John Kennington	UPDES Engineering Section Manager, Utah Division of Water Quality	No Response Submitted
Robert Herbert	Ground Water Section Manager, Utah Division of Water Quality	No Response Submitted
Scott Anderson	Division Director, Utah Division of Solid and Hazardous Waste	No Response Submitted
Liz Thomas	Staff Attorney, Southern Utah Wilderness Alliance	Letter Received
Sarah Fields	Uranium Watch	Letter Received
Sandy Johnson	Fry Canyon	Letter Received
Harold Reid	Governor, Pueblo of Zia	No Response Submitted
Peter Pino	Cultural Resources Director, Pueblo of Zia	No Response Submitted
Arlen Quetawkie Sr.	Governor, Pueblo of Zuni	No Response Submitted
Kurt Dongoske	Director and Tribal Historic Preservation Officer Pueblo of Zuni	No Response Submitted
Gregg Shutiva	Governor, Cultural Preservation Office Pueblo of Acoma	No Response Submitted

Name	Description	Response
Theresa Pasqual	Director, Historic Preservation Office Pueblo of Acoma	No Response Submitted
Richard Luarkie	Governor, Pueblo of Laguna	No Response Submitted
Casey Dumo	Cultural Resources, Pueblo of Laguna	No Response Submitted
Bruce Tafoya	Governor, Pueblo of Santa Clara	No Response Submitted
Gilbert Tafoya	Office of Cultural Preservation, Pueblo of Santa Clara	No Response Submitted
Vincent Toya Sr.	Governor, Pueblo of Jemez	No Response Submitted
Christopher Toya	Department of Resource Protection Pueblo of Jemez	No Response Submitted
Ben Shelly	President, Navajo Nation	Letter Received
Timothy Begay,	Program Manager Navajo Nation Historic Preservation Department	Letter Received
Manuel Heart	Chairman, Ute Mountain, Ute Tribe	No Response Submitted
Terry Knight	Historic Preservation Officer Ute Mountain, Ute Tribe	No Response Submitted
Elaine Atcitty	Councilwoman, White Mesa, Ute Council	No Response Submitted
Irene Cuch	Chairwoman, Uintah and Ouray Ute Tribe	No Response Submitted
Betsy Chapoose	Directory, Uintah and Ouray Ute Tribe	No Response Submitted
Leroy Ned Shingoitewa	Chairman, Hopi Tribe	Letter Received
Leigh Kuwanwisiwma	Hopi Cultural Preservation Office	Letter Received

Native American Tribes

On February 4, 2014, the BLM sent 21 consultation letters to 12 tribal entities describing the Proposed Action and presenting the results of the cultural resource inventories conducted within the Area of Potential Effect (APE). A map of the general project location was attached to the letter.

The BLM received response letters from the Hopi Cultural Preservation Office and the Navajo Historic Preservation Department. The responses from the tribes and consultations conducted by the BLM as a follow-up to those letters are described below.

The response letter from the Hopi Cultural Preservation Office (dated February 10, 2014) stated that the Hopi Tribe claims ancestral and cultural affiliation to prehistoric cultural groups in the Monticello area, and that the Hopi Cultural Preservation Office considers the archaeological sites of their ancestors to be Traditional Cultural Properties (TCPs). The letter also stated that they understood that the cultural resource survey of the Project Area identified no prehistoric sites, but that they oppose uranium mining pursuant to the doctrine of discovery and 1872 mining law, and the BLM's application of categorical exclusions for such proposals, particularly near a National Monument. Concerns expressed by the Hopi did not relate to specific sites, TCPs, or sacred areas.

The response letter from the Navajo Historic Preservation Department – Traditional Culture Program (HPD-TCP) (dated February 10, 2014) stated that based on its HPD-TCP Sacred Sites Database, there are numerous Cultural Sacred Sites located within the proposed Project Area. The letter requested that if the Proposed Project inadvertently discovered Navajo habitation sites, plant gathering areas, and/or human remains and objects of cultural patrimony, the HPD-TCP be notified in accordance with the Native American Graves Protection and Repatriation Act.

U.S Fish and Wildlife Service

Consultation with the U.S. Fish and Wildlife Service is not required since there are no known threatened or endangered species and associated habitat within or near the proposed Project Area and listed species would not be affected by the Proposed Action.

State Historic Preservation Officer

Consultation with the State Historic Preservation Officer (SHPO) was conducted under the Utah Protocol of the BLM's statewide programmatic agreement. On April 2, 2014, the SHPO concurred with BLM's determination of No Adverse Effect from the Proposed Action on Historic Properties.

5.3 Summary of Public Participation

Public scoping for this EA started on February 5, 2014, when BLM posted the proposal on its Environmental Notification Bulletin Board (ENBB). BLM again informed the public on February 12, 2014, in local newspapers regarding the proposal and asked for further input. The Proposed Action was also made available for public review on the MFO website. The BLM invited the public to provide comments on the proposal beginning February 5, 2014 through March 14, 2014. On February 4, 2014, BLM sent letters to 12 tribal entities requesting comments on the Proposed Action. Letters were also sent to interested parties. On February 10, 2014, the BLM sent a letter to several State of Utah agencies requesting input on issues and concerns.

5.4 List of Preparers

Bureau of Land Management, Monticello Field Office		
Name	**Title**	**Responsible for Following Sections of This Document**
Ted McDougall	Geologist	Project Leader, Mineral Resources, ACECs, Noise, Environmental Justice
Brian Quigley	Assistant Field Manager, NEPA Coordinator	Visual Resources, Wild and Scenic Rivers, Wilderness, Recreation, BLM Natural Areas
Mandy Scott	Wildlife Biologist	T&E Species, Water Quality, Woodlands, Wildlife
Jed Carling	Rangeland Management Specialist	Floodplains, Vegetation, Wetlands, Riparian, Livestock Grazing
Jeff Brown	Petroleum Engineering Tech.	Human Health, Wastes (hazardous or solid)
Chris Ransel	Realty Specialist	Lands and Realty
Don Simonis	Archaeologist	Cultural Resources, Native American Religious Concerns
Leonard Herr	Air Quality Specialist, BLM Utah +State Office	Air Quality
Clifford Giffen	Natural Resource Specialist	Air Quality, Soils, Climate and Transportation
Paul Plemons	Fuels Specialist	Fire and Fuels
Rebecca Hunt-Foster	Paleontologist	Paleontological Resources
Bill Stevens	Outdoor Recreation Planner, Moab Field Office	Socioeconomic, Lands with Wilderness Characteristics
Douglas N. Cox, Ph.D.	Environmental Risk Assessment Specialist, BLM National Operations Center	Human Health

Edge Environmental Inc.	
Name	**Provided the Following Support for this Document:**
Mary Bloomstran	Project Manager
Carolyn Last	Document Control, Human Health and Safety and Cumulative Impact Analysis
Jim Zapert and Susan Connell (Carter Lake Consulting)	Air Quality and Climate Impact Analysis
Roberta Hoy	Water Quality Impact Analysis
Nikie Gagnon	Scoping Comment Summary
Joseph Thomas	GIS Analysis

CHAPTER 6 - REFERENCES AND ACRONYMS

6.1 References Cited

Boice, John D., Jr., M.T. Mumma, S. Schweitzer, and W.J. Blot. 2003. Cancer mortality in a Texas county with prior uranium mining and milling activities, 1950–2001. *Journal of Radiological Protection*, Volume 23, Issue 3, pp. 247–262. Available at: http://www.iop.org/EJ/abstract/0952-4746/23/3/302/. Accessed December 2008.

Boice, John D. Jr., S. S. Cohen, M.T. Mumma, B.Chadda, and W.J. Blot. 2007. Mortality among residents of Uravan, Colorado who lived near a uranium mill, 1936–84. Journal of Radiological Protection. Issue 3. Available at: http://www.iop.org/EJ/abstract/0952-4746/27/3/004. Accessed December 2008.

Boice, J.D., Cohen S.S., Mumma M.T., Chadda B., and Blot, W.J. 2008. A Cohort Study of Uranium Millers and Miners of Grants, New Mexico, 1979-2005. Journal of Radiological Protection, Devon, England 2008.

Boice, John D., Mumma, Michael T., and Blot, William J. 2010. Cancer Incidence and Mortality in Populations Living Near Uranium Milling and Mining Operations in Grants, New Mexico, 1950-2004. Radiation Research, Bozeman, MT, July 2010.

Bureau of Land Management. 1992. Recreation Management Restrictions; Occupancy Stay Limitation. 57 Federal Register 240 (December 14, 1992), pp. 59121-59122.

Bureau of Land Management. 2006. Utah State Office Abandoned Mine Land Workplan Period: FY2007-FY2013. Bureau of Land Management, Utah State Office, Salt Lake City, Utah. Assumed 2006.

Bureau of Land Management. 2008a. Record of Decision and Approved Resource Management Plan (RMP). Bureau of Land Management, Monticello Field Office, Monticello, Utah. November 2008.

Bureau of Land Management. 2008b. Monticello Field Office Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Bureau of Land Management, Utah State Office, Salt Lake City, Utah. Prepared by the Monticello Field Office, August 2008.

Bureau of Land Management. 2011. Decision Record, Finding of No Significant Impact, and Environmental Assessment (UT-090-07-43) for the Daneros Mine Project. Monticello Field Office. June 2011.

Bureau of Land Management. 2013. Final Environmental Impact Statement for the Gas Hills In-Situ Recovery Uranium Project. October 2013. Accessed online: www.blm.gov/wy/st/en/info/NEPA/document/lfo/gashills.html.

Bureau of Land Management. 2014a. Modeling Protocol Colorado Air Resource Management Modeling Study (CARMMS), Bureau of Land Management, Colorado State Office, Lakewood, Colorado. January.

Bureau of Land Management, 2014b. Desert Bighorn Sheep Habitat and Water Improvement, Monticello Field Office. November 2014.

Bureau of Land Management. 2014c. Colorado Air Resource Management Modeling Study (CARMMS), Preliminary Results for the High Development Scenario (Draft), Bureau of Land Management, Colorado State Office, Lakewood, Colorado. May.

Bureau of Land Management. 2015. Risk Assessment Review and BLM Recommendations Regarding Energy Fuels' Environmental Assessment Report for the Daneros Mine Plan Modification, December 2014. Bureau of Land Management, National Operations Center, Lakewood, Colorado. April 6, 2015.

Butt, Jim. 2009. Previous Operator of the Royal Mine, Personal Communication by John Hasleby on April 3, 2009.

CDM Smith. 2013a. Drainage Report for Daneros Mine, San Juan County, Utah. Prepared for Energy Fuels Mines (USA) Corp. February.

Cooperative Institute for Research in the Atmosphere. 2014. IMPROVE and RHR Summary Data, Means for Best, Middle, and Worst 20% Visibility Days. Accessed online at : http://vista.cira.colostate.edu/improve/Data/IMPROVE/summary_data.htm. 2014.

Clean Air Status and Trends Network. 2012. 2010 Annual Report. Prepared by AMEC Environment and Infrastructure, Inc. Prepared for U.S. Environmental Protection Agency. EPA Contract No. EP-W-09-028. April 2012.

Countess, R. J., W.R. Barnard, C.S. Claiborn, D.A. Gillette, D.A. Latimer, T.G. Pace, and J.G. Watson. 2001. Methodology for Estimating Fugitive Windblown and Mechanically Resuspended Road Dust Emissions Applicable for Regional Scale Air Quality Modeling. Report No. 30203–9. Western Regional Air Partnership, Denver, Colorado.

Denison Mines. 2012. Application for Approval of Construction or Modification for the Daneros Underground Uranium Mine. Submitted to State of Utah Department of Environmental Quality Air Quality division on April 27, 2012.

Ecology and Environment. Inc. 2014. Draft-Final Engineering Evaluation/Cost Analysis Fry Canyon Tailings Site. Prepared for the Bureau of Land Management – Utah State Office. November 2014.

Energy Fuels Resources (USA) Inc. 2012. Notice of Intent for the Daneros Mine. Submitted by Energy Fuels Resources (USA) Inc., Salt Lake City, Utah. Prepared by Redhorse Corporation, San Diego, California. October 2012. On file and available at the Monticello Field Office.

Energy Fuels Resources (USA) Inc. 2013. Plan of Operations Modification, Daneros Mine, San Juan County Utah, UTU-74631, January 2016.

Energy Fuels Resources (USA) Inc. 2014. Notice of Intent for the Daneros Mine – Supplemental Modeling Dispersion Modeling Results. Submitted by Energy Fuels Resources (USA) Inc., Salt Lake City, Utah. Prepared by Redhorse Corporation, San Diego, California. March 2014. On file and available at the Monticello Field Office.

Energy Information Administration. 2014a. Annual Energy Outlook 2014. Released April 2014. Accessed on-line at www.eia.gov/forecasts/aeo.

Energy Information Administration. 2014b. 2013 Uranium Marketing Annual Report. Released May 2014. Accessed on-line at www.eia.gov/uranium/marketing.

Energy Information Administration. 2014c. 2013 Domestic Uranium Production Report. Released May 2014. Accessed on-line at www.eia.gov/uranium/production/annual/pdf/dupr.pdf.

Federal Highway Administration. 1980. Noise Fundamentals Training Document: Highway Noise Fundamentals. September.

Federal Highway Administration. 2014. Construction Noise Handbook. Available November 2014. Access on-line at https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Federal Land Managers' Air Quality Related Values Workgroup. 2010. Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report – Revised (2010). U.S. Forest Service-Air Quality Program, National Park Service-Air Resources Division, U.S. Fish and Wildlife Service-Air Quality Branch. October 2010.

Fox, Douglas G.; Bartuska, Ann M.; Byrne, James G.; and others. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. Gen. Tech. Rep. RM-168. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. pg. 36.

Franklin, W., 2014. Office Manager, San Juan County Road Department. Personal communication with Edge Environmental. July 26.

Friedberg W., and Copeland, K. 2003. What Aircrews Should know About Their Occupational Exposure to Ionizing Radiation. DOT/FAA/AM-03/16. October 2003.

Health Canada. 2012. Available at: http://www.hc-sc.gc.ca/index-eng.php. Accessed September 2014.

Howells, L. 1990. Base of Moderately Saline Ground Water in San Juan County, Utah. Utah Division of Water Rights Technical Publication 94. Available at: http://waterrights.utah.gov/docSys/v920/w920/w92000ah.pdf. Accessed April 2014.

International Uranium Corporation. 2003. Description of the Affected Environment, White Mesa Mill, Blanding, Utah, for Transport by Slurry Pipeline and Disposal of the Moab Tailings. Denver, CO. May.

Laws, Lynn. 2013. San Juan County Roads Superintendent. Written Communication with Andrea Reither, Environmental Permitting Specialist with Energy Fuels. September.

National Academy of Sciences. 1998. Biological Effects of Ionizing Radiation VI Report: “The Health Effects of Exposure to Indoor Radon.” February 19, 1998.

National Council on Radiation Protection and Measurement. 2009. Ionizing Radiation Exposure of the Population of the United States, Report No. 160, Bethesda, Md.

National Highway Traffic Safety Administration. 2014. Fatality Analysis Reporting System, Fatalities and Fatality Rates by State. Accessed online: http://www-fars.nhtsa.dot.gov/States/StatesFatalitiesFatalityRates.aspx Accessed December 2014

National Institute of Health. 2015. DevCan - Probability of Developing or Dying of Cancer. National Center Institute at the National Institute of Health. Accessed online: http://surveillance.cancer.gov/devcan/

National Park Service. 2005. National Park Service Class I Areas. Available at: http://www.nature.nps.gov/air/maps/NpsTextList.cfm. Accessed March 2014.

National Park Service, 2010. Air Quality in National Parks, 2009 Annual Performance & Progress Report. Natural Resource Report NPS/NRPC/ARD/NRR—2010/266. Natural Resource Program Center, Air Resources Division. Denver, Colorado. November 2010. Accessed online at http://www.nature.nps.gov/air/pubs/pdf/gpra/AQ_Trends_In_Parks_2009_Final_Web.pdf.

National Park Service. 2012. Visibility in Our Nation’s Parks and Wilderness Areas. Available at: http://www.epa.gov/air/visibility/monitor.html. Accessed March 2014.

Nuclear Regulatory Commission. 1979. Final Environmental Statement Related to Operation of White Mesa Uranium Project Energy Fuels Nuclear, Inc. May 1979.

Nuclear Regulatory Commission. 2013a. Information on power reactors regulated by the Nuclear Regulatory Commission updated December 31. Accessed on-line at www.nrc.gov/reactors/power.html. Accessed June 2014.

Nuclear Regulatory Commission. 2013b. Location of New Nuclear Power Reactors. Updated April 15. Information accessed online at www.nrc.gov/reactors/new-reactors/col/new-reactor-map.html. Accessed June 2014

Nuclear Regulatory Commission. 2014. Doses in Our Daily Lives. Accessed online: http://www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html. February 2014.

Pinkerton, L. E., T. F. Bloom, M. J. Hein, and E. M. Ward. 2004. Mortality among a cohort of uranium mill workers: an update. *Occupational and Environmental Medicine* 2004 61:57–64. Available at: http://oem.bmj.com/cgi/content/abstract/61/1/57. Accessed December 2008.

Roberts, Harold. 2014. Personal Communication between Harold Roberts, Executive Vice President and Chief Operating Officer, and Andrea Reither, Environmental Permitting Specialist with Energy Fuels. June 30, 2014.

Sanders, Thomas G. 2008. Road Dust Suppressants: A Win-Win Solution. Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, Colorado. Paper presented at MINExpo International 2008, Las Vegas, Nevada.

Shephard-Wesnitzer, Inc. 2008. Hydrology and Hydraulics Narrative for Utah Energy Corporation Daneros Uranium Mine. Prepared for Utah Energy Corporation. June.

State of Utah. 2001. Utah's Water Resources: Planning for the Future, May 2001. Utah State Water Plan. State of Utah Natural Resources, Division of Water Resources. Available at: http://www.water.utah.gov/Waterplan/SWP_pff.pdf. Accessed May 2014.

Stilson, Marc. 2009. State of Utah, Department of Natural Resources. Comment letter on Daneros Draft EA, from Marc Stilson, Southeastern Regional Engineer, April 2, 2009.

Thaden, R.E., Trites, A.F., Jr., and Finnell, T.L., 1964. Geology and Ore Deposits of the White Canyon Area, San Juan and Garfield Counties, U.S. Geological Survey Bulletin 1125. Washington, U.S. Government Printing Office.

Thaden, R.E., Trites, A.F., Jr., Finnell, T.L., and Willis, G.C., 2008. Geologic map of the White Canyon-Good Hope Bay area, Glen Canyon National Recreation Area, San Juan and Garfield Counties, Utah. Utah Geological Survey Miscellaneous Publication 08-3DM.

United Nations Committee on the Effects of Atomic Radiation. 2000. UNSCEAR 2000 Report Vol. II – Sources and Effects of Ionizing Radiation. United Nations Scientific Committee on the Effects of Atomic Radiation. Available at: http://www.unscear.org/unscear/en/publications/2000_2.html. Accessed January 15, 2009.

U.S. Census Bureau, 2014. State and County Quick Facts. Data last revised: March 27, 2014. Accessed on-line: quickfacts.census.gov/qfd/states/49000.html.

U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency. 2011. Memorandum of Understanding among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act Process. June 23, 2011. Accessed online on 3/12/15 at: http://www.epa.gov/compliance/resources/policies/nepa/air-quality-analyses-mou-2011.pdf

U.S. Department of Energy. 2007. Uranium Leasing Program Final Programmatic Environmental Assessment. Office of Legacy Management. DOE/EA-1535. July 2007.

U.S. Department of Energy. 2014. Final Uranium Leasing Program Programmatic Environmental Impact Statement. Office of Legacy Management. DOE/EIS-0472.

U.S. Environmental Protection Agency. 1985. Draft Background Information Document, Standard for Radon-222 Emissions from Underground Uranium Mines, Office of Radiation Programs, Washington D.C. EPA 520/1-85-010 February 14, 1985.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety. March.

U.S. Environmental Protection Agency. 1989. Risk Assessments, Environmental Impact Statement, NESHAPS for Radionuclides, Background Information Document, Volume 2, EPA/520/1-89-006-1. EPA Office of Radiation Programs, Washington, D.C.

U.S. Environmental Protection Agency. 1991. Diffuse NORM: Waste Characterization and Preliminary Risk Assessment, Draft. EPA Office of Radiation Programs, Washington, D.C.

U.S. Environmental Protection Agency. 1994. Technical Document, Background for NEPA Reviewers: Non-Coal Mining Operations. EPA Office of Solid Waste, Special Waste Branch, Washington, D.C.

U.S. Environmental Protection Agency. 1995. AP-42 Fifth Edition. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC. With updates through 2009.

U.S. Environmental Protection Agency. 2001. Visibility in Mandatory Federal Class I Areas (1994-1998): A Report to Congress. Accessed at: http://www.epa.gov/visibility/report/CHAP01.pdf.

U.S. Environmental Protection Agency. 2003. Visibility in our Nation's Parks and Wilderness Areas. Visibility Homepage, Environmental Protection Agency. Accessed at: http://www.epa.gov/oar/visibility/monitor.html.

U.S. Environmental Protection Agency. 2005. Assessment of Variations in Radiation Exposure in the United Sates (Revision 1)." Contract Number EP–D–05–02. Washington, DC: EPA. July 15, 2005.

U.S. Environmental Protection Agency. 2007. Technical Report on Technologically Enhanced Naturally Occurring Radioactive Materials from Uranium Mining Volume 2: Investigation of Potential Health, Geographic, And Environmental Issues of Abandoned Uranium Mines. Updated and Published April 2008 as Vol. 2 of EPA 402-R-08-005. April 2008.

U.S. Environmental Protection Agency. 2009. Compliance Assistance, Bevill Amendment Questions. Available at: http://www.epa.gov/compliance/assistance/sectors/minerals/processing/bevillquestions.htm. Accessed February 17, 2009.

U.S. Environmental Protection Agency. 2013. Clean Air Status and Trends Network. Accessed online: http://java.epa.gov/castnet/viewsiteinfo.do. October 2011.

U.S. Environmental Protection Agency. 2014a. U.S. Environmental Protection Agency Office of Air and Radiation. National Ambient Air Quality Standards. http://www.epa.gov/air/criteria.html. Accessed April 2014.

U.S. Environmental Protection Agency. 2014b. U.S. Environmental Protection Agency Office of Air and Radiation, Clean Air Markets, Clean Air Status and Trends Network Data. Total Nitrogen Deposition for Canyonlands National Park. Site ID CAN407, 1996–2012. Accessed online at http://epa.gov/castnet/javaweb/index.html.

U.S. Environmental Protection Agency. 2014c. Summary of the Clean Water Act. Available at: http://www2.epa.gov/laws-regulations/summary-clean-water-act. Accessed May 2014.

U.S. Environmental Protection Agency. 2014d. STORET. Available at: http://epa.gov.storet, Station ID = 4952220, Organization ID = UTAHDWQ. Accessed May 2014.

U.S. Environmental Protection Agency. 2014e. National Trends in CO Levels. U.S. Environmental Protection Agency, Office of Air and Radiation, Air Trends. Accessed online: http://www.epa.gov/airtrends/carbon.html.

U.S. Geological Survey. 2007. Kimberly R. Beisner, Thomas M. Marston, and David L. Naftz, U.S. Geological Survey; Terry Snyder, Bureau of Land Management; and Michael L. Freeman, U.S. Geological Survey. Assessment of Nonpoint Source Chemical Loading Potential to Watersheds Containing Uranium Waste Dumps and Human Health Hazards Associated with Uranium Exploration and Mining, Red, White, and Fry Canyons, Southeastern Utah. Scientific Investigations Report 2010-5108.

U.S. Geological Survey 2010. Otton, J.K., Zielinski, R.A., and Horton, R.J. Geology, Geochemistry, and Geophysics of the Fry Canyon Uranium/Copper Project Site, Southeastern Utah-Indications of Contaminant Migration: Scientific Investigations Report 2010-5075.

U.S. Geological Survey. 2011. Naftz, D.L., Ranalli, A.J., Rowland, Ryan C., Marston, T.M., 2011, Assessment of Potential Migration of Radionuclides and Trace Elements from the White Mesa Uranium Mill to the Ute Mountain Ute Reservation and Surrounding Areas, Southeastern Utah, US Geological Survey Scientific Investigations Report 2011-5231.

U.S. Geological Survey. 2014. Utah Water Science Center. Available at: http://ut.water.usgs.gov/. Accessed May 2014.

Utah Department of Transportation. 2013. UDOT Average Crash Rates 2007 – 2011. Released April 15, 2013. Accessed at: http://www.udot.utah.gov/main/f?p=100:pg:::::V,T:,580. Accessed December 2014.

Utah Department of Transportation. 2014. AADT Traffic Map, Updated Using 2012 Data. Available at http://www.udot.utah.gov/main/f?p=100:pg:0:::V,T:,528. Accessed July 2014.

Utah Division of Air Quality. 2011a. Utah Division of Air Quality Modeling Guidelines, June 28, 2011.

Utah Division of Air Quality. 2011b. Utah Division of Air Quality. Approval Order No. DAQE-AN0112050018-11. Denison Mines Corp., White Mesa Mill. March 02, 2011.

Utah Division of Air Quality. 2014a. Approval Order for a New Underground Uranium Mine, Approval Order Number DAQE-AN144920002-14. Issued by the Utah Division of Air Quality to Energy Fuels Resources (USA) Inc. Daneros Mine. July 8, 2014.

Utah Division of Air Quality. 2014b. Utah Division of Air Quality 2013 Annual Report, February 2014.

Utah Division of Radiation Control. 2014 Dawn Mining Alternate Feed Amendment Request. Public Participation Summary. July 10, 2014.

Utah Division of Water Resources. 2014. Plan, Conserve, Develop, and Protect Utah's Water Resources. Available at: http://www.water.utah.gov/. Accessed May 2014.

Utah Division of Water Rights. 2014a. WELLVIEW Well Information Program. Version: 2007.03.17.00. Well Log Information Page. Available at: http://www.waterrights.utah.gov/. Accessed April 2014.

Utah Division of Water Rights. 2014b. Shapefile of points of diversion from Water Rights database. Available at: http://www.waterrights.utah.gov/gisinfo/wrcover.asp. Accessed November 2014.

Utah Division of Water Quality. 2012. Nonpoint Source Management Plan for Abandoned Mines in Utah. Available at: http://www.waterquality.utah.gov/NPS/Abandoned_Mine_NPS_Feb272012.pdf. February 2012.

Utah Energy Corporation. 2008. Plan of Operations – Daneros Mine Project. Submitted to the U.S. Department of the Interior, Bureau of Land Management, Monticello Field Office. Moab: Utah Energy Corporation.Utah Geological Survey. 2005. Uranium and Vanadium Map of Utah Map 215. Robert Gloyn, Roger Bon, Sharon Wakefield, and Ken Krahulec, Utah Geological Survey, Department of Natural Resources.

Utah Geological Survey. 2005. Gloyn, Robert W.; Bon, Roger L.; Wakefield, Sharon; and Krahulec, Ken. Uranium and Vanadium Map of Utah. Map 215. 2005.

6.2 List of Abbreviations and Acronyms

µeq/L	micro-equivalents per liter
µg /L	micrograms per liter
µg/m^3	micrograms per cubic meter
µR/hr	microroetgen/hour
uS/cm	microsiemens per centimeter
AADT	annual average daily traffic
ALARA	as low as is reasonably achievable
AMRP	Abandoned Mine Reclamation Program
ANC	acid neutralizing capacity
ANFO	ammonium nitrate fuel oil
AO	Approval Order
APE	area of potential effect
AQRV	air quality related values
ARD	acid rock drainage
BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
BLM	Bureau of Land Management
BMPs	best management practices
CAA	Clean Air Act
CAMx	comprehensive air quality model
CARMMS	Colorado Air Resource Management Modeling Study
CASTNet	Clean Air Status and Trends network
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFM	cubic feet per minute
CFR	Code of Federal Regulations
CI	compression ignition
CIAA	cumulative impact analysis area
CIRA	Cooperative Institute for Research in the Atmosphere
CO	carbon monoxide
CO_2	carbon dioxide
CR	county road
CWA	Clean Water Act
cy	cubic yards
dB	decibels
dBA	A-weighted sound levels (environmental sound levels)
DOE	U.S. Department of Energy
DR	Decision Record
DRA	development rock area
DRC	Division of Radiation Control
dv	deciview
EA	Environmental Assessment
EAC	Early Action Compact
EIA	Energy Information Administration
EIS	Environmental Impact Statement
Energy Fuels	Energy Fuels Resources (USA) Inc.
EPA	Environmental Protection Agency
ETV	emission threshold value

fbs	feet below surface
FEIS	Final Environmental Impact Statement
FLAG	Federal Land Managers Air Quality Working Group
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
gpm	gallons per minute
H2SO4	sulfuric acid
HAP	hazardous air pollutant
HNO_3	nitric acid
Hp	horsepower
ICE	internal combustion engines
IMPROVE	Interagency Monitoring of Protected Visual Environments
IUC	International Uranium Corp.
ky/ha/yr	kilogram/hectare/year
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
LSA	low specific activity
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Act
MDC	minimum detectable concentration
MFO	Monticello Field Office
mg/m^3	milligrams/cubic meter
mrem	milirem
mrem/hr	milirem per hour
mrem/y	milirem per year
mph	miles per hour
MPO	Mining Plan of Operations
MPOM	Mining Plan of Operations Modification
MSDS	material safety data sheet
MSHA	Mine Safety and Health Administration
mSV	millisieverts
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAS	National Academy of Sciences
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_4	Ammonium
NO_2	nitrogen dioxide
NO_3	nitrate
NOx	nitrogen oxides
NOI	Notice of Intent
NPS	National Park Service
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSR	new source review
NTU	nephelometric turbidity unit
NWS	National Weather Service
O_3	ozone

Pb	lead
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PEA	Programmatic Environmental Assessment
PGM	photochemical grid model
PLS	pure live seed
$PM_{2.5}$	particulate matter less than 2.5 microns in effective diameter
PM_{10}	particulate matter less than 10 microns in effective diameter
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PSD	Prevention of Significant Deterioration
Ra 226	radium 226
RCNM	Roadway Construction Noise Model
rem	roentgen equivalent man
RFAS	Reasonably Foreseeable Action Scenario
RFD	reasonable foreseeable development
RMP	Resource Management Plan
RSO	radiation safety officer
SH	state highway
SILs	Significant Impact Levels (EPA)
SO_2	sulfur dioxide
SO_4	sulfate
SOP	standard operating procedures
SPCC	Spill Prevention, Control, and Countermeasures
SSL	Soil screening level
SWPPP	Stormwater Pollution Prevention Plan
TENORM	technically enhanced naturally occurring radioactive material
TI	transport index
TMDL	Total Maximum Daily Load
tpd	tons of ore per day
tpy	tons per year
U_3O_8	yellowcake
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality
UDEQ	Utah Department of Environmental Quality
UDOGM	Utah Division of Oil, Gas and Mining
UDOT	Utah Department of Transportation
UDWR	Utah Division of Water Rights
UDWQ	Utah Division of Water Quality
UEC	Utah Energy Corporation
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Elimination System
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USDOT	U.S. Department of Transportation
USGS	U.S. Geological Survey
VOC	volatile organic compound
VPD	vehicles per day

APPENDIX A

2011 BLM FONSI/DR Conditions of Approval and Compliance and Monitoring Requirements

APPENDIX B

Figures

Figure 1	General Location Map
Figure 2	Access Roads and Vent Shaft Area
Figure 3	Daneros Portal Area Existing and Proposed Disturbance
Figure 4	Bullseye Portal Area Existing and Proposed Disturbance
Figure 5	South Portal Area Existing and Proposed Disturbance
Figure 6	Typical Vent Shaft
Figure 7	Daneros Portal Area Reclamation
Figure 8	Bullseye Portal Area Reclamation
Figure 9	South Portal Area Reclamation
Figure 10	PSD Class I and Sensitive Class II Areas
Figure 11	Surface Water
Figure 12	Groundwater
Figure 13	Conceptual Geologic Cross Section of the Daneros Portal Area
Figure 14	Gamma Survey – Daneros and Bullseye Portal Areas
Figure 15	Gamma Survey – South Portal Area
Figure 16	Air Quality Cumulative Impact Area
Figure 17	Water Quality Cumulative Impact Area
Figure 18	Human Health and Safety Cumulative Impact Areas

APPENDIX C

Interdisciplinary Team Analysis Record Checklist

APPENDIX D

Scoping Report

APPENDIX E

Evaluation of the Radiological Characteristics of Uranium Mine Waste Rock

APPENDIX F

Air Quality Emissions Inventory

APPENDIX G

Daneros Mine Dispersion Modeling Results, Natural Bridges National Monument