



United States Department of Agriculture

Forest Service

Hermosa Drilling Project

Draft Environmental Assessment

Sierra Vista Ranger District, Coronado National Forest, Santa Cruz County, Arizona

March 2014



Project Area looking toward Harshaw, view to the northeast. (Chamorro, King, Trask, Tinseth, & White III, 2013)

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Acronyms

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADT	Average daily traffic
ADWR	Arizona Department of Water Resources
AMA	Active Management Areas
AMI	Arizona Minerals, Inc.
ANSI	American National Standards Institute
ARS	Arizona Revised Statutes
AZ	Arizona
AZGFD	Arizona Game and Fish Department
AZNST	Arizona National Scenic Trail
AZPDES	Arizona Pollution Discharge Elimination System
BH	Geotechnical Borehole
BMP	Best Management Practice
CE	Categorical Exclusion
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CPG	Construction General Permit
CS	Characterization Site
CWA	Clean Water Act
dBA	A-weighted Decibels
EA	Environmental Assessment
EPA	Environmental Protection Agency
EPM	Environmental Protection Measures
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FSH	Forest Service Handbook
FSM	Forest Service Manual
HUC	Hydrologic Unit Code
MIS	Management Indicator Species

MSDS	Material Safety Data Sheet
MVUM	Motor-Vehicle Use Map
MW	Monitor Well
NA	Not Applicable or Not Available
NEPA	National Environmental Policy Act
NFS	National Forest System
NFSR	National Forest System Road
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service (USDA)
NSR	New Source Review
PSD	Pretension of Significant Deterioration
RC	Reverse circulation
ROS	Recreation Opportunity Spectrum
SHPO	State Historic Preservation Office
SMS	Scenery Management System
SPCC	Spill Prevention, Control, and Countermeasures
Spp	Species
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TDD	Telecommunications device for the deaf
TP	Test Pit
USDA	United States Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMS	Visual Management System
VQO	Visual Quality Objective
Z	Hydrogeological Borehole

Chapter 1

Purpose and Need

1.1 Introduction

Arizona Minerals, Inc. (AMI) submitted a Plan of Operations for the Hermosa Exploration Drilling Project to the Coronado National Forest on June 6, 2013 (AMI, 2013a). AMI revised the plan slightly and resubmitted it on October 31, 2013 (AMI, 2013b). The Plan of Operations is to conduct site characterization activities on unpatented mining claims located within the Sierra Vista Ranger District of the Coronado National Forest, as part of ongoing feasibility studies of the Hermosa mineral deposit. The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*) as amended, requires Federal agencies to use a systematic interdisciplinary approach to ensure the integrated use of natural and social sciences in planning and decision making. It also requires an analysis of probable environmental effects of certain proposed Federal actions. This Environmental Assessment (EA) was prepared by the Forest Service (USFS) to determine whether implementation of the Hermosa Exploration Drilling Project (also referred to as the proposed action) may significantly affect the quality of the human environment and thereby require the preparation of an environmental impact statement.

1.2 Purpose of and Need for Action

The purpose of the proposed action is to allow AMI to gather necessary information related to further characterizing their mineral resource (exploration), geophysical aspects of the environment, and groundwater conditions.

The Forest Service is obligated to process, administer, and manage mining operations conducted on National Forest System (NFS) land under the authorities of laws and regulations that confer on the public a statutory right to go upon and use open public domain land. Forest Service regulations at 36 CFR 228 Subpart A – Locatable Minerals set forth rules and procedures for management of mining-related activity on NFS land to minimize adverse environmental impacts on surface resources.

1.3 Proposed Action

The proposed federal action by the Forest Service is to approve the Plan of Operations as submitted by AMI in accordance with 36 CFR 228.5 with additional Forest Service Required Design Features.

The proposed action is described in more detail in Section 2.3. AMI has proposed site access and drilling activities in the Plan of Operations for the Hermosa Drilling Project. These activities include drilling 23 geotechnical boreholes, 10 exploration boreholes, 12 hydrogeological boreholes/monitoring wells, and excavating 15 test pits. These activities would be conducted on 46 characterization sites, 11 of which would host multiple activities. Access to the 46 characterization sites would be from existing NFS roads (some requiring maintenance and a minor amount of reconstruction), construction of 8 temporary access roads (TAR) (2.67 miles), use 10 overland vehicle paths (3.30 miles), and 2 overland foot paths (1.51 miles). These activities will result in a maximum total disturbance of approximately 13.90 acres in the Coronado National Forest. All disturbed areas would be reclaimed to Forest Service and applicable regulatory agency satisfaction. A reclamation bond will be posted by AMI to ensure reclamation is completed as required.

1.3.1 Project Location

The proposed project is located approximately 6 miles southeast of Patagonia (see **Figure 1**). The legal description for the project area, including characterization sites and access roads is:

- Township 22 South, Range 16 East, portions of Sections 33, 34, 35 and 36;
- Township 23 South, Range 16 East, portions of sections 1, 2, 3, 4, 5 9, 10, 11, 12, 14, 15, and 16; and
- Township 22 South, Range 17 East, portions of Sections 6 and 7, of the Gila and Salt River Meridian.

1.4 Decision Framework

The District Ranger is the responsible official to whom the authority to review and approve operating plans has been delegated (36 CFR Part 228.3(e)). Approval of AMI's Plan of Operations will be contingent upon the findings of the NEPA review. That is, potential adverse effects of activities proposed in the Plan of Operations may necessitate the District Ranger to impose additional terms and conditions for resource protection to supplement the Plan of Operations. Any applicable Plan of Operations supplement and a reclamation bond will be required prior to approval of the Plan of Operations.

The Mining and Minerals Policy Act of 1970 states that the continuing policy of the Federal Government is to foster and encourage private enterprise in the development of economically sound and stable domestic mining and minerals industries and the orderly and economic development of domestic mineral resources.

The Organic Administration Act of June 4, 1897, (30 Stat. 11, as amended; 16 U.S.C. 473-475, 477-482, 551) provides the Secretary of Agriculture the authority to regulate the occupancy and use of NFS lands. It provides for the continuing right to conduct mining activities under the general mining laws if the rules and regulations covering NFS lands are complied with. This act recognizes the rights of miners and prospectors to access NFS lands for all proper and lawful purposes, including prospecting, locating, and developing mineral resources.

Hard rock minerals are also known as "locatable minerals". Management of locatable minerals on NFS lands is regulated by 36 CFR Part 228, Subpart A and the General Mining Law of 1872 (30 USC 22 et seq.) as amended. All operations shall be conducted so as, where feasible, to minimize adverse environmental impacts on National Forest surface resources (36 CFR Part 228.8). The project must be in compliance with the Coronado National Forest Plan (Forest Plan) (USFS, 1986). The District Ranger is required to evaluate the Plan of Operations and notify the operator if any changes, or additions to, the Plan of Operations is deemed necessary (36 CFR Part 228.5 (a)(3)).

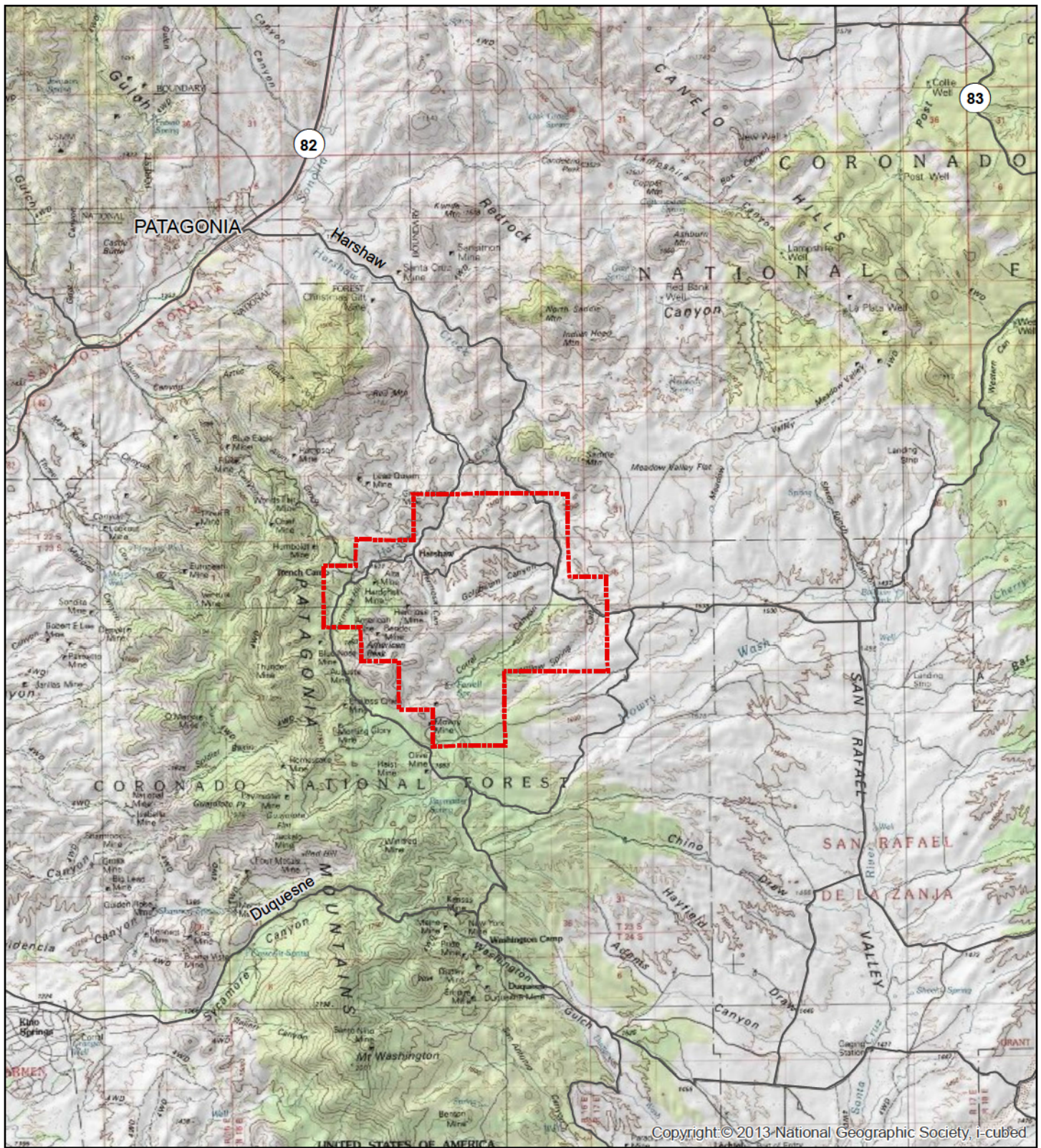
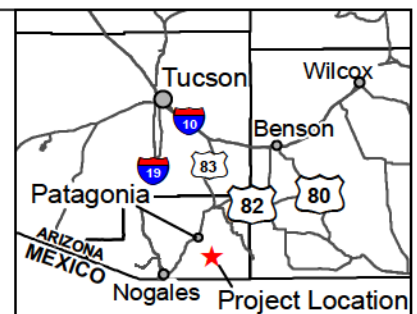
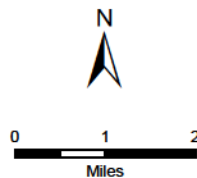


Figure 1
Project Location

Hermosa Exploration
Drilling Project
Arizona Minerals, Inc.

 Project Area

Portions of T22S R16E,
T23S R16E and R17E
USGS 7.5' Quad: Harshaw
Santa Cruz County, Arizona
Projection: UTM NAD83 Zone12N



February 25, 2014

1.5 Public Involvement

The project was included on the quarterly Schedule of Proposed Actions for the Coronado National Forest beginning in April 2013.

In August 2013, the Coronado National Forest announced the project scoping period and public informational meeting by posting information and documents on the Forest Service's project website, publishing a legal notice and press release, and emailing and mailing letters. The Coronado National Forest mailed a scoping letter to 150 individuals, groups, and agencies on August 2, 2013. The same information was emailed to about 360 email addresses. A legal notice announcing the initiation of public scoping was published in the *Sierra Vista Herald* and the *Nogales International* newspapers on August 6, 2013. A press release was posted on the project website on August 7, 2013 and emailed to about 760 individuals (<http://www.fs.usda.gov/detail/coronado/news-events/?cid=STELPRDB5430963>).

A public informational meeting was held in Patagonia, Arizona from 6 to 8 pm on August 20, 2013. The Coronado National Forest Hermosa Project Manager made a presentation detailing aspects of the project and provided information on how comments could be submitted. Forest Service specialists in biology, hydrology, range, and watersheds were available to answer questions related to the project. Also present was the District Ranger and Communications Staff Officer. Forty-nine people signed into the meeting.

September 6, 2013 was the close of the public scoping period. Approximately 200 letters and emails were received in response to the request for comments during scoping.

The Forest Service sent a project update by email and letter to those on the mailing list and those that commented during scoping in December 2013 notifying them that the proposed action had been revised and that the Draft EA was scheduled to be published in early 2014.

1.6 Tribal Consultation

The scoping announcement and the draft of the Cultural Resources Inventory report prepared by Westland Resources, Inc. (Chamorro, King, Trask, Tinseth, & White III, 2013) were sent to the 12 tribes the Coronado National Forest, including: Ak-Chin Indian Community, Ft. Sill Apache Tribe, Gila River Indian Community, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, Tohono O'odham Nation, San Carlos Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, Hopi Tribe, Pueblo of Zuni. The Tribes were also provided an opportunity to comment on the draft cultural resources inventory report and the comments were incorporated in the revised report. The Forest Archaeologist presented an overview of the project and the results of the cultural resources inventory report to the December 20, 2013 meeting of the Four Southern Tribes Cultural Resources Working Group. Coronado National Forest personnel accompanied the Tribal Historic Preservation Officers of the White Mountain Apache and Mescalero Apache Tribes on a trip to inspect select sites in the project area on January 31, 2014.

1.7 Potential Issues Identified During Scoping

Public and internal scoping identified potential impacts or concerns from the proposed action. The issues are explained in greater detail in Chapter 3 under each resource and summarized below.

- Dust and emissions effects on air quality and the health of humans, livestock, and wildlife;

- Water use effects on the availability of water for the town of Patagonia;
- Drilling and road use effects on water quality in streams;
- Drilling effects on groundwater quality;
- Disturbance from lights, noise, and activities on wildlife;
- Effects on wildlife habitat;
- Effects on cultural resources;
- Noise effects on residents;
- Increased traffic and the effect on other road users and public safety;
- Visual impacts from lights at night and ground-disturbing activities;
- Potential for weed spread or introduction;
- Requirements for reclamation;
- Use, storage, and cleanup of hazardous materials, including the core samples.

1.8 Forest Land and Resource Management Plan Direction

Management of the NFS lands where the project is proposed is directed by the Coronado National Forest Plan (USFS, 1986) and applicable amendments. The Forest Plan provides forest-wide and management area direction including direction for minerals management.

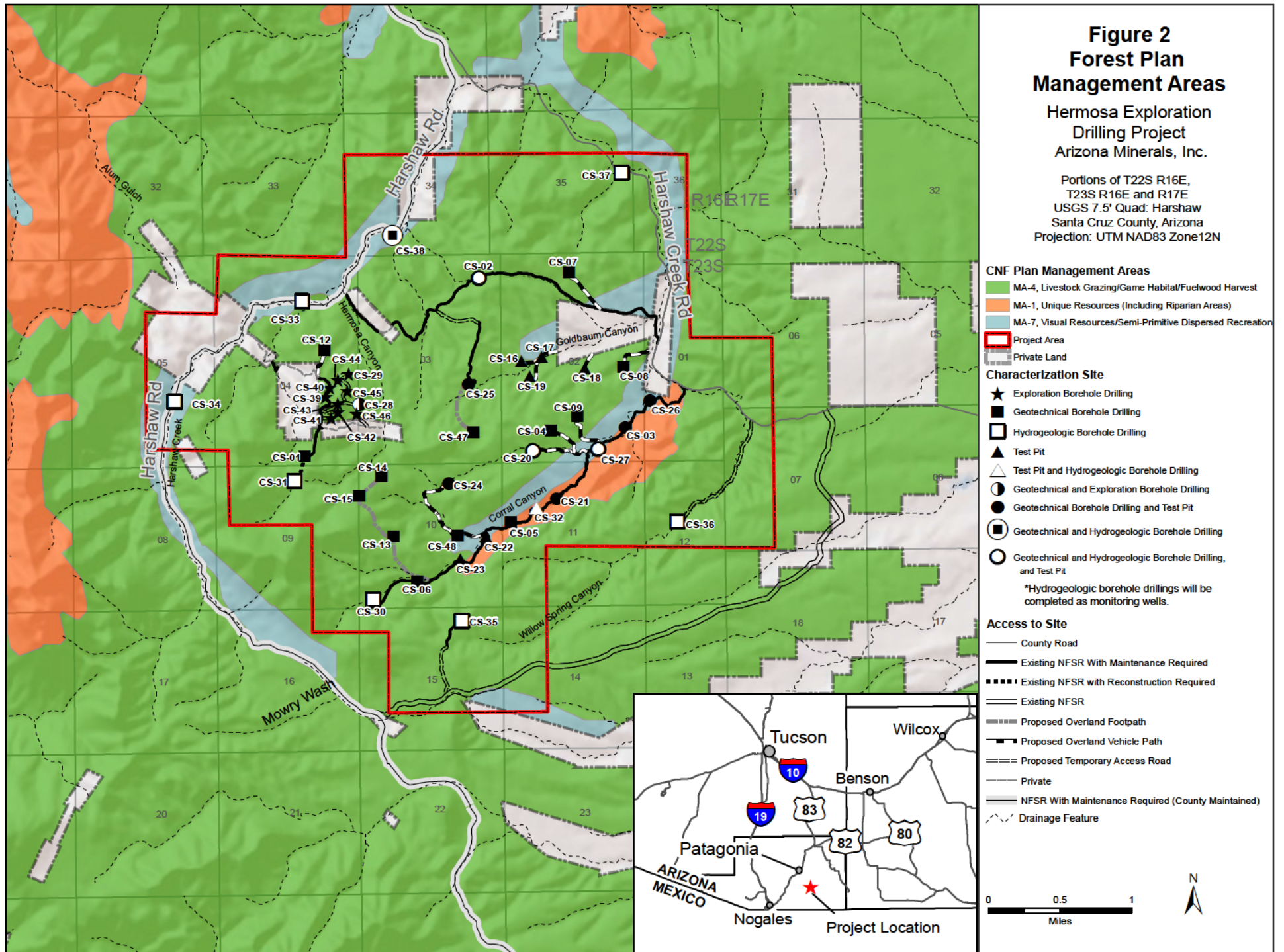
“Mining and leasing activities will be allowed within the framework of applicable laws and regulations including environmental laws and regulations designed to mitigate the impacts of mining activities. Emphasis should be on gaining cooperation and control through the use of operating plans and bonds for rehabilitation to protect and restore surface resources.”

The project is located in Forest Plan Management Areas 1, 4, and 7 (**Figure 2**).

Figure 2 Forest Plan Management Areas

Hermosa Exploration
Drilling Project
Arizona Minerals, Inc.

Portions of T22S R16E,
T23S R16E and R17E
USGS 7.5' Quad: Harshaw
Santa Cruz County, Arizona
Projection: UTM NAD83 Zone12N



February 25, 2014

Chapter 2

Proposed Action and Alternatives

2.1 Introduction

This chapter describes the alternatives considered in the analysis. The proposed action is considered along with the No Action Alternative. No additional alternatives were analyzed in detail (see Section 2.4). Only reasonable alternatives need to be considered in detail, as specified in 40 CFR 1502.14(1). Reasonable alternatives must be those that are feasible; feasibility must focus on accomplishing the underlying purpose and need that would be satisfied by the proposed action.

2.2 No Action

Under the no action alternative, the Forest Service would not approve the exploration Plan of Operations as submitted by AMI. Not approving the Plan of Operations does not preclude AMI from proposing future exploration activities.

2.3 Proposed Action

The proposed action is for the Coronado National Forest to approve the Plan of Operations as submitted by AMI in October 2013, with additional Forest Service Required Design Features (Section 2.3.5).

AMI submitted a Plan of Operations for the Hermosa Exploration Drilling Project on June 6, 2013 (AMI, 2013a), and revised slightly in October (AMI, 2013b). The revisions were made to avoid identified conflicts with some surface resources. The changes eliminated 2 characterizations sites, added activities to 2 other sites, moved 13 sites slightly, and modified the location of 3 TAR and 3 overland vehicle paths. The proposed action in this Draft EA describes the October Plan of Operations. The Forest Service modified the description of the proposed action slightly because three of the roads AMI proposed to use are not NFS roads and therefore, the use is considered TAR (Table 1).

The Plan of Operations describes site characterization activities, access to characterization sites, and environmental protection measures that AMI would conduct, followed by reclamation. Characterization activities are part of ongoing feasibility studies of the Hermosa mineral deposit.

Activities would occur on unpatented mining claims located within the Sierra Vista Ranger District of the Coronado National Forest. The project area includes about 7,350 acres NFS lands and lands owned by AMI, other private owners. The Plan of Operations is

Table 1. Total Disturbance Calculations		
Type of Disturbance	Miles	Acres
Characterization Sites (includes cut and fill)	NA	4.01
Reconstruction ¹	0.20	0.15
New TAR ²	0.89	2.71
Existing TAR ³	1.78	3.03
Overland Vehicle Routes ⁴	3.30	4.00
Total Disturbance		13.90

Source: (AMI, 2013b) Tables 4, 4 Supplemental, A-3, A-4

1. Reconstruction will add 6 feet of disturbance width

2. Disturbance for TARs is 25 feet width, which includes cut and fill slopes.

3. Disturbance for TARs that are currently existing user created roads is 15 feet.

4. Disturbance for Overland Vehicle Routes is 10 feet width.

available online at

http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/93760_FSPLT3_1464489.pdf.

A total of 13.90 acres (**Table 1**) will be temporarily disturbed for drill pads, new access roads, existing road reconstruction and overland vehicle paths. The entire drilling program is expected to take approximately six months, with final reclamation completed within two years from the start of operations, except for the 12 monitoring wells to be installed as part of the characterization activities. Monitoring wells will be maintained and then reclaimed within 15 years.

2.3.1 Access

The project area is located approximately six miles southeast of Patagonia in Santa Cruz County, Arizona (**Figure 3**). Access to the project area is primarily from Patagonia by way of Harshaw Road (NFS Road 49). Equipment, materials, and personnel will be directed to a four-acre staging area located on AMI's private land prior to field deployment. Access to the 46 characterization sites would be from existing NFS Roads, TARs, via overland vehicle paths, and by foot on overland foot paths.

Existing NFS roads (5521, 5522, 5525, 4694, 4687, 4686, and 4690) will be maintained (8.3 miles) to allow access to the characterization sites. Maintenance will include selective vegetation removal if necessary to establish access, such as tree trimming along the immediate sides of roads and clearing of fallen trees within the disturbance area of the existing roadbed. Reconstruction will be done on 0.02 miles of NFS Road 4687 including widening to 12 feet (6 feet average additional disturbance width), outsloping, clearing vegetation, drainage improvement, temporary drainage crossings (fords or culverts), filling and leveling heavily eroded areas. The road will be reconstructed using a Caterpillar D6 or equivalent-sized dozer and/or John Deere 772-2B motor grader or equivalent (Appendix A, AMI, 2013b).

Access would also include five new TARs and use three user created roads (**Table 1**) that are considered TARs (totaling 2.67 mi). Additionally, AMI proposes to utilize 10 overland vehicle paths totaling 3.3 miles to be used by track-mounted, low ground-pressure drill rigs and excavators, support vehicles, and portable drilling equipment. The overland vehicle paths would be limited to two narrow parallel tracks (approximately 5 feet wide each¹) and some tree and vegetation trimming or removal.

Four characterization sites will be accessed by foot via overland footpaths (1.51 mi). No construction would occur for footpaths. Crews and laborers, will use two footpaths to carry drilling equipment and supplies to these characterization sites (AMI, 2013b).

2.3.2 Characterization Activities

Proposed site characterization activities include: mineral exploration borehole drilling; hydrogeological borehole drilling and testing to assess groundwater conditions; and geotechnical borehole drilling and sampling and geophysical testing to assess soil and rock conditions. Test pit excavations will be conducted to gather soil for geotechnical laboratory testing. Hydrogeological drillings will be used for monitoring wells and conduct groundwater testing.

¹ While it is likely that most of the disturbance will be 5 feet or less as indicated in AMI's Plan of Operations, the Forest Service used 10 feet average disturbance for the impacts analysis.

Figure 3 Characterization Sites and Access

Hermosa Exploration
Drilling Project
Arizona Minerals, Inc.

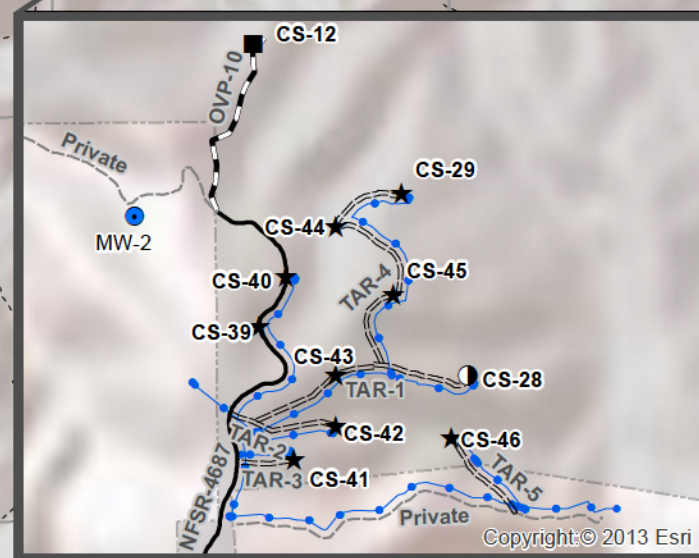
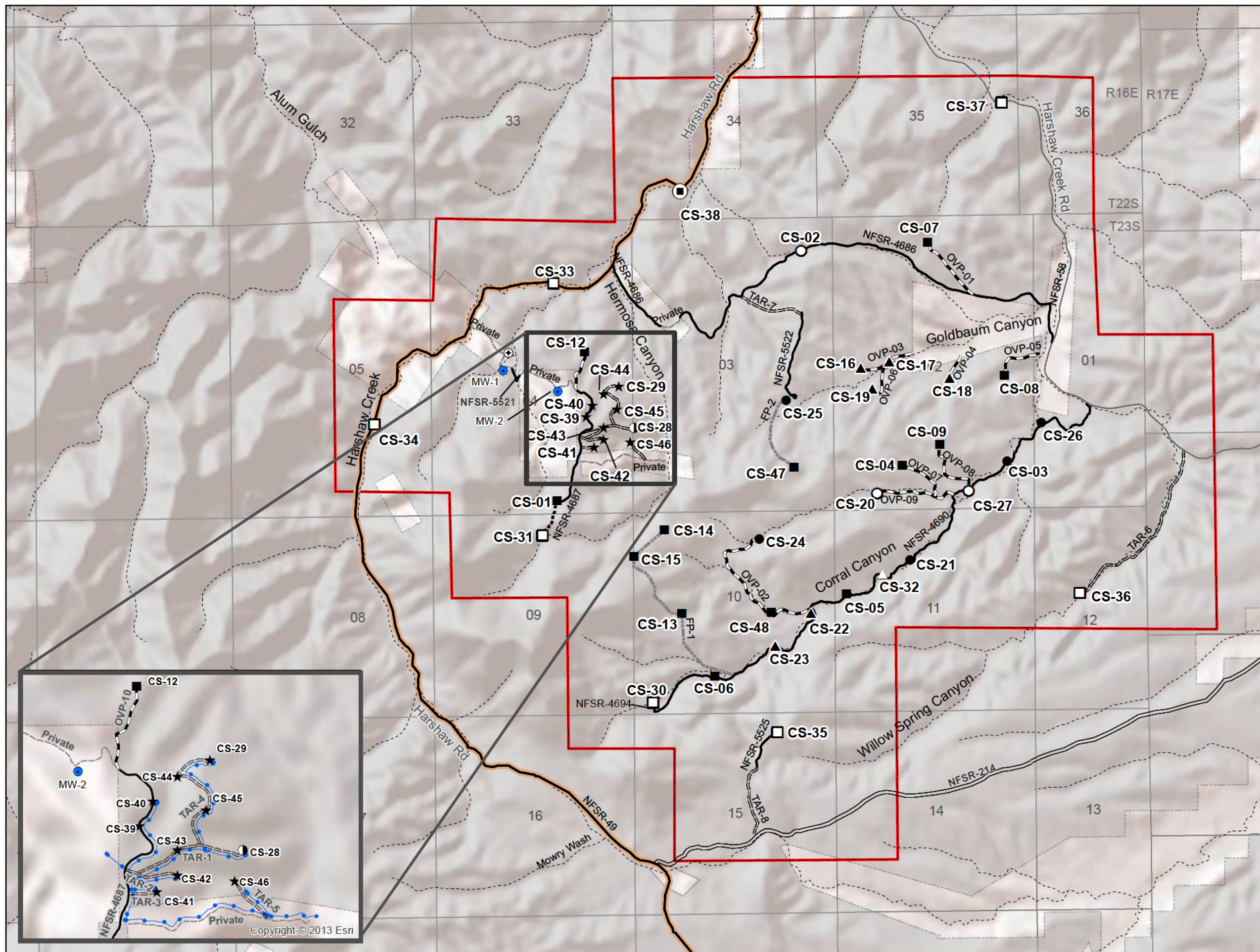
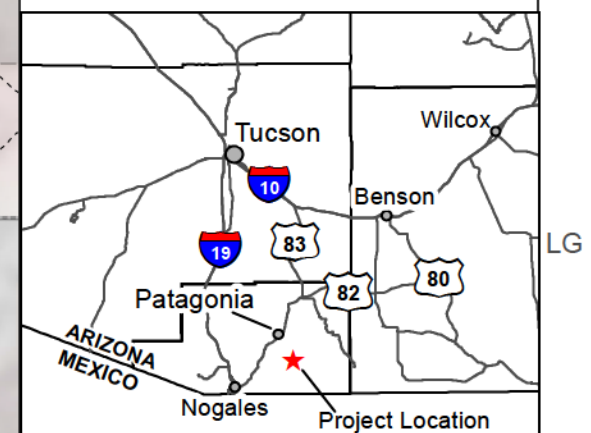
Portions of T22S R16E,
T23S R16E and R17E
USGS 7.5' Quad: Harshaw
Santa Cruz County, Arizona
Projection: UTM NAD83 Zone12N

- Project Area
- Staging Area
- Existing AMI Monitoring Well
- Temporary Water Line
- Characterization Site**
 - ★ Exploration Borehole Drilling
 - Geotechnical Borehole Drilling
 - Hydrogeologic Borehole Drilling
 - ▲ Test Pit
 - △ Test Pit and Hydrogeologic Borehole Drilling
 - Geotechnical and Exploration Borehole Drilling
 - Geotechnical Borehole Drilling and Test Pit
 - Geotechnical and Hydrogeologic Borehole Drilling
 - Geotechnical and Hydrogeologic Borehole Drilling and Test Pit

*Hydrogeologic borehole drillings will be completed as monitoring wells.

- Access to Site**
 - County Road
 - Existing NFSR With Maintenance Required
 - - - Existing NFSR with Reconstruction Required
 - Existing NFSR
 - - - Proposed Overland Footpath
 - Proposed Overland Vehicle Path
 - - - Proposed Temporary Access Road
 - Private
 - NFSR With Maintenance Required (County Maintained)
- Land Ownership**
 - Coronado National Forest
 - Private Land
 - Drainage Feature

0 0.25 0.5
Miles



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To conduct the sampling and assessment, AMI will conduct:

- 23 geotechnical boreholes,
- 10 exploration boreholes,
- 12 hydrogeological boreholes, and
- Excavate 15 test pits.

Testing of samples taken during drilling would be done offsite.

These activities will be conducted on 46 sites, 11 of which would host multiple activities (**Figure 1** and **Table 2**). Exploration, hydrogeological, and geotechnical drillings may be conducted up to seven days per week for 24 hours per day. Crew size will be three to four workers per characterization site. Up to three drill crews and the test pit excavation crew may be active on certain days, but on most days only one or two crews will be active.

The proposed project will require construction of temporary drill pads and test pits. Drill pads will be constructed using heavy equipment including excavators, loaders, dump truck, and water trucks, to accommodate drilling activities. The size and purpose of each characterization site is shown in **Table 2**. Co-located sites have more than one activity indicated.

Site	Geotechnical Borehole	Exploration Borehole	Test Pit	Hydrogeological Borehole/ Monitoring Well	Equipment Type	Pad Area ¹ (acres)
CS-01	1001				Track Mounted Drill	0.055
CS-02	1004		TP-1	MW-06	Wheeled Drill	0.126
CS-03	1005		TP-15		Track Mounted Drill	0.055
CS-04	1006				Track Mounted Drill	0.055
CS-05	1012				Track Mounted Drill	0.055
CS-06	1020				Track Mounted Drill	0.055
CS-07	BH-1				Track Mounted Drill	0.055
CS-08	BH-5				Track Mounted Drill	0.055
CS-09	BH-8				Track Mounted Drill	0.055
CS-12	BH-17				Track Mounted Drill	0.055
CS-13	BH-12				Portable (Winkie) Drill	0.009
CS-14	1017				Portable (Winkie) Drill	0.009
CS-15	1018				Portable (Winkie) Drill	0.009
CS-16			TP-7		Track Excavator	0.009
CS-17			TP-8		Track Excavator	0.009
CS-18			TP-9		Track Excavator	0.009
CS-19			TP-10		Track Excavator	0.009
CS-20	BH-24		TP-17	MW-08 ²	Track Mounted Drill	0.055
CS-21	BH-23		TP-18		Track Mounted Drill	0.055
CS-22			TP-20		Track Excavator	0.009
CS-23			TP-21		Track Excavator	0.009
CS-24	BH-21		TP-22		Track Mounted Drill	0.055

Table 2. Hermosa Drilling Project Characterization Site Summary						
Site	Geotechnical Borehole	Exploration Borehole	Test Pit	Hydrogeological Borehole/ Monitoring Well	Equipment Type	Pad Area¹ (acres)
CS-25	BH-10		TP-24		Track Mounted Drill	0.055
CS-26	BH-6		TP-14		Track Mounted Drill	0.055
CS-27	BH-9		TP-16	MW-9	Wheeled Drill	0.126
CS-28	BH-18	Z-107			Wheeled Drill	0.103
CS-29		Z-102			Wheeled Drill	0.103
CS-30				MW-05	Wheeled Drill	0.126
CS-31				MW-10	Wheeled Drill	0.126
CS-32			TP-19	MW-11	Wheeled Drill	0.126
CS-33				MW-12	Wheeled Drill	0.126
CS-34				MW-13	Wheeled Drill	0.126
CS-35				MW-15	Wheeled Drill	0.126
CS-36				MW-18	Wheeled Drill	0.126
CS-37				MW-19	Wheeled Drill	0.126
CS-38	BH-19			MW-20	Wheeled Drill	0.126
CS-39		Z-071			Wheeled Drill	0.103
CS-40		Z-075			Wheeled Drill	0.103
CS-41		Z-079			Wheeled Drill	0.103
CS-42		Z-087			Wheeled Drill	0.103
CS-43		Z-088			Wheeled Drill	0.103
CS-44		Z-089			Wheeled Drill	0.103
CS-45		Z-094			Wheeled Drill	0.103
CS-46		Z-106			Wheeled Drill	0.103
CS-47	BH-20				Portable (Winkie) Drill	0.009
CS-48	BH-22				Track Mounted Drill	0.055
Additional Total disturbance for cut and fill on drill pads						0.67
Totals	23	10	15	12		4.01

Source: Table 4. Plan of Operations (AMI, 2013b)

1 Sites with multiple characterization activities are sized to the activity requiring the largest footprint.

2 MW-08 is the only hydrological borehole that will be drilled with a track-mounted drill rig.

Water is required for the drilling activities. Water use anticipated and its source is shown in **Table 3**. Water use for drilling the 10 exploration drill holes (CS-28, CS-29, CS-39 through 46) will be obtained from an existing water well, production well MW-2 (**Figure 3**) (AMI, 2013b). Water from the existing wells will be distributed to the sites via 2-inch, high-density polyethylene, gravity fed, temporary waterlines laid on the ground surface along access roads (**Figure 3**). At road crossings, the water lines will either be buried within the road section, or placed in crossing guards/under split steel pipe. Water required for drilling at all other drill holes will be supplied from off-site sources using a rubber-tired truck or rubber-tracked support vehicle, or will be hand carried, or a combination. For drill holes located at or within 100 feet of NFS roads or of private access roads, a rubber-tired water truck with a capacity of 4,000 gallons will be parked on or adjacent to the road and distributed to sites via gravity fed, temporary waterlines (**Figure 3**). For holes accessed overland using tracked rigs, water will be transported in a 1,000-gallon polyethylene tank secured to a tracked

support vehicle. For boreholes advanced using a portable drill system, water will be carried by hand in 5-gallon containers. Water will not be used for the test pits.

Water for dust suppression (see Section 2.3.3.1) will be provided mainly from supply wells located on AMI's patented land. AMI estimates that the average volume of water required for dust suppression is approximately 20,000 gallons per day during drilling operations. In general, AMI is not proposing to perform dust suppression when construction and drilling activities are not actively occurring. The drilling schedule is dependent upon the number of drill rigs available. AMI identifies a 23-week drilling schedule with five shift breaks when no drilling will occur, resulting in 18 weeks of drilling, in addition to approximately 2 weeks of construction required prior to drilling.

Anticipated water use and source for drilling and dust suppression is shown in **Table 3**. Water that comes into contact with site activities will be managed as described in Section 2.3.3.2, below. Water pumped from AMI's supply wells, while considered in the analysis, is not under the jurisdiction of the USFS. The use of the AMI's water for drilling on NFS lands and application of AMI's water for dust suppression on NFS lands is under Forest Service jurisdiction as is pumping and use of water from NFS lands. Water from NFS lands includes the water used for the aquifer testing and water produced from the boreholes during drilling. This NFS-derived water will be captured as much as possible and used for dust abatement.

Table 3. Estimated Total Water Use for Characterization Activities and Tests					
Characterization Activity	Number of Sites	Depth (Feet)	Water Source	Estimated Water Usage (Gallons)	Total Water Usage (Gallons)
Geotechnical (Track Mounted Drill Rig)	19	50-1,000	AMI Supply well	1,000	19,000
Geotechnical (Portable Winkie Drill Rig)	4	100	AMI Supply well	200	800
Hydrogeological/Monitoring Well (Wheeled)	11	Below Water Table	AMI Supply well	3,000	33,000
Hydrogeological/Monitor Well (Track Mounted Drill Rig)	1	Below Water Table	AMI Supply well	1,000	1,000
Test Pit	15	20	AMI Supply well	0	0
Exploration Borehole	10	600-1,200	AMI Supply well	24,000	240,000
Aquifer Testing	12		Hydrogeological borehole (NFS lands)	86,400 to 432,000 ¹	432,000
Dust suppression Usage			AMI Supply well, produced water from drilling NFS lands		2,800,000
Total Estimated Water Usage					3,525,800

Table 6 in the Plan of Operations (AMI, 2013b), and (AMI, 2013c)

¹ Total estimated amount for all aquifer testing.

Water will be produced during some of the hydrogeological testing activities. The type and frequency of the planned testing is shown in **Table 4**.

In the hydrogeological wells, a pump will be used to extract water for testing during the initial pump tests. The pumps will be powered by a generator. There will not be a need to pump water from these wells after the initial testing, so long-term power supplies or pump installations are not required.

The amount of water pumped during aquifer testing is an estimate, and the exact volume of water that each well will produce is unknown until the drilling is completed for that site. However, pumping of 10 to 50 gallons per minute is estimated during each test. Water that is produced during aquifer testing will be pumped into a temporary water storage tank positioned adjacent to the well. The water will subsequently be transferred by water truck for storage on private land or applied to roads for dust suppression. The packer testing, downhole geophysical logging, slug testing, and water quality and level monitoring will not result in water being pumped out of the monitor well.

Table 4. Tests Conducted at Hydrogeological Drilling Sites				
Test	Number of Sites	Timing	Frequency	Duration
Packer Testing	12 sites, 6 tests per site	As drilling advances or once total depth is reached	During drilling or once at conclusion of drilling	3 to 4 hours per interval
Downhole Geophysical Logging	12 sites, 1 test per site	After drilling and prior to well installation	Single event	6 to 8 hours per site
Aquifer Testing	12 sites, 1 test per site	Following well development and once water levels have stabilized	Single event	Up to 12 hours per site
Slug Testing (falling and rising head)	To be determined, used if needed to supplement aquifer testing	Following well development and once water levels have stabilized	Single event	2 to 8 hours per site
Water Quality Sampling	11 wells	Following well development and once water levels have stabilized	Quarterly, possibly reduced to semiannual or annual	2 to 3 hours per monitoring well
Water Level Monitoring	12 wells	Following well development and once water levels have stabilized	Monthly	1 hour per monitoring well

Source: (AMI, 2013b)

2.3.3 Environmental Protection Measures

The Plan of Operations includes measures to protect the environment. Environmental Protection Measures (EPMs) are listed by resource below. These are considered part of the proposed action and would be required to be implemented as part of the Plan of Operations approval. Some of the proposed EPMs were modified under Forest Service Required Design Features (Section 2.3.5), which would also be required and part of the Plan of Operations approval.

2.3.3.1 Air Quality

The following practices will reduce impacts on air quality:

- Both core and reverse circulation (RC) drilling are wet drilling methods and do not generate dust.
- Slash will not be burned, but will instead be limbed, lopped and scattered, or chipped for use in site control and reclamation.

- One to four water trucks, with up to 4,000-gallon capacity, will be used in rotation watering access roads as needed on operating days to control dust being generated by vehicular traffic related to the project.
- Drilling vehicle traffic will be limited to the required access roads relevant to active drilling locations and related activity.
- The speed limit will be 15 miles per hour on all Coronado National Forest roads and as signed on other roads, such as county roads.
- All engines utilized in the operations will be equipped with the pollution control equipment provided by the manufacturer (i.e., catalytic converters, mufflers, and/or spark arrestors).

2.3.3.2 Water Quality

To minimize the impacts on water quality:

- AMI will operate in accordance with the requirements of an Arizona Pollution Discharge Eliminating System (AZPDES) Construction General Permit (CGP). Per Arizona Department of Environmental Quality's (ADEQ) *De Minimis* CGP program, AMI will develop and implement a stormwater pollution prevention plan (SWPPP) to minimize and manage stormwater. The SWPPP will describe the best management practices (BMPs) including sediment/erosion control, good housekeeping, maintenance, inspections, and any required monitoring. SWPPP requirements will be incorporated into all phases and a copy of the SWPPP will be maintained at the staging area.

Specific BMPs that will be implemented as erosion control measures within disturbed areas include the following:

- Minimize drill pad size.
- Minimize exposure of disturbed areas to rainfall by building drill pads only immediately prior to scheduled drilling activity. Reclamation and revegetation will be scheduled to commence rapidly following completion of drilling to stabilize the site and restore vegetative density as quickly as possible.
- Minimize disturbance by placing drill pads as close as possible to existing roads.
- Retain and preserve existing vegetation.
- When available, utilize chipped branches as wood mulch to stabilize disturbed soil and promote vegetation growth.
- Unpaved roads can be a source of erosion. Surface disturbance and tire compaction promote gully formation by increasing the concentration and velocity of runoff. Water bars or check dams can be used to shorten the flow length within a long sloping right-of-way, thereby reducing the erosion potential by diverting storm runoff to a stabilized outlet or sediment trapping device. Water bars can also be used to direct runoff to the inner hillside of roads where culverts with velocity dissipation devices and/or slope drains are present.
- Fiber rolls (also known as wattles; BMP SE-5) placed at the toe and on the face of slopes intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and remove sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

- Seasonal closures are not anticipated to occur during the course of the project. If unanticipated temporary cessation of activities occurs, BMPs, monitoring, and inspections will continue until reclamation is complete.
- Water will come into contact with inert bentonite drilling mud and ground rock at depth. After it is pumped out of the borehole, the water will be treated by allowing it to evaporate and by allowing the solids to settle out in excavated mud pits at each drill site. During installation and development, and testing of the monitoring wells, water will be collected in water trucks at the characterization sites. Collected water will be used for dust suppression or trucked to reservoirs and cattle tanks on private lands.
- The strategic installation of bentonite seals and professional drilling practices will minimize potential impacts of the drilling program to the existing groundwater aquifer system. In addition, no land application of wastewater will occur during the project.

2.3.3.3 Solid Wastes

Solid waste generated during drilling/exploration activities will be minimized as follows.

- In general, solids generated from drilling (e.g., rock and drilling mud) are not considered waste and will be placed back into the borehole or used as fill on private land.
- The cuttings that will not be placed back in the hole are the wet and dry cuttings from the hydrogeological holes that will be monitoring wells. The wet and dry cuttings removed from these sites will be accumulated in lined bins and transported off site for use as fill on private land.
- Waste grout and concrete from monitoring well installations will be transported and accumulated in the roll-off box at the project staging area for disposal by Waste Management at the Los Reales Landfill.
- General trash including remains of food wastes, packaging, and empty containers will be accumulated in 30-cubic yard roll-off boxes that are staged at the project staging area. A portable toilet will be placed at each active drill site and at the project staging area and will be serviced periodically by a contractor. Up to seven portable toilets may be used on NFS lands during the drilling activities.

2.3.3.4 Scenic Values

To protect scenic values, AMI will implement the following protective measures:

- Scenic values will be protected by good housekeeping practices, minimizing disturbance, and implementation of timely reclamation. Impacts to scenic values as a result of the proposed project will be minimized by implementing the following protective measures:
- Vegetation removal will be selective and will be conducted in such a way as to minimize visual contrast.
- Slash and vegetation debris will not be burned, but will be limbed, lopped and scattered, and/or chipped for reclamation and site stabilization use.
- Dust control measures discussed above will prevent degradation of scenic values.
- BMPs implemented for stormwater control will reduce erosion and sedimentation and minimize dust generation.

- Lights used for night work and safety will be directed or shielded to minimize nightlight effects to surrounding areas. Drilling activities are proposed for up to 12-hrs per day at CS-26.
- Reclamation activities will be implemented in a timely and concurrent manner as described in Appendix D of the Plan of Operations (AMI, 2013b).

2.3.3.5 Fish and Wildlife

The proposed project will be conducted in a manner that minimizes disturbance to wildlife species and habitat to the extent practicable to safely allow access and drilling.

The following general preventative measures will be employed by AMI as part of daily operations for the protection of wildlife that may encounter proposed activities:

- Open mud pits at unoccupied drill sites will be covered to prevent wildlife from being trapped. For drilling operations that are anticipated to be continuous, wildlife are not expected to approach active rigs.
- For exploration drilling mud pits, excavated material will be pushed up at one side to create a small berm, and the opposite side will be sloped to allow safe egress in the unlikely event that wildlife or personnel should enter the pit.
- Roll-off bins used for trash management will remain covered to prevent wildlife from entering the containers and becoming trapped.

2.3.3.6 Cultural Resources

AMI has included the following measures to avoid impacts on cultural, historical, or tribal resources:

- Adverse effects to historical properties sites will be avoided. All personnel involved in disturbance operations will be instructed on site avoidance and mitigation measures. This training will be conducted for all personnel prior to initial site mobilization and will be provided to new personnel on their first day of work.
- Archaeological monitors will be onsite to monitor construction activities that will take place within 50 feet of historic properties considered eligible or of undetermined eligibility for listing on the National Register of Historic Places. All historic properties near proposed activities and access routes will be flagged. Combined with the revised locations of site characterization activities, these monitoring efforts are designed to avoid adverse effects to historic properties.
- Class I and Class III cultural resources surveys to determine the presence and/or absence of cultural resources (pre-historic, historic, and tribal considerations) within the project area were completed. Continued coordination with Coronado National Forest archaeologists will identify any additional survey requirements and appropriate historical properties protection measures. The Forest Service will consult with the State Historical Preservation Office and has consulted interested Native American as required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 Code of Federal Regulations [CFR] part 800).

2.3.3.7 Hazardous Substances

AMI will manage hazardous substances and avoid impacts on public health and safety by using the following measures:

General

- The Material Safety Data Sheets (MSDSs) for the materials planned for use in the proposed project are included in the Plan of Operations under Appendix E – Material Safety Data Sheets. All downhole additives, well construction materials, and hazardous substances including petroleum products (diesel fuels, oil/lubricants), cleaning chemicals, contingency welding supplies, and other materials to be used in the drilling program are identified in the Plan of Operations under Appendix F – Spill Response Procedures. Note that very few of these materials have Reportable Quantities as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in Title 40 Code of Federal Regulations Parts 116–117. The reason for this is that most of the materials are either exempt as petroleum products or they do not meet the hazard criteria. The drill rigs and support vehicles use several petroleum products, including diesel fuel or gasoline, motor oil, hydraulic oil, and deck engine oil. Many of the sealants used for downhole equipment and tooling will be bentonite-based products, and the liquid oils or lubricants are considered edible or “environmentally friendly” such as fish oil. Thus, while some of the materials may contain components that, under special circumstances, may be hazardous to human health, no materials, other than petroleum products, pose a significant threat to the natural environment.
- The products with acute or chronic toxic properties include either petroleum products (diesel fuel, gasoline, and the lubricant IDP-214) or the specific drilling additives Quik-Gel Gold® and EP Mudlube®. These additives are listed as toxic because they contain up to 5 percent crystalline silica, which poses inhalation risks to humans under occupational exposure.
- Diesel fuel will be supplied by tanker trucks to a temporary contractor-furnished tank located at the project staging area on AMI-owned property. To prevent any spills from leaving AMI property, AMI will implement the spill contingency plan procedures documented in the Plan of Operations under Appendix F – Spill Response Procedures. The spill contingency plan starts with potential spill anticipation and cognizance, with a focus on prevention.
- Drilling contractors will provide temporary diesel fuel storage tank(s) equipped with a spill containment barrier of sufficient capacity to contain a volume of fluid equivalent to the capacity of the tank plus the quantity of rainfall resulting from a 100-year, 24-hour rainfall event. Fuel will be delivered as needed depending on the level of drilling activity. The larger drill rigs consume approximately 35 gallons per day of diesel fuel.
- As a priority, and to the extent that it is practical to do so, all heavy equipment and support vehicles will be fueled at the project staging area on AMI private property. Fueling of drill rigs, support vehicles, and portable field equipment involved with dedicated work away from the project staging area will be accomplished using National Fire Protection Association 1192 Standard, American National Standards Institute (ANSI) 119.2-rated pickup-borne fuel tanks of limited capacity that are equipped with electric fuel pumps. These portable tanks are typically used by construction and contracting personnel. Actual fueling will take place over a portable containment vessel of sufficient size to capture any spillage. Spill kits containing leak pans, rags, granular sorbents, and/or blotters will be maintained at the project staging area and on fueling pickup trucks to be used to clean any leaks, spillage, or drips. Any used absorbent material will be contained within a lidded barrel for proper disposal off site.
- Hydraulic oil and motor oil will be delivered and stored at the project staging area described in Section 4.6.1 of the Plan of Operations. The fluids will arrive in 5-gallon containers and will be

stored on wooden pallets in a secure enclosure to prevent theft, vandalism, and accidental spillage. The enclosure will be equipped with a secondary containment curb or berm such that the volume of containment is equivalent to the capacity of the largest container plus the quantity of rainfall resulting from a 100-year, 24-hour rainfall event. These measures will prevent any spilled material from leaving AMI's property. Immediate cleanup will prevent contamination of runoff that may exit the private lands to NFS lands.

- All petroleum products will be stored with secondary containment and in quantities below the 1,320-gallon threshold limit applicable to Spill Prevention, Control, and Countermeasures (SPCC) plans. Lubricating grease will be delivered in point-of-use containers such as grease cartridges. These materials will be stored in the secure area holding hydraulic and motor oils.
- Drill fluid additives will be used to thicken and condition the drilling water. Some of these products (such as bentonite gel) are in powder form and come in plastic lined paper bags weighing approximately 50 pounds. Other drill fluid additives (such as Quick-Trol® polymer and Rod Ease) are available in liquid form, delivered in 5-gallon plastic containers. Quick-Trol® is a biodegradable polymer that forms long chain molecules when mixed with water. Rod Ease is a vegetable oil-based product added to the drill fluid to loosen up the drill string when squeezing conditions are present in the hole and to enhance lubrication of the bit and drill string. These and similar products are commonly used in the drilling industry and are essential to core drilling in geological formations existing under the project area.
- On-site storage of drill consumables including drill fluid products will be held to a minimum. Bagged items will be stored on wooden pallets and protected from weather using plastic sheeting. The liquids contained in plastic containers will be stored on wooden pallets.
- All refuse and debris generated by use of these products will be disposed of as general trash as presented in 2.3.3.3.

Spill Prevention, Control and Reporting

Spills will be prevented or managed through the following:

- Site contractors will maintain less than 1,320 gallons of petroleum and petroleum-related material on site; therefore, a SPCC Plan as part of Title 40 CFR Part 112 is not required. Even though an SPCC Plan is not required, AMI has developed Spill Response Procedures in order to address spill prevention, containment, notification, and cleanup measures. Details of these procedures are provided in the Plan of Operations in Appendix F– Spill Response Procedures.

2.3.3.8 Health and Safety

Crew Health, Safety, and Emergency Services

- At least one person present in the project area will be trained in first aid and cardio pulmonary resuscitation. Vehicles and rigs will be equipped with first aid kits.

Site Security

- Private lands are monitored during the day by AMI staff on site. At night, NFS Road 5521 is secured by a locked gate. During night time when equipment is present, on-site security contractors will patrol the area where the drill and excavation equipment are located to minimize the potential for vandalism. Security services will be provided by AMI and its subcontractors.

Fire Prevention and Control

AMI will implement the following measures for the prevention and control of fires during the course of the project:

- Firefighting personnel and equipment shall be on site, ready, and available at all times.
- All combustion engine equipment including chain saws will be equipped with spark arrestors installed by the manufacturer.
- Welding, cutting, and other hot work activities that create sparks must be done off site or in clear areas, free of combustible materials. These activities require the presence of a fire suppression vehicle and fire-fighting personnel.
- All vehicles will be equipped with a working fire extinguisher and a shovel. Drill rigs will be equipped with a filled water tank during periods of operation.
- All smoking will be prohibited.
- Campfires or uncontained fires of any kind will be prohibited.
- The crew contingency plan will include a fire communications protocol for contacting fire-fighting personnel.
- The Project will comply with fire restrictions and/or red flag warning day guidelines.

2.3.3.9 Use of Roads

AMI's Plan of Operations (AMI, 2013b) included a Road Use Plan (Appendix A of the Plan of Operations). The Road Use Plan includes the following measures:

- All of the existing roads would remain open for motorized use during proposed characterization activities, unless the road is identified as restricted to public use. During temporary road improvements, signage will be placed at road junctions on each side of the road improvement segment indicating road maintenance.
- Drainage improvements to reconstructed roads will be conducted only as needed. Roadways will be sloped for drainage to reduce erosion, water bars will be installed where necessary to prevent concentration of runoff. The creation of berms along the side of the road will be avoided. Rolling-dip cross-drains will be constructed into the roadway on steep grades to help prevent erosion. Rolling-dip cross-drains are designed to slow traffic and disperse surface water. Rolling dips require less maintenance and are less likely to plug and fail than culvert pipes. Spacing of rolling dips is a function of road grade and soil type. Recommended maximum distances between rolling dips is provided in **Table 5**. Specific locations of rolling dips will be determined in the field based upon actual water flow patterns, rainfall intensity, road surface erosion characteristics, and available erosion resistant outlet areas. A typical rolling dip profile is provided in Figure A-02 in the Plan of Operations.

Table 5. AMI Proposed Maximum Distance Between Rolling Dips on Roads		
Road Grade %	Low to Non-Erosive Soils	Erosive Soils
0-3	120 feet	75 feet
4-6	90 feet	50 feet
7-9	75 feet	40 feet
10-12	60 feet	35 feet

Table 5. AMI Proposed Maximum Distance Between Rolling Dips on Roads

Road Grade %	Low to Non-Erosive Soils	Erosive Soils
12+	50 feet	30 feet

- To the extent practicable, existing drainage crossings will be simple ford-style low water crossings. Where existing drainages that cross the roadway are deeply incised, temporary crossings may be constructed and armored using cobble-sized rocks to allow water to flow through the crossings to the extent possible. The use of culverts will be avoided to the extent practicable, although some temporary culverts may be installed if required by Nationwide Permit No. 14, under the Clean Water Act (if any potential jurisdictional waters are encountered).
- Erosion control BMPs to be implemented during reconstruction of NFS roads are documented in Section 5 of AMI's submitted Plan of Operations and within the Stormwater Pollution Prevention Plan (SWPPP).
- To avoid transporting noxious weeds onto NFS lands, heavy equipment will be washed off-site on private property prior to entering the Project Area.
- Erosion control BMPs will be designed as recommended in the Low-Volume Roads Engineering Best Management Practices Field Guide (Keller & Sherar, 2003), and within the Project SWPPP.

2.3.3.10 Measures To Be Taken Prior To Commencement

Measures that will be taken prior to commencement of activities to minimize impact to Coronado National Forest resources are listed below:

- AMI will accommodate recommendations and requests from Coronado National Forest specialists to adjust the location of any planned characterization sites or access routes to reduce impacts to Coronado National Forest resources.
- All drilling and earth-moving equipment will be inspected for leaks prior to operating within the boundaries of the Coronado National Forest. Leaks will be remedied by repair and/or placement of leak containment beneath equipment.
- All AMI contractors will be briefed on the importance of maintaining clean work areas and minimizing impact to Coronado National Forest resources.
- The proposed alignments of TARs and overland vehicle paths (OVPs) have been designed to minimize disturbance on Coronado National Forest land.

2.3.3.11 Prevention of Unnecessary Degradation and Adverse Impacts

Measures that will be taken to prevent or control onsite and off-site damage to the environment and Coronado National Forest resources are derived from the general requirements established by 36 CFR § 228.8 (g) surface management regulations for reclamation as listed below:

- Drill holes will be properly constructed, maintained, and decommissioned to ensure protection of the groundwater resource.
- Surface disturbance will be minimized.

- Where suitable as a growth media, soils and alluvial material will be managed as a topsoil resource and replaced during reclamation.
- Straw wattles will be placed on site during exploration and characterization activities to reduce soil erosion and water runoff. These wattles will remain on site until reclamation and will be used as mulching material during reseeding.
- No access routes will cross wetlands.
- All vehicles will travel only on roads identified in the Hermosa Drilling Project Plan of Operations.

2.3.4 Reclamation Plan

The purpose of the Reclamation Plan (Appendix D in the Plan of Operations) is to describe the methods AMI will implement to return the land and vegetation to a stable state after the Hermosa Drilling Project concludes.

In accordance with 36 CFR § 228 and the policies of FSM 2840, AMI will reclaim temporarily disturbed areas and return them to a use that is consistent with long-term forest land and resource management plans. The reclamation operations will be ongoing (concurrent reclamation) and will be completed within two years after start of the project, with the exception of the monitoring wells, which would be reclaimed within 15 years.

2.3.4.1 Concurrent Reclamation

AMI will conduct concurrent reclamation, closing characterization sites, temporary access routes, and overland vehicle paths as associated activities are completed. This will minimize the size of the exposed area and the potential for soil erosion.

2.3.4.2 Reclamation of Characterization Sites

AMI will notify the Coronado National Forest prior to the commencement of reclamation activities. Following the completion of characterization activities, all materials, including equipment, pipe, lubricants and other products, tanks, cores, plastic sheeting, and any other supplies, will be removed from the site.

At characterization sites where exploration drilling is conducted (see **Table 1**), solids and desiccated drilling muds (inert materials) in the mud pits will be, where practicable, returned to the borehole. If the hydrogeological borehole is to be maintained as a monitoring well, the cuttings will be backfilled and compacted into the sump. The sump will then be fully covered with the native material previously stockpiled. No drill cuttings will remain on the surface as waste. Any excess cuttings beyond what can be backfilled into the sump will be removed from the drill site for use as fill material on AMI land. The former sump area will then be returned to natural grade with a track hoe using rocks and soil set aside during site construction and mud pit excavation. For boreholes that will be abandoned, the boreholes will be closed in accordance with ADWR protocols and requirements (see Section 2.3.4.3).

At characterization sites where geotechnical drilling is conducted (see **Table 1**), drill cuttings, where practicable will be returned to the drill hole. Any excess cuttings will be placed in a tilt hopper and removed from the drill site for use as fill material on AMI land. Geotechnical boreholes will be closed in accordance with ADWR protocols and requirements.

At characterization sites where test pit excavation is conducted (see **Table 1**), after samples have been collected, all remaining excavated material will be returned to the excavated pit and compacted as needed.

Each characterization site (borehole or test pit) will then be ripped to reduce compaction, recontoured, and seeded in accordance with the Coronado National Forest guidance using approved seed mixes, certified native weed-free species. If the initial seeding effort is unsuccessful, up to two additional seedings will be attempted.

For the sites that will continue to be used long term for scheduled groundwater monitoring, a portion of the characterization site will be reclaimed while still maintaining foot access to the monitor well. The same procedure will be followed for partial site reclamation as describe above, except that the borehole (monitor well) will not be closed. At the time of closure of the monitor well, the borehole will be abandoned in accordance with ADWR regulations, and the remainder of the site will be reclaimed.

Stormwater BMPs, such as water bars, culverts, and erosion-control features, would be repaired or removed as necessary and as specified by the Coronado National Forest Authorized Officer.

2.3.4.3 Abandonment of Drill Hole and Monitor Wells

Drilling and borehole abandonment would be conducted in accordance with Arizona Administrative Code (AAC) R12-15 and Arizona Revised Statutes (ARS) Title 45, Chapter 2, Article 10, as administered by the ADWR. Exploration borehole abandonment will be in accordance with AAC R12-15-816 and 817 requirements. Monitor well abandonment activities will be conducted according to AAC R12-15-816 requirements. Well abandonment by definition means the modification of the structure of a well by filling or sealing the borehole so that water may not be withdrawn or obtained from the well. The state regulations allow for cement grout, concrete, bentonite drilling mud, clean sand with bentonite, or cuttings from the well to be used for abandonment. If special aquifer conditions are encountered during drilling operations or abandonment, such as artesian conditions or mineralized or polluted water, AMI will follow AAC R12-15-812.

2.3.4.4 Reclamation of Temporary Access Routes

Temporary access routes will be reclaimed by ripping/roughing and seeding (up to three times) with an appropriate seed mix and placement of rocks or other protective materials. Areas of reseeding would be scarified (ripped) prior to seeding to break up compaction. Road-surfacing material, if any, may need to be removed and potentially redeposited on NFS roads, as determined by the Coronado National Forest Officer. Onsite straw wattles used to reduce runoff will be broken up and used as mulching material. Other stormwater BMPs, such as water bars, culverts, and erosion-control features, will be repaired or removed as necessary and as specified by the Coronado National Forest Officer. Temporary access routes would be recontoured as closely as possible to pre-disturbance condition and blocked with an earthen berm or boulders at each access point.

2.3.4.5 Reclamation of Overland Vehicle Paths

Overland vehicle paths will be reclaimed by ripping/roughing with hand tools and seeding (up to three times) with a Forest-approved seed mix and placement of rocks or other protective materials. Areas of reseeding would be scarified (ripped) with hand tools prior to seeding to break up compaction.

2.3.4.6 Final Reclamation and Post-Project Monitoring

Each characterization site and associated access route will receive a closure inspection within one growing season following final closure. Surveys will assess the effectiveness of natural vegetation establishment and document the presence or absence of noxious or invasive weeds. A site specific action plan will be developed and implemented if a site:

- Shows signs of surface erosion,
- Shows signs of noxious or invasive weed establishment, or
- Fails to show establishment of native species from the surrounding community.

AMI will document characterization site conditions before project activities begin and at closure with photographs in three locations for each site (e.g. characterization site, from characterization site to road, side view of characterization site). The closure photographs will be presented in a letter report which will provide a summary of monitoring regarding reclamation success, and include recommendations for additional corrective actions.

2.3.4.7 Proposed Reclamation Measures To Achieve Post-Project Land Use

Growth Media

Growth media salvaged from the proposed disturbance areas will be replaced. Where available (i.e. not in areas covered with rock), growth media will be saved and stockpiled in the side cast fill material for reclamation purposes and where reasonably practical to do so.

Revegetation, Seeding, and Planting

Generally, the final surface of characterization sites, temporary access routes, and overland vehicle routes will be left in rough condition to hold seed and to optimize germination. Reclaimed areas will be hand broadcast seeded with the approved seed mix shown in **Table 6**. Changes or adjustments to the seed mix or application rate may be made in consultation with the Coronado National Forest Officer. Seeding will be completed at the appropriate time of year. The straw wattles left on site during project operations will be broken up and used as mulching material to reduce erosion and improve water retention in the soil. The seed mix is specific to the Huachuca Ecosystem

Management Area of the Sierra Vista Ranger District. The specifications in pounds of pure live seed per acre are detailed in **Table 6**.

Noxious and Invasive Weed Control

AMI will implement EPMs to eliminate or minimize the introduction and spread of noxious weeds and invasive plant species during the project. These include:

- All straw wattles used on site to reduce soil erosion will be composed of non-invasive plant species.
- All drill and excavator rigs and equipment will be rinsed and inspected for noxious or invasive species before they enter the Coronado National Forest

Table 6. Reclamation Seed Mix¹

Species		Pure Live Seed Per Acre
Sideoats grama	<i>Bouteloua curtipendula</i>	1
Blue grama	<i>Bouteloua gracilis</i>	0.75
Cane beardgrass	<i>Bothriochloa barbinodis</i>	0.5
Arizona cottontop	<i>Digitaria californica</i>	0.5
Hairy grama	<i>Bouteloua Hirsuta</i>	0.75
Plains bristlegrass	<i>Setaria vulpisetia</i>	1
Green sprangletop	<i>Leptochloa dubia</i>	0.75
Curly mesquite	<i>Hilaria belangeri</i>	0.5

¹As described in Forest Service required Design Features (Section 2.3.5), the final seed mix must be approved by the Coronado National Forest Authorized Officer.

to begin the project.

- Contractors will avoid driving, drilling, or parking in weedy areas.
- Drill and excavator rigs and transport vehicles will be power washed weekly or when moving from one Coronado National Forest weed management area to another. An air compressor will accompany the drill and excavator rig and be used daily to remove weed parts and seed from all vehicles.
- The potential exists for noxious or invasive weeds to become established following drilling or excavation despite implementation of BMPs. Post-project observations will identify areas where noxious weeds have established and recommend treatment as part of the monitoring report.

Post Project Land Use

Final revegetation will be consistent with the post-project land uses of cattle grazing, wildlife habitat, and various forms of recreation including camping, hiking, mountain biking, bird watching, and hunting.

2.3.5 Forest Service Required Design Features

The Coronado National Forest has reviewed the Plan of Operations for consistency with the Coronado National Forest Plan (USFS, 1986), National Core BMPs (USFS, 2012), and Arizona state requirements. Under the proposed action, the Forest Service will require additional Design Features to minimize impacts and make the proposed action compliant with the direction referenced above.

2.3.5.1 Threatened, Endangered, Sensitive, Management Indicator Species, and Migratory Birds

To help reduce impacts on special status species, the Coronado National Forest is requiring AMI to implement the following Design Features

- BIO-1 No trees greater than 12 inches diameter at breast height shall be cut for road or pad clearing.
- BIO-2 Any Agave plants that must be removed for project activities shall be transplanted.
- BIO-3 All project employees, contractors, and service personnel must be advised to neither harm nor harass wildlife encountered in the project area.

2.3.5.2 Vegetation and Sensitive and Invasive Plants

To reduce the potential to spread or introduce invasive plant species, the Coronado National Forest is requiring AMI to implement the following Design Features:

- VEG-1 In the Plan of Operations, including the EPMs, when AMI says “noxious weeds” the Forest Service interprets that to include all invasive plants.
- VEG-2 A native seed mix that is approved by the Forest Service shall be used for revegetation.
- VEG-3 Each characterization site and all roads shall be surveyed pre and post-disturbance for native species, invasive species, and Forest Service sensitive plants. The survey area will include a 100 feet around each characterization site and a 50 feet on either side of the road. Surveys for invasive and Forest Service sensitive plants could be done concomitantly, depending on the expertise and qualifications of the surveyor(s). Surveys will be

conducted under Forest Service direction provided in Pre-Disturbance Vegetation Surveys, including invasive and Forest Service Sensitive Plants (USFS, 2014).

Any Forest Service Sensitive plants encountered during surveys should be flagged and avoided if possible. If individuals cannot be avoided, they should be transplanted. If individuals cannot be transplanted and seeds are available, they should be collected and used in post-disturbance reclamation efforts.

Invasive species that were not present prior to disturbance will be eradicated; if invasive plants existed on a site prior to disturbance, their production, frequency and percent composition after disturbance shall not exceed that which existed prior to disturbance.

Overall success of reclamation will be determined on a site by site basis using the pre disturbance survey data. Percent bare ground shall not exceed pre disturbance levels. Total annual production and diversity of native herbaceous species shall be within at least 90% of pre disturbance levels.

Monitoring of reclamation efforts shall take place for a minimum of three years after the completion of disturbance activities.

- VEG-4 Pre- and post-disturbance monitoring shall capture the effects of the peak growing season, generally defined as July through September. In addition, surveys for invasive and rare plants should occur in the spring and fall following the regional bimodal precipitation patterns to detect species that germinate with winter or summer rains. Post-disturbance monitoring of reclamation efforts shall take place for a minimum of three years.
- VEG-5 AMI will be responsible for treating populations of invasive plants that establish following drilling or excavation. Results from pre-disturbance surveys may indicate the desire to treat areas prior to drilling activities to further reduce the chance of spread. Post-disturbance treatments shall be repeated biannually or annually as needed until the infestations are eradicated (e.g. species eliminated for three successive monitoring events). Areas where infestations existed prior to disturbance, infestations shall not be greater than the original extent. Treatment activities will follow the four elements of Integrated Vegetation Management and the mitigation measures outlined in the Decision Notice/Finding of No Significant Impact for the Invasive Exotic Plant Management Program (USFS, 2004). A pesticide use proposal will be submitted to the Forest Service for approval that documents which chemicals will be used, when, and where applications will occur.
- VEG-6 AMI's EPMs 2.3.4.2 and 2.3.4.4 stated seeding would occur up to three times. Instead, the Forest Service will determine if revegetation is successful on a site-by-site basis using the pre-disturbance survey data, which may require more than three seedings. The minimum components of reclamation success will include:
- Percent bare ground shall not exceed pre-disturbance levels.
 - Total annual production and diversity of native herbaceous species shall be at least 90 percent of pre-disturbance levels.

2.3.5.3 Soils

To reduce the potential for erosion or compaction, the Coronado National Forest is requiring AMI to implement the following Design Features:

- GEO-1 Overland vehicle travel is prohibited when soils are saturated or on slopes steep enough to cause wheelspin/traction problems.
- GEO-2 Avoid all mechanical ground disturbing activities when soils are wet.
- GEO-3 Stockpile of topsoil and overburden soil piles should be surrounded with silt fence or straw wattles to minimize soil loss and reduce erosion runoff.
- GEO-4 All remnant vegetation and woody material from the excavation activity and TAR construction should be stock piled for use during reclamation for erosion control.

2.3.5.4 Water Quality and Quantity

To reduce potential impacts on surface or groundwater, the Coronado National Forest is requiring AMI to implement the following Design features:

- HYD-1 AMI shall avoid road/trail use when road beds are saturated. AMI shall not allow trucks to drive on roads if the vehicles tires/tracks produce ruts in the road.
- HYD-2 AMI is required to maintain a 15-foot setback from the active stream bank for characterization sites.
- HYD-3 During borehole and well abandonment, instead of returning the borehole cuttings to the open borehole, AMI shall use low permeable cement grout for borehole abandonment.
- HYD-4 All materials that remain in the sump after completion of characterization activities shall be allowed to dry (or solidified using inert additives) sufficiently to rework and compact materials prior to sump reclamation.
- HYD-5 If sump liners are used, they must either consist of 100 percent biodegradable materials or be removed during sump reclamation.
- HYD-6 Use appropriate erosion control measures (such as straw wattles, silt fencing, etc.) along the perimeters of disturbance to help control any runoff, and reduce the potential for sedimentation.
- HYD-7 Design TARs to support wheel loads, stabilize the roadbed, reduce dust, and control erosion consistent with anticipated traffic and use.
- HYD-8 The drainage standards in the Plan of Operations Road Use Plan, as specified for reconstructed roads, shall also apply to TARs.
- HYD-9 Refueling and equipment maintenance activities will occur at least 15 feet from riparian areas, riparian vegetation, surface water, and stream channels. Fuel dispensers will be outfitted with automatic shut-off valves and required alarm systems.
- HYD-10 Avoid natural hill slopes greater than 40 percent.
- HYD-11 AMI shall implement the following monitoring program as specified by the Coronado National Forest:
 - A shallow groundwater monitoring well co-located with two of the characterization sites shall be installed to monitor the shallow groundwater levels during project activities. Shallow monitoring wells will be installed prior to any other drilling.

- Photo points shall be established before the activities begin. Photos shall be taken monthly throughout the project and continue for at least one year after the active drilling program is complete.
- Surface water flow shall be measured with a meter in the stream reaches identified by the Coronado National Forest.
- Precipitation shall be monitored and recorded.
- AMI supply well discharge volumes shall be recorded.

Monitoring information shall be reported monthly and used by the Coronado National Forest to determine if modifications need to be made to the drilling program to reduce impacts.

2.3.5.5 Visual Quality

To meet VQOs and reduce the impacts on visual quality, the Coronado National Forest is requiring AMI to implement the following Design Features:

- VIS-1 Design and construct TARs minimizing clearings and cut and fills.
- VIS-2 Design drill pads facilities to fit into existing clearings wherever possible. Minimize vegetation removal (especially large shrubs and trees).
- VIS-3 Protect trees and vegetation that remains after clearing, especially vegetation that is visible from NFS roads.
- VIS-4 If overland routes result in features that contrast with the natural landscape (such as tire tracks or bare soils) naturalize these areas appropriately. Access to overland routes shall be physically blocked until reclamation is complete.
- VIS-5 Instead of berms, place boulders, branches, and plants where needed to block vehicular access into areas to be naturalized. Boulders should be installed in a random, non-linear fashion, and partially buried to appear natural.
- VIS-6 Paint monitoring wellhead lock boxes to blend with landscape. Dark tan or neutral brown is recommended.

2.3.5.6 Public Safety

To maintain a safe environment for humans and wildlife, the Coronado National Forest is requiring AMI to implement the following Design Features:

- HAZ-1 AMI will use construction materials and drilling additives that are commonly used by the industry (Section 2.3.3.7) and are considered nonhazardous to the environment and wildlife.
- HAZ-2 AMI shall post signs warning other users in the area that work is occurring; at each worksite, and at intersections leading to the worksites.
- HAZ-3 Public access to each drilling sump shall be limited through the construction and maintenance of high-visibility fencing placed around each sump to warn project personnel and other users in the area of the hazard.

- HAZ-4 Antifreeze/engine coolant is not anticipated to be stored on site; however, an MSDS in Appendix E of the Plan of Operations outlines the spill response procedures to be followed. The material would also be stored at the project staging area in secondary containment.
- HAZ-5 Use of herbicides will follow safety guidelines outlined in the Decision Notice/Finding of No Significant Impact for the Invasive Exotic Plant Management Program Coronado National Forest - Mitigation Measures Involving the Use of herbicides (USFS, 2004), listed below:
- All applicable state and federal laws, including herbicide label requirements will be followed.
 - Projects will be supervised by a certified applicator who will be responsible for insuring safe handling, application and disposal of herbicides.
 - Herbicides will be applied only by ground-based equipment, including hand painting or daubing, backpack sprayers and spray units on all-terrain vehicles or trucks. In areas with sensitive vegetation, spot application will be used to treat individual weeds while protecting desired vegetation.
 - Picloram will not be used where the water table is within 40 inches of the surface, where soil permeability would be conducive to water contamination.
 - Only herbicides labeled for aquatic use (i.e. Rodeo (glyphosate), Renovate (triclopyr), and Weedar 64 (2,4-D amine) will be used within 30 feet of streams and other bodies of water.
 - Persons involved in mixing, loading and applying herbicides will be required to wear appropriate personal protective equipment as required on the label.
 - Areas used for mixing herbicides and cleaning equipment shall be located where spillage will not run into surface waters or result in ground water contamination.
 - All requirements in a Safety and Spill Plan will be followed.
 - Treatment areas will be signed to alert the public of the herbicide application.
 - Landowners within ½ mile of the area to be treated with herbicide will be notified in writing before the project is undertaken.
- HAZ-6 In addition to AMI's fire prevention EPMs, implementation of practices in the Coronado National Forest Industrial Fire Plan are required.

2.3.5.7 Cultural Resources

To help minimize impacts to cultural resources, the Coronado National Forest is requiring AMI to implement the following Design Features:

- CUL-1 The edges of the roads within or adjacent to National Register-eligible cultural resource sites will marked with temporary flagging to assure vehicular traffic is limited to existing roadbeds. Flagging will be extended to include areas within 50 feet of site boundaries. No road improvements will be permitted within site boundaries or 50-foot buffer zones.

- CUL-2 If additional cultural resources are located during project implementation that were not identified during surveys, the ground disturbing activities shall stop, and the Coronado National Forest shall be notified immediately. The new information shall be evaluated prior to the commencement of ground disturbing activities.
- CUL-3 Archaeological monitors will perform weekly inspections, and monitor any road improvement work within 50 feet of a site buffer.
- CUL-4 The existing, unauthorized non-system road that would be used to access one of the characterization sites passes directly through the remains of an historical structure; a length of approximately 15 feet of geotextile fabric will be placed upon the feature, followed a layer of clean fill in order to mitigate potential adverse effects.
- CUL-5 All personnel involved in any surface disturbance operations will be instructed on site avoidance and mitigation measures. This training will be conducted for all personnel prior to initial site mobilization and will be provided to new personnel on their first day of work.

2.3.5.8 Noise

To help reduce noise impacts, the Coronado National Forest is requiring AMI to implement the following Design Features:

- NOI-1 AMI shall be required to distribute a 24 hour telephone number to residents within and adjacent to the project area for the recording of complaints or inquiries regarding the level of noise from drilling operations. AMI would make reasonable efforts to investigate any such complaint or inquiry within 24 hours of the complaint or inquiry. AMI would record each complaint or inquiry, and the results of its investigation and response and report the incident to Coronado National Forest staff within 48 hours of the complaint or inquiry;
- NOI-2 If, after investigation of a recorded noise complaint, drilling operations are determined to have exceeded the noise impact standards described in the noise analysis completed for the project, in consultation with the Coronado National Forest, AMI would further reduce drilling noise by installing a noise barrier to shield these receptors from the principal drilling rig noise sources (i.e. diesel engines and air compressors) at the drill site being drilled.

2.3.5.9 Reclamation

To promote reclamation success, the Coronado National Forest is requiring AMI to implement the following Design Features:

- REC-1 AMI shall compact test pits when backfilling by tamping with equipment used for test pit excavation. AMI shall monitor test pit sites for abnormal settlement for 1 year after reclamation of each site. If settlement is identified during monitoring, a report shall be submitted to the Coronado National Forest with appropriate measures to repair the settlement problem. The Coronado National Forest shall approve settlement correction methods.
- REC-2 Reclaim sumps, drill holes, characterization site pads, overland vehicle paths, and TARs and as soon as practicable after completion of their intended use.

2.4 Alternatives Dismissed from Further Consideration

Public comment during scoping suggested several alternatives to the proposed action or modifications and mitigations that should be applied. This section describes the alternatives and mitigations that were considered and why they were not carried forward in the detailed analysis.

2.4.1 Original Proposed Action

As mentioned in Section 1.1, AMI submitted a Plan of Operations on June 6, 2013. This Plan of Operations is the version of the proposed action that the Forest Service presented during scoping discussed in Section 1.5. This proposed action was largely the same as the proposed action described in Section 2.3, however there was one additional characterization site and 3 additional OVPs identified that are not included in the revised Plan of Operations (October 2013). The original proposed action was not considered in detail due to potential impacts on surface resources such as cultural resources and vegetation (AMI, 2013c).

2.4.2 Drill only during daylight hours and only 5 days a week

This alternative was suggested by the public to reduce the impacts from light and noise during night-time hours on wildlife, nearby residents, and recreationists. AMI indicated this suggestion was not practicable for their exploration project which was developed to be timely and efficient. Additionally, a schedule such as this would more than double the time of active drilling. The schedule would also result in twice as many trips out to the sites by drilling crews and excessive periods where expensive equipment is sitting idle. Lengthening the project timeline and doubling the trips to and from each site will result in more water usage for dust control, increased traffic and more impacts from more overland vehicle and foot travel and general human activities. Therefore this alternative was not considered in detail.

2.4.3 Use pack animals where there are no existing roads

Road construction and temporary overland travel is not restricted if permitted by approval of the Plan of Operations and implemented following the environmental protection measures required in the Plan of Operations. These are standard practices used to access drilling locations on NFS lands throughout the U.S. AMI indicated that this option was not practicable (AMI, 2013d). Proposed activities could not be conducted in this manner and therefore this alternative would not meet the purpose of the proposed action (see Section 1.2).

2.4.4 Prohibit operations during Gould's Wild Turkey winter flock/breeding period

The impacts on Gould's Turkey are addressed in Section 3.6.3.2. The proposed project may affect individuals, but is not likely to result in a loss of population viability in the area, nor cause a trend toward federal listing for the Gould's wild turkey; therefore seasonal restrictions on proposed activities are not warranted.

Chapter 3

Affected Environment and Environmental Consequences

3.1 Introduction

In this chapter, characteristics of the environment that may be affected by the Hermosa Drilling Project are described. The chapter is organized for each environmental resource area as follows: the regulatory framework for management of those resources is described; the existing conditions, which represents the current conditions of aspects of the resources and the direct and indirect effects of the proposed action and no action alternatives.

The analysis area may vary with resource. Therefore, the applicable analysis area is described under each resource.

Several resources are not anticipated to be affected by the project either because they do not occur in the area, or the nature of the project would not result in effects. Resources that do not occur in the area include congressionally designated Wild and Scenic Rivers and Wilderness areas, and Inventoried Roadless Areas. The nearest wilderness area, Mt Wrightson, is 12.2 miles from the project area. The Miller Peak Wilderness Area is 15.2 miles away, and Pajarita Wilderness Area is 25 miles away. The nearest Inventoried Roadless Areas to the project area are Tumacacori (19.8 miles) and Wetstone (22.6 miles). Because of the nature of the project, its relatively small footprint, and short duration of activities; resources that are not anticipated to have measurable effects from the proposed action, include geology, minerals, fire management, special uses, climate change, and economics.

Major land uses in the area include livestock grazing and recreation. Dispersed recreation, including off-highway vehicle use, camping, hunting, mountain biking, hiking, and sightseeing, occur in the project area. The Harshaw Creek Road (NFS Road 49) is frequently used for sightseeing. The topography in the action area is characterized by rolling to steep hills and mountaintops, drainages, and canyons. Elevations in the action area range from 4,600 to 6,100 feet. The general climate in this region is desert (continental), with a bimodal precipitation regime. Rain (or snow at higher elevations) occurs in winter and also during the summer monsoon season, when convective thunderstorms are common.

3.2 Air Quality

3.2.1 Regulatory Framework

3.2.1.1 Coronado Forest Plan

The Coronado National Forest Plan direction for air quality management states that all management practices will be planned so that air quality will meet local, State and Federal standards (page 45 of the Coronado Forest Plan).

The ADEQ, Air Quality Division issues air permits to emitters of regulated pollutants. Drilling is considered an “insignificant activity” (AAC, Title 18, Chapter 2, Section 101.68.g) under the air

quality regulations, therefore, an air quality permit is not required. To comply with the federal Clean Air Act of 1963 (42 USC 7401 through 7671q) as amended, the State of Arizona has defined air emission standards (AAC, Title 18 Chapter 2, Section 101). The project is not located in any non-attainment areas for air quality, and there are no non-attainment areas that would be affected by the project. Because it is not in a non-attainment area, the project is not subject to requirements for prevention of significant deterioration (PSD) or new source review (NSR).

Table 7. AZ Significant Rate of Emissions		
Pollutant	Emissions Rate would need to Equal or Exceed (tons/year)	AZ Permitting Exemption Level Converted to Pounds/Year
Carbon monoxide	100	200,000
Nitrogen oxides	40	80,000
Sulfur dioxide	40	80,000
Particulate matter	25	50,000
PM ₁₀	15	30,000
PM _{2.5}	10 tons of direct PM _{2.5} emissions	20,000
VOC	40	80,000

Source: AAC, Title 18 Chapter 2, Section 101, 130 http://azsos.gov/public_services/Title_18/18-02.htm#Article_2

Table 8. AZ Permitting Exemption Thresholds For Regulated Minor NSR Pollutant Means		
Regulated Air Pollutant	Emission Rate In Tons Per Year	AZ Permitting Exemption Level Converted To Pound/Year
PM _{2.5} (primary emissions only; levels for precursors are set below)	5	10,000
PM ₁₀	7.5	15,000
SO ₂	20	40,000
NO _x	20	40,000
VOC	20	40,000
CO	50	100,000
Pb	0.3	600

Source: AAC, Title 18 Chapter 2, Section 101, 99. http://azsos.gov/public_services/Title_18/18-02.htm#Article_2

3.2.2 Existing Conditions

The analysis area for direct and indirect effects on air quality is the project area because air quality in and around the project area, including the nearby town of Patagonia is currently meeting air quality standards established by the Environmental Protection Agency (EPA). Nogales, approximately 19 miles from the project, has been identified as having elevated particulate matter of a size less than 10 microns (PM₁₀) due to impacts on air quality from Mexico. Existing conditions in the project area meet local, State, and Federal standards, as indicated because it is not in a non-attainment area.

3.2.3 Environmental Consequences

3.2.3.1 Direct and Indirect Effects from No Action

As no ground disturbing activities or project-related vehicle use would occur because of the no action alternative, there would be no impacts on air quality.

3.2.3.2 Direct and Indirect Effects from the Proposed Action

An air emissions inventory of the proposed project was conducted (Pinyon Environmental Inc., 2013). The study quantified the emissions of criteria pollutants from the equipment specified in the plan of operation submitted June 6, 2013 (AMI, 2013a). The equipment specified in the June 6 Plan of Operations is the same as specified in the October 31, 2013 Plan (AMI, 2013b). Equipment analyzed included trucks and support vehicles, tractors, graders, excavators, portable drill rigs, and fugitive dust. Calculations were made for daily and total emissions.

“Emission estimates for the first phase (pre-feasibility drilling program) were calculated for maximum daily and total emissions, with maximum daily emissions representing the 24-hour period during the course of the Project in which the highest level of air emissions could occur, and total emissions representing the sum of all emissions projected for the 25-week period encompassing the first phase (20 weeks of construction and active drilling, plus 5 weeks of shift breaks during the drilling activities). Emission estimates for the second phase (ongoing monitoring of water wells) were calculated for maximum daily and maximum annual emissions” (page 5, Pinyon Environmental Inc., 2013).

Under the proposed action, air quality around the drilling sites would be temporarily affected to a minor degree during the times of pad construction and drilling activities from vehicle exhaust. Some dust would also be produced as the result of increased traffic driving to and from the project area, and from road and pad construction and reconstruction.

All of the activities in the drilling program would generate combined maximum daily and maximum annual emissions as shown in **Table 9**. The project would not qualify as a “Major Source” according to AAC Title 18, Chapter 2 Article 101(64) because it would emit less than the specified tons per year of any of the criteria pollutants (**Table 9**).

Table 9. Overall Estimated Maximum Annual Emissions From The Hermosa Drilling Project

Source Category	Emissions (tons/year)					
	Nitrogen Oxides NOx	Carbon Monoxide CO	Sulfur Dioxide SO ₂	Volatile Organic Compounds VOCs	Particulate Matter, 10 microns or less PM ₁₀	Particulate Matter, 2.5 microns or less PM _{2.5}
Portable Source Exhaust	13.53	2.92	0.89	1.13	0.95	0.95
Road Vehicle Exhaust	0.06	0.11	0.00	0.01	0.00	0.00
Non-Road Equipment Exhaust	0.74	0.91	0.00	0.10	0.00	0.00
Fugitive Dust - Construction					1.20	0.12
Fugitive Dust - Road Travel					6.09	0.61
Total	14.32	3.94	0.89	1.25	8.24	1.68
AZ permitting exemption level (See Table 8) converted to pounds/year	40,000	100,000	40,000	40,000	15,000	10,000

Source: Table 15 (Pinyon Environmental Inc., 2013)

Totals may not add up exactly due to rounding.

Water would be used to minimize dust (see Section 2.3.3.1). Additionally, AMI indicates that up to three drilling operations could occur simultaneously. Having three drilling operations operating at any one time in this area would not contribute a noticeable amount of exhaust or dust to the air beyond the immediate surroundings of the drilling.

Based on the calculated emissions shown in **Table 9**, the Hermosa Drilling Project would not produce enough emissions or dust to degrade or endanger air quality. Air quality impacts would remain within the project area and dirt or gravel surfaced roads accessing the project area. Air emission impacts on air quality would not be large enough to affect the overall air quality or cause or increase secondary health impacts such as asthma, emphysema, and chronic obstructive pulmonary disease, based on the amount of emissions modeled being 0.055% to 0.003% of the threshold for needing a permit (shown in **Table 7** and **Table 8**). Air effects would be negligible, short-term (during project activities), and localized to the project area. Additionally, implementation of specific AMI proposed EPMs in Section 2.3.3.1 will reduce impacts on air quality.

3.2.4 Compliance with Forest Plan and Other Regulations

The project would meet state and federal air quality standards and therefore would meet the Forest Plan standards for air quality as stated on page 45 of the Forest Plan.

3.3 Noise

3.3.1 Regulatory Framework

3.3.1.1 Coronado Forest Plan

The Coronado National Forest Plan does not include standards or guidelines for noise levels. The Forest Service has not adopted any specific noise impact criteria or standards.

3.3.1.2 Other Regulations

The federal Noise Pollution and Abatement Act of 1970 established an Office of Noise Abatement and Control within EPA. Primary responsibility of addressing noise issues was transferred to State and local governments in 1981. Federal agencies have authority to adopt noise regulations pertaining to agency programs.

State regulations focus primarily on noise from motor vehicles, aircraft, and equipment operation. The AAC does not contain specific noise abatement language.

The Occupational Safety and Health Administration provides standards for noise exposure for workers (29 CFR 1910.95). Permissible noise exposure for 8 hours is a maximum of 90 decibels.

3.3.2 Existing Conditions

The analysis area for noise is the project area and a 1/2-mile radius from the project area boundary lines. The human ear is sensitive to sound (air pressure fluctuations) over a wide range of frequencies and energy levels. To express this large range in sound levels, and provide a scale that matches the perception of sound levels by the human ear, the decibel scale is used. When sound levels are being considered in relation to human hearing ability, the measured sound levels are adjusted by using the “A” weighting audibility scale (dBA), to indicate how loud they are perceived by a human receiver.

A noise survey to measure current conditions has not been performed because there currently are few noise-generating uses in the area. As the area is largely unpopulated, natural noise levels are low. Background sound levels were based on typical sound levels for a rural nighttime of 25 dBA (ADOT 2008).

3.3.3 Environmental Consequences

3.3.3.1 Direct and Indirect Effects from No Action

As no ground disturbing activities or project-related vehicle use would occur because of the no action alternative, there would be no impacts on noise quality.

3.3.3.2 Direct and Indirect Effects from the Proposed Action

A noise study was completed for the Hermosa Drilling Project (WestLand Resources, Inc., 2013a). The report included a table showing some examples of sound sources and typical sound levels for comparison (**Table 10**).

The project would have short-term effects on ambient noise levels from drilling and road construction activities. The effects of noise from drilling activities may be 24 hours per day and last for up to two weeks at each characterization site. Noise from road maintenance and construction would be short-term (likely for one day, less than one week before drilling activities begin) and during daylight hours.

Noise modeling to assess the impacts of construction and drilling (WestLand Resources, Inc., 2013a) predicted sound levels from the proposed activities. Six receiver locations were selected to assess sound levels at the closest residences to proposed drilling activities. A seventh receiver was included in the San Rafael Valley, a popular recreational area east of the project area (**Figure 4**). For each week or part of a week of the drilling program, sound levels were modeled at each receiver location based on background sound levels and drilling locations. Results of the modeling are shown in **Table 11**.

Table 10. Examples of Sound Sources and Typical Sound Levels

Description of Sound Source	Sound Level (dBA)
Threshold of pain	140
Jet flyover (1,000 feet)	120
Rock band (15 feet)	110
Gas lawn mower (3 feet)	100
Food blender (3 feet)	90
Noisy urban daytime	80
Vacuum cleaner (10 feet)	70
Normal speech (3 feet)	67
Heavy traffic (300 feet)	60
Dishwasher next room	50
Urban nighttime	40
Quiet bedroom at night	30
Rural nighttime	25
Threshold of hearing	0

Source: (ADOT, 2008)

Table 11. Results (dBA) of Noise Modeling on Residences and Recreation Receivers							
Week¹	Receiver						
	1	2	3	4	5	6	7
1	25.4	26.4	41.5	30.6	53.0	31.7	25.6
2a	25.4	26.5	41.5	30.6	43.0	31.0	25.5
2b	25.3	26.6	43.5	31.0	43.0	31.0	25.5
3a	25.4	26.5	43.5	31.0	36.8	27.2	25.7
3b	25.5	27.1	43.5	31.0	37.3	27.8	25.7
5	25.6	26.5	42.3	30.7	37.5	27.6	25.6
6a	25.3	26.3	42.2	30.7	34.2	27.0	25.6
6b	25.2	26.5	43.4	31.0	34.2	27.0	25.7
7	25.5	26.4	43.4	43.5	38.3	28.1	25.9
9	25.6	25.9	39.8	43.5	37.3	27.7	25.5
10a	26.1	26.4	40.2	43.5	37.4	27.7	25.8
10b	26.3	25.9	38.9	29.5	32.5	26.4	25.5
11	25.7	26.2	38.4	28.1	33.1	26.9	25.2
13	25.7	25.7	38.4	28.1	30.1	25.9	25.2
14	30.8	25.1	28.3	25.9	27.5	25.7	25.5
15	30.8	25.2	28.1	25.9	26.1	25.7	25.5
17a	30.8	25.0	27.7	25.9	30.2	26.6	25.6
17b	25.6	33.4	25.6	25.2	30.6	26.4	25.0
18	25.8	33.4	26.5	25.3	31.3	26.2	25.2
19a	26.0	33.4	27.8	26.0	26.4	25.6	25.5
19b	25.8	25.1	27.7	26.0	25.5	25.4	25.5
21	25.0	25.0	25.5	43.3	25.2	25.0	25.1
22	25.1	25.0	42.3	29.8	25.3	25.0	25.4
23	26.5	25.0	31.3	26.6	25.5	25.0	25.0

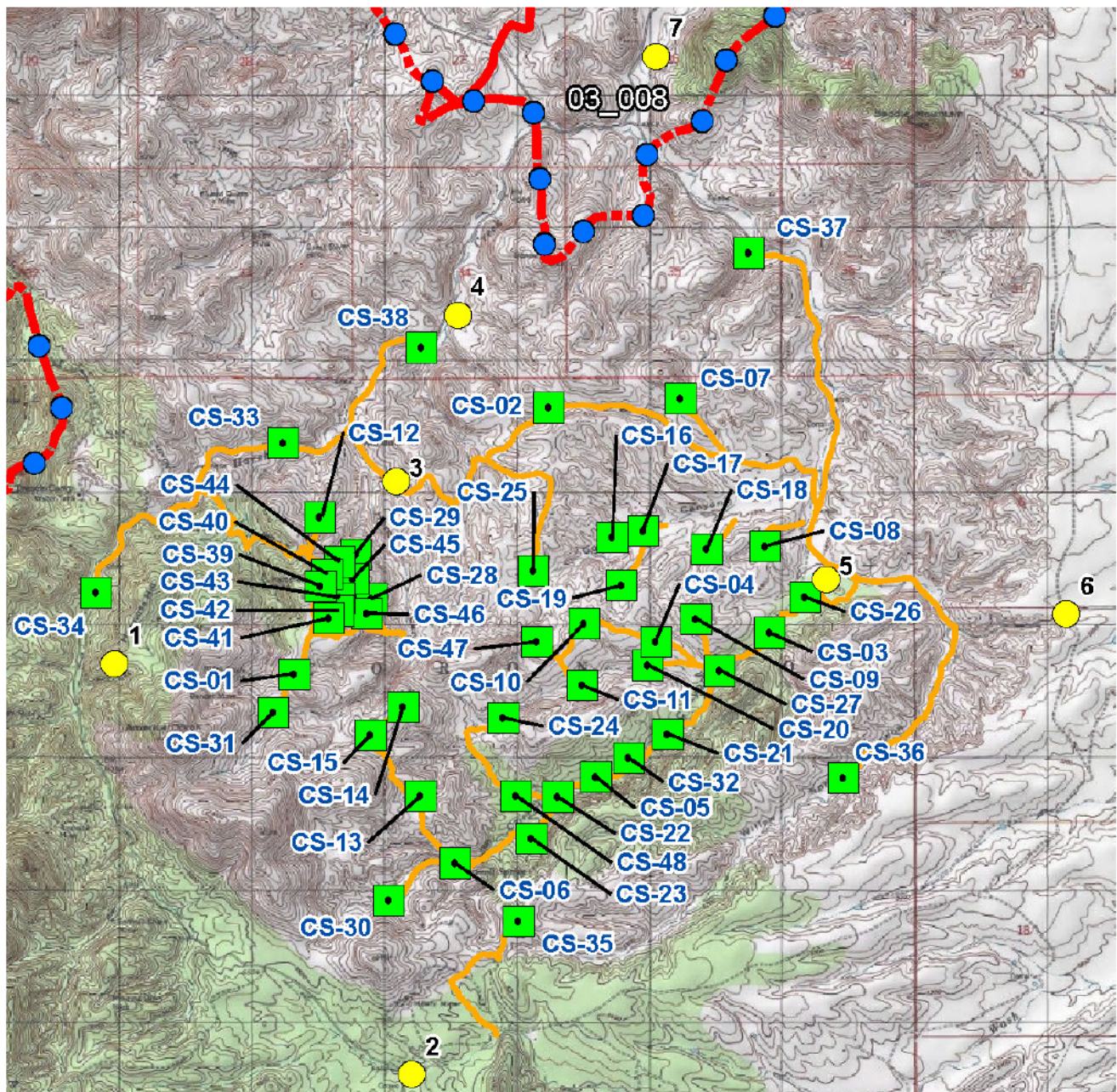
Source: (WestLand Resources, Inc., 2013a)

Reclamation activities would follow drilling when activities are complete. Reclamation activities would create noise from use of equipment (bull dozers and excavators) to recontour drill pads and TARs. Overland vehicle paths will be reclaimed using hand tools.

Impacts on noise would be short-term and slightly above ordinary rural nighttime background noise levels of 25 dBA (**Table 10**), and would occur only during project activities (two weeks per site). Implementation of specific Forest Service Required Design Features in Section 2.3.5.7 (NOI-1 and NOI-2) will reduce noise conflicts.

3.3.4 Compliance with Forest Plan and Other Regulations

As there are no Forest Plan standards for noise, or other regulations that are applicable to the project related to noise levels, the project complies with all laws and regulation. The project would comply with FHWA noise abatement criteria standards and Occupational Safety and Health Administration standards for worker exposure.

Figure 4. Modeled Noise Receptor Locations

3.4 Vegetation

3.4.1 Regulatory Framework

3.4.1.1 Coronado Forest Plan

The Forest Plan does not address vegetation management as a specific resource. However, other resources, such as wildlife habitat, timber sales, and threatened and endangered species management may have standards that provide direction on how vegetation should be managed. The purpose of the Hermosa Drilling Project is not for vegetation management. Therefore, the Forest Plan standards that relate to vegetation are addressed under the various other resources in the EA.

3.4.2 Existing Conditions

The analysis area for vegetation is the project area. The vegetation types found in the project area are shown in **Table 12**. Each vegetation type with disturbance under the proposed action is described below.

3.4.2.1 Madrean Encinal Woodland

This community is dominated by Madrean evergreen-shrubs, such as Arizona white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), gray oak (*Quercus grisea*), Mexican blue oak (*Quercus oblongifolia*), and Toumey oak (*Quercus toumeyi*). In addition, Chihuahuan pine (*Pinus leiophylla* var. *chihuahuana*), Arizona cypress (*Hesperocyparis arizonica*), piñon (*Pinus subsection cembroides*), juniper (*Juniperus* spp.), and interior chaparral species may be present,

but do not codominate. Ground cover is dominated by warm-season grasses, such as threeawns (*Aristida* spp.), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), Rothrock grama (*Bouteloua rothrockii*), Arizona cottontop (*Digitaria californica*), plains lovegrass (*Eragrostis intermedia*), curly-mesquite (*Hilaria belangeri*), green sprangletop (*Leptochloa dubia*), muhly grasses (*Muhlenbergia* spp.), or Texas bluestem (*Schizachyrium cirratum*).

Table 12. Vegetation Types in the Project Area and Disturbance Acres

Potential Natural Vegetation Type	Acres of Disturbance	Acres within Project Area
Madrean Encinal Woodland	8.52	5,366
Desert Communities	0.30	216
Semi-desert Grassland	3.90	1242
Interior Chaparral	1.18	521
Madrean Pine Oak Woodland ¹	0.00	4
Total	13.90	7,350

Source: (USGS National Gap Analysis Program, 2004)

¹ As no proposed disturbance will occur within this vegetation type, it is not described below.

3.4.2.2 Desert Communities

Predominant vegetation includes shrubs, desert trees, and succulents; the desert community has lesser amounts of grasses and forbs. Common species include catclaw acacia (*Acacia greggii*), triangleleaf bursage (*Ambrosia deltoidea*), white bursage (*Ambrosia dumosa*), mesquite (*Prosopis* spp.), desert ironwood (*Olneya tesota*), saltbush (*Atriplex* spp.), creosote (*Larrea tridentata*), iodine bush (*Allenrolfea occidentalis*), splitleaf brickellia (*Brickellia laciniata*), desert broom (*Baccharis sarothroides*), desert willow (*Chilopsis linearis*), Apache plume (*Fallugia paradoxa*), cheesebush (*Hymenoclea salsola*), barrel cactus (*Ferocactus* spp.), hedgehog cacti (*Echinocereus* spp.), cholla and prickly pear (*Opuntia* spp.), saguaro (*Carnegie gigantea*), salt grass (*Distichlis spicata*), rice grasses (*Oryzopsis* spp.), and dropseed grasses (*Sporobolus* spp.) (USFS, 2009a).

3.4.2.3 Semi-desert Grassland

Species composition varies with soil, topography and precipitation. Dominant grassland associations on NFS lands include mixed native perennial species and nonnative perennial species, with smaller aggregations dominated by various *Bouteloua* spp., tobossa (*Hilaria mutica*), and/or giant sacaton (*Sporobolus wrightii*). Shrubs also occupy grasslands; their abundance and species composition varies (USFS, 2009a).

On the Coronado National Forest, there are more invasive plant and animal species in the grasslands than any other vegetation community, including Lehmann lovegrass (*Eragrostis lehmanniana*), weeping lovegrass (*Eragrostis curvula*) (USFS, 2009a).

3.4.2.4 Interior Chaparral

Interior chaparral occurs across the Coronado National Forest as a discontinuous band of vegetation. Most chaparral exists at mid-elevations (3,000 to 6,000 feet) and is bordered and intermixed with Madrean Encinal Woodland at the upper elevations, and grasslands or Sonoran desert at lower elevations.

Interior chaparral is typically found on mountain foothills and lower slopes where low-elevation desert transitions into wooded evergreens. It comprises mixed shrub associations including, but not limited to, the following species: manzanita (*Arctostaphylos* spp.), crucifixion thorn (*Canotia holacantha*), desert ceanothus (*Ceanothus greggii*), mountain mahogany (*Cercocarpus montanus*), antelope bush (*Purshia* spp.), silktassle (*Garrya* spp.), Stansbury cliffrose (*Purshia stansburiana*), shrub live oak (*Quercus turbinella*), and sumac (*Rhus* spp.). In general, the proportion of interior chaparral vegetation is similar to that which is found in surrounding areas outside the Coronado National Forest boundaries (USFS, 2009a).

3.4.3 Environmental Consequences

3.4.3.1 Direct and Indirect Effects from No Action

As no ground disturbing activities or project-related vehicle use would occur because of the no action alternative, there would be no impacts on vegetation.

3.4.3.2 Direct and Indirect Effects from the Proposed Action

The proposed project would remove vegetation to construct TARs, drill pads, reconstruct an existing road, and trimming and/or removal of trees and vegetation along a two-track overland vehicle paths. Impacts on vegetation would be limited due to the extent of disturbance (13.90 acres). Implementation of specific AMI proposed EPMs in Section 2.3.3 and Forest Service Required Design Features in Sections 2.3.5.2 and 2.3.5.9 (VEG-1, VEG-2, and VEG-5) will help protect native vegetation from negative impacts due to invasive plants. **Table 12** shows the disturbance by vegetation type.

Reclamation is planned at each characterization site following exploration activities. Final reclamation would be completed for all activities within two years, with the exception of the monitoring wells, which would be reclaimed within fifteen years.

Reclamation activities are not proposed on existing roads. Existing roads would be maintained, repaired, or reconstructed to the appropriate maintenance level. TARs would be recontoured as closely as possible to pre-disturbance conditions, ripped/roughed and seeded with appropriate seed mix. Overland vehicle paths would be ripped/roughed with hand tools and seeded with appropriate seed mix.

Vegetation would be removed on 13.90 acres until reclamation reestablishes native vegetation. See Section 3.5.3.2 for impact on invasive plants. Implementation of specific Forest Service Required Design Features in Sections 2.3.5.2 and 2.3.5.9 will help improve reclamation success (VEG-3, VEG-4, and VEG-6). VEG-2 requires native species be used, which will help to ensure native vegetation is reestablished. Based on successful implementation of these measures at other nearby sites (see Photo 5 in Section 3.12.3.2), reclamation, including revegetation, is anticipated to be successful, therefore, impacts from disturbance would be reclaimed in two years (for everything but monitoring wells) to 15 years (for monitoring wells).

3.4.4 Compliance with Forest Plan and Other Regulations

There are no Forest Plan standards established for management of vegetation as an individual resource related to a drilling exploration project. However, with incorporation of Forest Service Required Design Features into the proposed action, the project is viewed as consistent with the Forest Plan requirements for vegetation management.

3.5 Invasive Species

3.5.1 Regulatory Framework

3.5.1.1 Coronado Forest Plan

There are no standards for invasive species management specified in the Forest Plan. Forest Service Manual direction for Invasive Species Management is contained in FSM 2900, effective December 5, 2011. This direction sets forth NFS policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens).

3.5.1.2 Federal Regulations

Executive Orders

Executive Order #13112, Invasive Species, February 3, 1999, Federal Register establishes the National Invasive Species Council and directs that invasive species would be controlled on all federal lands. The Council publishes the USDA-Forest Service Guide to Noxious Weed Prevention Practices.

Forest Service Manuals and Handbooks

- FSM 2900 – Invasive Species Management, Amendment No. 2900-2011-1, December 5, 2011 sets forth NFS policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens).

3.5.2 Existing Conditions

The analysis area for invasive species is the project area. Invasive plant species in the project area were noted during a 2013 survey of the project area (**Table 13**).

Table 13. Noxious and Invasive Plant Species Survey Results		
Species	Number of sample sites Species where species was observed	Percent of total sample sites (n=201) where species was observed
Noxious Weed Species (Arizona Department of Agriculture)		
Morning glory (<i>Ipomoea</i> sp.) ¹	19	10%
Sandbur (<i>Cenchrus incertus</i>)	9	5%
Invasive Exotic Species (Coronado National Forest)		
Lehmann lovegrass (<i>Eragrostis lehmanniana</i>)	44	22%
Johnson grass (<i>Sorghum halepense</i>)	22	11%
Tree of heaven (<i>Ailanthus altissima</i>)	4	2%
Species that are potentially invasive		

Table 13. Noxious and Invasive Plant Species Survey Results

Species	Number of sample sites Species where species was observed	Percent of total sample sites (n=201) where species was observed
Bermudagrass (<i>Cynodon dactylon</i>)	32	16%
Weeping lovegrass (<i>Eragrostis curvula</i>)	22	11%
Common mullein (<i>Verbascum thapsus</i>)	6	3%
Russian thistle (<i>Salsola tragus</i>)	6	3%
Horehound (<i>Marrubium vulgare</i>)	6	3%
Bird of paradise (<i>Caesalpinia gilliesii</i>)	1	<1%
Rabbitfoot grass (<i>Polypogon monspeliensis</i>)	1	<1%
Black locust (<i>Robinia pseudoacacia</i>)	1	<1%

Source: (Westland Resources, Inc., 2013b).

1 Native morning glories are not subject to control under the Invasive Exotic Plant Management Program, Coronado National Forest EA (USFS, 2004).

3.5.3 Environmental Consequences

3.5.3.1 Direct and Indirect Effects from No Action

As no ground disturbing or vehicle use would occur from the no action alternative. There would be no impacts on existing invasive species management.

3.5.3.2 Direct and Indirect Effects from the Proposed Action

The risk of transporting new invasive plants into the project area is determined to be high. Heavy equipment would be imported to the project area by contractors from unknown geographical areas.

The risk of spreading existing occurrences of invasive plants (**Table 13**) is determined to be high at locations directly associated with access and characterization activities. The risk of spread of existing occurrences throughout the project area would likely be moderate as the distance from disturbance and access activities increases. Existing weed populations at proposed disturbance areas and adjacent to roads provide the seed source for infestations to spread. The risk of spread continues away from roads, but is lessened with distance.

Ground-disturbing activity can facilitate the spread and establishment of invasive plants, especially in areas of exposed soil. Once established, these invasive species may eliminate native vegetation and associated plant and wildlife habitats. They also create a fuel-bed that may accelerate fire return intervals. Use and maintenance of travel routes, construction of new TARs, and development of drill pads would provide opportunities for introduction spread, and establishment of invasive plants. The high risk of introducing and spreading invasive species can be reduced to a moderate short-term risk (Tetra Tech, 2014a) by the implementation of the following:

- AMI's EPMs to minimize noxious weeds and invasive plants (Section 2.3.4.7);
- pre-disturbance surveys of characterization sites and access routes, post-reclamation monitoring (see Sections 2.3.5.2 and 2.3.5.9, VEG-3, VEG-4 and VEG-6);

- implementing immediate treatments to eradicate infestations that do occur (Section 2.3.5.2, VEG-1, VEG-5); and
- implementing the planned environmental protection measures (Section 2.3.4.7).

Based on these factors, the risk of introducing and establishing new occurrences of non-native plants is determined to be a moderate, short-term risk.

3.5.4 Compliance with Forest Plan and Other Regulations

The project would comply with Forest Service management plans and manuals and federal laws and guidelines described in Section 3.5.1, as the standards specify the direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species.

3.6 Special Status Wildlife and Plants

3.6.1 Regulatory Framework

3.6.1.1 Coronado Forest Plan

Forest-wide standards for special status wildlife and plants are found in the Forest Plan, pages 31-1 to 37. These include:

1. Maintain or improve occupied habitat of commonly hunted species, listed threatened and endangered species, and management indicator species through mitigation of Forest activities with cooperation of New Mexico Department of Game and Fish, Arizona Game and Fish Department, and USFWS. Where applicable consult with other wildlife and plant oriented groups and affected parties. (See Appendix H of the Forest Plan for minimum desired habitat acres).
7. Determine presence of federally and state listed threatened and endangered plant and animal species in project areas through on-site inventory and consultation with existing databases as part of environmental analysis completion. Recommendations for habitat needs will be made on a project by project basis.
12. Mitigate impacts on wildlife and plant diversity by applying the following standards and guidelines to the appropriate management activities. Wildlife species to be featured are shown for each individual management area.
 - a. Mineral entry and oil and gas exploration
 - 1) Leave buffers around watering and feeding areas for escape and hiding cover. Buffer widths vary with the site but must be wide enough to screen affected wildlife from the project site.
 Within occupied habitat of threatened and endangered species.
 - a. Specific recommendations made on site by site basis. Recommendations vary from seasonal limitations to no construction permitted or mineral withdrawal (page 33).

3.6.1.2 Sensitive and Management Indicator Species

The USFS policy regarding the designation of sensitive species is those species identified by the Regional Forester (USFS, 2013a) for which population viability is a concern. The National Forest

Management Act of 1976 directed the Forest Service to identify and actively monitor management indicator species (MISs) to assess impacts of forest management activities on native biota. The Coronado National Forest lists MISs (USFS, 1981).

3.6.1.3 Federal Regulations

Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed threatened or endangered species or modify their critical habitat. A Section 7 consultation with the USFWS is required if listed species under its jurisdiction or their designated critical habitat may be affected by a proposed action.

Migratory Birds

Under the Migratory Bird Treaty Act, it is unlawful to take, kill, or possess migratory birds. Executive Order 13186, issued on January 11, 2001, further defines the responsibilities of federal agencies to protect migratory birds. The USFWS includes as migratory birds “all species native to the United States or its territories, which are those that occur as a result of natural biological or ecological processes (see 70 FR 12710, March 15, 2005).” Protected birds are listed in 50 CFR Part 10.13.

3.6.2 Existing Conditions

The analysis area for special status species is the project area and a 1-mile radius from the project area boundary lines. Special status species surveys were conducted in appropriate habitat types by WestLand Resources in 2012 (WestLand Resources, 2013a through 2013h) and 2013 (WestLand Resource, Inc. 2013j through 2013q). This is in compliance with Forest Plan standards and guidelines (section 3.6.1) that specifies that presence of federally and state listed threatened and endangered plant and animal species in project areas should be determined through on-site inventory and consultation with existing databases as part of environmental analysis completion.

3.6.2.1 Threatened and Endangered Species

There are 22 ESA listed, candidate, or proposed species in Santa Cruz County (USFWS, 2013). Of the 22 listed, 12 have potential to be present within the project area and are analyzed in the Biological Assessment (Tetra Tech, 2014c) (**Table 14**). Because the proposed action would not affect species that do not occur, or do not have habitat in the action area, those species are not addressed in the Biological Assessment. Consultation with the USFWS on species determinations has not yet been initiated.

Table 14. ESA Listed, Candidate, and Proposed Species that May be Present within the Project area		
Species	Status ¹	Occurrence
Amphibians		
Arizona Treefrog (<i>Hyla wrightorum</i>) – Huachuca/Canelo Distinct Population Segment	Candidate	May occur. Project area contains suitable habitat. Known to occur in the Canelo Hills, located 12 miles to the northeast of the project area. No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013c).
Chiricahua Leopard Frog	Threatened; Designated	May occur. Project area contains suitable habitat. There is no designated critical habitat in the action area. Known to occur within 1

Table 14. ESA Listed, Candidate, and Proposed Species that May be Present within the Project area

Species	Status ¹	Occurrence
<i>(Lithobates chiricahuensis)</i>	Critical Habitat	mile of the project area (AZGFD, 2013). No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013c).
Sonora Tiger Salamander <i>(Ambystoma mavortium stebbinsi)</i>	Endangered	Known to occur. Portions of the project area contain suitable habitat. Known to occur within one mile of the project area (AZGFD, 2013). Detected at two locations during 2012 field surveys (WestLand Resources, Inc., 2013d).
Birds		
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	Threatened; Designated Critical Habitat	May occur. There is designated critical habitat in the project area. Known to occur within 1 mile of the action area (AZGFD, 2013). No individuals were detected during the 2012 field surveys (WestLand Resources, Inc., 2013e).
Yellow-billed Cuckoo <i>(Coccyzus americanus)</i>	Proposed Threatened	Known to occur. Project area contains sections of suitable habitat. Individuals/populations of this species were detected at eight separate locations in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013f).
Fish		
Gila Topminnow (<i>Poeciliopsis occidentalis occidentalis</i>)	Endangered	May occur. Known to occur within 1-mile buffer of action area (AZGFD, 2013). According to the current Recovery Plan for this species (Weedman, 1998), the fish was stocked in Harshaw Creek in 1982, approximately three miles downstream of the action area. However, it is not currently known to occur in Harshaw Creek (Weedman, 1998). action area
Invertebrates		
Huachuca Springsnail <i>(Pyrgulopsis thompsoni)</i>	Candidate	May occur. Portions of the project area contain suitable habitat. Known to occur in the San Rafael Valley, located to the east of the project. No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013c).
Mammals		
Jaguar (<i>Panthera onca</i>)	Endangered; Proposed Critical Habitat	May occur. USFWS proposed critical habitat is located within the Project area (Unit 3: Patagonia Unit). Project area contains suitable habitat. Known to occur within 1-mile buffer of project area (AZGFD, 2013).
Lesser Long-nosed Bat <i>(Leptonycteris curasoae yebabuenae)</i>	Endangered	May occur. Portions of the project area contain suitable foraging habitat. Known to occur within 1-mile buffer of project area (AZGFD, 2013). There is a significant post-maternity roost site at Bat Cave, located within a five miles of the project area. No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013g).
Ocelot (<i>Leopardus pardalis</i>)	Endangered	May occur. Project area contains suitable habitat, but the species is rare. The only recent sightings have been in Cochise County (2009 and 2011) (Culver, 2013).
Reptiles		
Northern Mexican Gartersnake <i>(Thamnophis eques megalops)</i>	Proposed Threatened; Proposed	May occur. Portions of the project area contain suitable habitat. However, the project area is located at higher elevations than where this species is most commonly found. Known to occur within 1-mile

Table 14. ESA Listed, Candidate, and Proposed Species that May be Present within the Project area

Species	Status ¹	Occurrence
	Critical Habitat	buffer of project area (AZGFD, 2013). No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013c).
Plants		
Huachuca Water Umbel (<i>Lilaeopsis schaffneriana</i> ssp. <i>recurva</i>)	Endangered; Designated Critical Habitat	May occur. Portions of the project area contains suitable habitat. No individuals or populations of this species were detected in the project area during the 2012 field surveys (WestLand Resources, Inc., 2013c).

¹ (USFWS, 2013).

3.6.2.2 Forest Service Sensitive Species

A preliminary review of the Forest Service Region 3 sensitive animals list (USFS, 2013a) and AZGFD database records identified plants and animals listed as Forest Service sensitive that may occur or that are known to occur in the project area. Some of these species were included in the species-specific surveys conducted by WestLand Resources, Inc. for the project area in 2012 and the winter of 2013. These species are considered because they are known or are likely to be present in the project area and include:

Amphibians

- Western Barking Frog (*Craugastor augusti cactorum*)

Birds

- Abert's Towhee (*Melospiza aberti*)
- American Peregrine Falcon (*Falco peregrinus anatum*)
- Arizona Grasshopper Sparrow (*Ammodramus savannarum ammodramus*)
- Arizona Woodpecker (*Picoides arizonae*)
- Baird's Sparrow (*Ammodramus bairdii*)
- Bald Eagle – Winter Population (*Haliaeetus leucocephalus*)
- Broad-billed Hummingbird (*Cynanthus latirostris*)
- Buff-breasted Flycatcher (*Empidonax fulvifrons*)
- Buff-collared Nightjar (*Caprimulgus ridgwayi*)
- Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)
- Elegant Trogon (*Trogon elegans*)
- Gould's Wild Turkey (*Meleagris gallopavo mexicana*)
- Lucifer Hummingbird (*Calothorax lucifer*)
- Northern Beardless-tyrannulet (*Camptostoma imberbe*)
- Northern Goshawk (*Accipiter gentilis*)
- Rose-throated Becard (*Pachyramphus aglaiae*)
- Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*)
- Thick-billed Kingbird (*Tyrannus crassirostris*)
- Violet-crowned Hummingbird (*Amazilia violiceps*)
- Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

- Whiskered Screech Owl (*Otus trichopsis*)

Invertebrates

- Bearded Mountainsnail (*Oreohelix barbata*)
- Huachuca Springsnail (*Pyrgulopsis thompsoni*)
- Sonoran Tallusnail (*Sonorella magdalenensis*)
- Sunrise Skipper (*Adopaeoides prittwitzi*)

Mammals

- Allen's Lappet-browed Bat (*Idionycteris phyllotis*)
- Hooded Skunk (*Mephitis macroura milleri*)
- Mexican Long-tongued Bat (*Choeronycteris mexicana*)
- Northern Pygmy Mouse (*Baiomys taylori ater*)
- Pale Townsend's Big-eared Bat (*Corynorhinus townsendii pallescens*)
- Western Red Bat (*Lasiurus blossevillii*)

Reptiles

- Arizona Ridge-nosed Rattlesnake (*Crotalus willardi willardi*)
- Brown Vinesnake (*Oxybelis aeneus*)
- Chihuahaun Black-headed Snake (*Tantilla wilcoxi*)
- Green Ratsnake (*Senticolis triaspis*)
- Northern Mexican Gartersnake (*Thamnophis eques megalops*)
- Slevin's Bunchgrass Lizard (*Sceloporus slevini*)
- Thornscrub Hooknosed Snake (*Gyalopion quadrangulare*)
- Yaqui Black-headed Snake (*Tantilla yaquia*)

Plants

- Alamos Deer Vetch (*Lotus alamosanus*)
- Arid Throne Fleabane (*Erigeron arisoli*)
- Arizona Coralroot (*Hexalectris arizonica* formerly *H. spicata* var. *arizonica*)
- Arizona Manihot (*Manihot davisiae*)
- Bartram Stonecrop (*Graptopetalum bartramii*)
- Beardless Chinchweed (*Pectis imberbis*)
- Broadleaf Ground Cherry (*Physalis latiphysa*)
- Bush Violet (*Browallia eludens*)
- Catalina Beardtongue (*Penstemon discolor*)
- Chihuahuan Sedge (*Carex chihuahuensis*)
- Chiricahua Mountain Brookweed (*Samolus vagans*)
- Cochise Sedge (*Carex ultra* Bailey = *C. spissa* var. *ultra*)
- Coleman's Crested Coralroot (*Hexalectris colemanii* formerly *H. revoluta*)
- Gentry Indigo Bush (*Dalea tentaculoides*)
- Greene Milkweed (*Asclepias uncialis* ssp. *uncialis*)
- Huachuca Mountains Lupine (*Lupinus huachucamus*)
- Huachuca Milkvetch (*Astragalus hypoxylus*)
- Large-flowered Blue Star (*Amsonia grandiflora*)
- Lemmon Milkweed (*Asclepias lemmonii*)
- Lemmon's Lupine (*Lupinus lemmonii*)

- Lemon Lily (*Lilium parryi*)
- Mexican Hemlock Parsley (*Conioselinum mexicanum*)
- Nodding Blue-eyed Grass (*Sisyrinchium cernuum*)
- Pinos Altos Flame Flower (*Talinum humile*)
- Ruttler's False Goldenaster (*Heterotheca rutteri*)
- Santa Cruz Beehive Cactus (*Coryphantha recurvata* Britt. and Rose = *Mammillaria recurvata* Engelm.)
- Santa Cruz Star Leaf (*Choisya mollis* Standl. = *C. dumosa* var. *mollis* L. Benson)
- Santa Cruz Striped Agave (*Agave parviflora* ssp. *parviflora*)
- Shade Violet (*Viola umbraticola*)
- Smooth Babybonnets (*Coursetia glabella*)
- Sonoran Noseburn (*Tragia laciniata*)
- Southwestern Muhly (*Muhlenbergia palmeri*=*M. dubioides*)
- Supine Bean (*Macroptilium supinum*)
- Sycamore Canyon Muhly (*Muhlenbergia elongata* =*M. xerophila* C.O. Goodding)
- Tepic Flame Flower (*Talinum marginatum* = *Phemeranthus marginatus* Greene) Kiger)
- Virlet Paspalum (*Paspalum virletii*)
- Wiggins Milkweed Vine (*Metastelma mexicanum* =*Cynanchum wigginsii*)

3.6.2.3 Management Indicator Species

Forest Service MIS are identified in the Coronado Forest Plan and are generally identified to represent habitat types that occur within the Coronado National Forest boundary and/or because they are thought to be sensitive to NFS management activities. Based on their known occurrences or presence of suitable habitat within or near the project area, 20 species were analyzed in detail. The remaining MIS were eliminated from consideration, because either their known distributions are outside the project area or the project area does not contain suitable habitats for those species (Table 15).

Table 15. Coronado National Forest MIS and Occurrence in the Project Area		
Species	Evaluation for Analysis	Further Analysis
American Peregrine Falcon (<i>Falco peregrinus anatum</i>)	Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h). Suitable foraging habitat is present within the project area.	Yes
Apache Trout (<i>Oncorhynchus gilae apache</i>)	Does not occur within the project area. This species' native range is the White Mountains (USFS, 2011a).	No
Arizona Ridge-nosed Rattlesnake (<i>Crotalus willardi willardi</i>)	May occur within the project area. This species is known to occur in the Patagonia Mountains (USFS, 2011a). Project area contains suitable habitat of oak and pine-oak woodland.	Yes
Arizona Treefrog (<i>Hyla wrightorum</i>)	May occur within project area. Project area contains sections of suitable habitat. Has previously been found in a few locations in the Huachuca Mountains at elevations of 4,920 to 6,560 feet in evergreen woodland and riparian areas in pine-oak woodland (USFS, 2011a). No individuals or populations of this species were detected during the 2012 field surveys (WestLand Resources, Inc., 2013h).	Yes

Table 15. Coronado National Forest MIS and Occurrence in the Project Area		
Species	Evaluation for Analysis	Further Analysis
Baird's Sparrow (<i>Ammodramus bairdii</i>)	Not thought to occur within the project area as this species prefers hilly grasslands at 4,000 to 5,000 feet elevation, which is not present in the project area (AZGFD, 2013). This species was not detected during 2012 avian field surveys (WestLand Resources, Inc., 2013h).	Yes
Bell's Vireo (<i>Vireo bellii</i>)	Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h). This species' populations are correlated to dense riparian vegetation dominated by mesquite, willow and salt cedar below 3,500 feet in elevation. Elevations in the project area range between 4,900 and 5,700 feet.	Yes
Bighorn Sheep (<i>Ovis Canadensis</i>)	Does not occur within the project area; endemic to the Pusch Ridge Wilderness Area of the Santa Catalina Mountains (USFS, 2011a).	No
Black Bear (<i>Ursus americanus</i>)	May occur within the project area. This species is a highly adaptable generalist and not highly correlated with a particular habitat except for dense cover (USFS, 2011a). There is suitable habitat within the project area.	Yes
Blue-throated Hummingbird (<i>Lampornis clemenciae</i>)	May occur within the project area as the species uses wet pine-oak and oak canyons above 4,500 feet in elevation. However, has only been reportedly observed within a few montane canyons with running water at higher elevations (USFS, 2011a).	Yes
Buff-breasted Flycatcher (<i>Empidonax fulvifrons</i>)	Not thought to occur within the project area, as no suitable pine forest habitat above 6,000 feet is present in the project area. Species was not detected during 2012 avian field surveys (WestLand Resources, Inc., 2013h).	Yes
Desert Massasauga (<i>Sistrurus catenatus edwardsii</i>)	Not thought to occur within the project area. It is found primarily in tobossa grasslands in the San Bernardino Valley at the southeast corner of the Chiricahua Mountains (USFS, 2011a). There is no record that the species ever occurred on the Coronado National Forest.	No
Elegant Trogon (<i>Trogon elegans</i>)	Known to occur within the project area. Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h).	Yes
Five-striped Sparrow (<i>Aimophila quinquestriata</i>)	Not thought to occur within the project area as this species is limited by its requirement for dense, brushy tropical deciduous woodland between 3,500 - 4,000 feet elevation (USFS, 2011a), which is not found in the project area.	No
Gila Chub (<i>Gila intermedia</i>)	Not thought to occur within the project area, as it is outside species known geographical range and lacks suitable aquatic habitat. On the Coronado National Forest the species occurs in Sabino and O'Donnell Creeks (USFS, 2011a).	No
Gila Topminnow (<i>Poeciliopsis occidentalis</i>)	Not thought to occur within the project area, but may occur downstream. It currently occurs only in the Redrock Canyon drainage on the Coronado National Forest (USFS, 2011a).	Yes
Gould's Turkey (<i>Meleagris gallopavo mexicana</i>)	May occur within the project area. The project area has the necessary habitat of oak-grassland-riparian areas with trees of sufficient size for roosting. Wild turkey were detected during 2012 field surveys, however, subspecies was not noted (WestLand Resources, Inc., 2013h).	Yes
Gray Hawk (<i>Buteo nitidus</i>)	Known to occur within the lower elevation deciduous riparian areas of the project area. Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h).	Yes
Merriam's Turkey	Not thought to occur within the project area. Because of lack of	No

Table 15. Coronado National Forest MIS and Occurrence in the Project Area

Species	Evaluation for Analysis	Further Analysis
<i>(Meleagris gallopavo merriami)</i>	observations since approximately 1990, it is generally believed that Merriam's turkeys on the Coronado National Forest are extirpated or nearly so (USFS, 2011a).	
Mexican Stoneroller (<i>Campostoma ornatum</i>)	Not thought to occur within the project area. In Arizona, it occurs only in Rucker Canyon in the Chiricahua Mountains (USFS, 2011a).	No
Montezuma Quail (<i>Cyrtonyx montezumae</i>)	Known to occur within the project area in Madrean evergreen woodlands. Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h).	Yes
Mount Graham Red Squirrel (<i>Tamiasciurus hudsonicus grahamensis</i>)	Does not occur within the project area; endemic to the Pinaleno Mountains. No suitable habitat is present, as this species is only found in mixed-conifer and subalpine forests at elevations above 8,700 feet in the Pinaleno Mountains (USFS, 2011a).	No
Northern Beardless-Tyrannulet (<i>Camptostoma imberb</i>)	Not thought to occur within the project area as this species depends on well-developed riparian zones in elevations that are lower than are found on the Coronado National Forest. Elevations in the project area is 4,900 and above (USFS, 2011a).	Yes
Primary and secondary cavity nesters	Known to occur within the project area. Suitable habitat (tree cavities) is present. Numerous owls, woodpeckers, and flycatchers known to nest in cavities have been detected during 2012 field surveys (WestLand Resources, Inc., 2013h).	Yes
Pronghorn (<i>Antilocapra americana</i>)	Not thought to occur within the project area. Pronghorn populations in southwestern Arizona are found off of the Coronado National Forest, with Forest lands providing seasonal or fringe habitats (USFS, 2011a).	No
Rose-throated Becard (<i>Pachyramphus aglaiae</i>)	Not thought to occur within the project area as this species depends on well-developed riparian zones below 4,000 feet. Elevations in the project area are 4,900 and above. It is known from only one location on the Coronado National Forest (Sycamore Creek) (USFS, 2011a).	Yes
Sonora Chub (<i>Gila ditaenia</i>)	Not thought to occur. Project area is outside species known geographical range and lacks suitable habitat. Within Arizona, it occurs only in Sycamore Canyon and California Gulch on the Nogales Ranger District. This species is found at an elevation of 3,900 feet in pools near cliffs, boulders, or other cover in stream channels (USFS, 2011a).	No
Sonoran Tiger Salamander (<i>Ambystoma mavortium stebbinsi</i>)	Known to occur within the project area. This species inhabits plains grassland, oak woodland, and pine-oak woodland habitats, which do occur within the project area. Species was detected during 2012 surveys in an above-ground stock drinker in Corral Canyon (WestLand Resources, Inc., 2013h).	Yes
Spikedace (<i>Meda fulgida</i>)	Does not occur within the project area. No populations are known from the Coronado National Forest. It currently occurs only in Aravaipa and Eagle Creeks, the upper Verde River and the upper Gila River in New Mexico (USFS, 2011a).	No
Sulphur-bellied Flycatcher (<i>Myiodynastes luteiventris</i>)	Known to occur within the project area in riparian zones that are dominated by an overstory of sycamore and areas with mixed deciduous habitat. Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h).	Yes
Tarahumara Frog (<i>Lithobates tarahumarae</i>)	Not thought to occur within the project area. This species was extirpated from Arizona in 1983. Was reintroduced into the Santa Rita Mountains in 2004 (USFS, 2011a).	No

Table 15. Coronado National Forest MIS and Occurrence in the Project Area

Species	Evaluation for Analysis	Further Analysis
Thick-billed Kingbird (<i>Tyrannus crassirostris</i>)	Known to occur within the project area in riparian zones that are dominated by an overstory of sycamore and areas with mixed deciduous habitat. Species was detected during 2012 avian surveys (WestLand Resources, Inc., 2013h).	Yes
Twin-spotted Rattlesnake (<i>Crotalus pricei</i>)	Not thought to occur within the project area. This species is found in the Huachuca Mountains, but at elevations ranging 6,000 to 11,000 feet in Petran Subalpine Conifer Forest and Petran montaine conifer forest communities (USFS, 2011a).	No
Western Barking Frog (<i>Craugastor augusti cactorum</i>)	May occur within the project area. Suitable habitat rock outcrops on hillsides within the Madrean evergreen woodlands at elevations ranging 5,200 to 6,200 feet are present in the project area.	Yes
White-tailed Deer (<i>Odocoileus virginianus</i>)	Likely to occur within the project area. Suitable habitat (oak and oak grassland) is present in the project area.	Yes

3.6.3 Environmental Consequences

3.6.3.1 Direct and Indirect Effects from No Action

As no ground disturbing activities or project-related vehicle use would occur because of the no action alternative, there would be no impacts on federally listed, proposed or candidate species, Forest Service sensitive, or management indicator species.

3.6.3.2 Direct and Indirect Effects from the Proposed Action

The effects analysis for all species, including migratory birds, was completed by comparing the likely presence and the extent of habitat with the activities, including the disturbance, duration of activities, and sensitivity. The amount of ground clearing disturbance was considered as a maximum of 13.90 acres. Project activities would occur for 24 hours a day, seven days a week, and the total duration of the project will last approximately 6 months. Characterization activities on any one site would be completed within two weeks. For this analysis, it was assumed that reclamation of characterization sites, except for monitoring well sites, would be completed within 2 years however, reclamation success will be defined, in part, by the establishment of native vegetation, which could take longer than two years.

The effects of light, noise, and dust are also considered in the determinations. Light may affect behavior, such as mating, migration, sleep, and foraging (International Dark-Sky Association, 2013) or foraging success. Nocturnal prey species may experience higher predation rates. Potential lighting impacts on bats include disruption in commuting behavior from roosts to foraging sites, insect behavior, and delayed emergence from roost sites (Fure, 2013).

Animals may be adversely affected by noise (Corman & Wise-Gervais, 2005): due to masking environmental cues and signals, physiological effects from stress, or behavior effects. Implementation of Forest Service Required Design Features (Section 2.3.5.1, BIO 1, BOI-2, and BOI-3) will help to minimize impacts by maintaining larger trees and agave plants and reducing harm or harassment of wildlife.

Dust generated by project activities may affect plant photosynthesis and habitat for aquatic wildlife species by dust settling on water surfaces. Dust suppression measures identified in AMI's EPMs (Section 2.3.3.1) will reduce adverse impacts from dust.

Pre-construction surveys identified in the Forest Service Required Design Features (Section 2.3.5.2, VEG 3 and VEG-4) and post-reclamation monitoring identified in AMI's EPMs (Section 2.3.4.6) will help ensure that sensitive plants are avoided and impacts are reduced.

Threatened and Endangered Species

Effects on threatened, endangered, candidate and proposed species are analyzed in detail in the Draft Biological Assessment (Tetra Tech, 2014c), the results of which are summarized in **Table 16**.

Table 16. Determination of Effects on ESA Listed, Candidate, and Proposed and Species		
Species Name	Status	Determination of Effects
Amphibians		
Huachuca/Canelo Hills treefrog /Arizona Treefrog (<i>Hyla wrightorum</i>)	Candidate	Not likely to jeopardize the continued existence. Nearest known population is 12-16 mi from action area. The project would not affect springs, stock ponds, or perennial waters. Disturbance in or near drainages is adjacent to existing roads, and has a relatively small footprint.
Chiricahua Leopard Frog (<i>Lithobates chiricahuensis</i>)	Threatened, Critical Habitat	May affect, not likely to adversely affect and no effect on critical habitat. No known individuals have been detected in the action area. The project would not affect springs, stock ponds, or perennial waters. Disturbance in or near drainages is adjacent to existing roads, and has a relatively small footprint. The project would result in no loss of habitat.
Sonora Tiger Salamander (<i>Ambystoma mavortium stebbinsi</i>)	Endangered	May affect, not likely to adversely affect. The project would not affect springs, stock ponds, or perennial waters. Disturbance in or near drainages is adjacent to existing roads, and has a relatively small footprint. The project would result in no loss of habitat.
Birds		
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	Threatened, Critical Habitat	May affect, not likely to adversely affect the species, and would have no effect on designated critical habitat. Preferable Mexican spotted owl nesting, roosting, and foraging habitat is available external to the project area. The three Protected Activity Centers are more than 0.5 miles from the project area.
(Western) Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	Candidate	Not likely to jeopardize the continued existence. The project will avoid removing trees whenever possible and will not remove any trees greater than or equal to 12" dbh. All ground disturbing activities will maintain a 15-foot setback from the active stream bank which would limit the impacts to potential breeding habitat. The drilling operations are expected to take six months to complete so impacts to breeding behavior would not exceed one breeding season.
Fish		
Gila Topminnow (<i>Poeciliopsis occidentalis occidentalis</i>)	Endangered	May affect, not likely to adversely affect. The project would not affect springs, stock ponds, or perennial waters. The nearest known population of Gila topminnow is downstream from the action area.
Invertebrates		
Huachuca Springsnail	Candidate	Not likely to jeopardize the continued existence. No known

Table 16. Determination of Effects on ESA Listed, Candidate, and Proposed and Species		
Species Name	Status	Determination of Effects
<i>(Pyrgulopsis thompsoni)</i>		individuals have been detected in the project area. Negligible habitat loss due to relatively small footprint.
Mammals		
Jaguar <i>(Panthera onca)</i>	Endangered	May affect, not likely to adversely affect and would not result in adverse modification or destruction of proposed critical habitat. The project would impact small, localized areas of habitat, but will not impact large tracts that would impede jaguar movement or result in long-term fragmentation.
Lesser Long-nosed Bat <i>(Leptonycteris curasoae yerbabuenae)</i>	Endangered	May affect, not likely to adversely affect. No maternity roost sites are known to occur in the area and no known roosts would be disturbed. The project will not impact inactive mine features, including adits, shafts, and test pits, in and near the action area. No individuals were documented during bat surveys conducted in the area in 2012, and there is low density of agave, making it unlikely that this bat forages in large numbers in the action area.
Ocelot <i>(Leopardus pardalis)</i>	Endangered	May affect, not likely to adversely affect. Ocelots have not been recorded in the Patagonia Mountains: all recent observations in Arizona have been of individuals in the Huachuca Mountains, approximately 15 mi away. The project would impact small, localized areas of habitat, but will not impact large tracts that would impede ocelot movement, nor result in long-term fragmentation.
Reptiles		
Northern Mexican Gartersnake <i>(Thamnophis eques megalops)</i>	Proposed Threatened	Not likely to jeopardize the continued existence. The project would not affect springs, stock ponds, or perennial waters. Disturbance proposed in or near drainages is located adjacent to existing roads, and has a relatively small footprint.
Plants		
Huachuca Water Umbel <i>(Lilaeopsis schaffneriana ssp. recurva)</i>	Endangered, Critical Habitat	The project would have no effect . Species was not detected during baseline surveys, and the nearest known population is 12 miles from the action area. The project would not affect springs, stock ponds, or perennial waters.

1 (USFWS, 2013).

Forest Service Sensitive Species and Migratory Birds

The effects on sensitive species are analyzed in detail in the Draft Biological Evaluation (Tetra Tech, 2014b). The determinations of effects on Forest Service Sensitive species are shown below. Due to their listing status, Huachuca/Canelo Hills Treefrog (Arizona Treefrog), western yellow-billed cuckoo, Huachuca springsnail, and northern Mexican gartersnake are discussed in **Table 14**. The determinations are based on limited extent of potential habitat affected and the short-term nature of the project. For all of the species listed in 3.6.2.2 except bald eagles, the project may impact individuals, but is not likely to result in a loss of viability in the area, nor cause a trend toward federal listing. Because they are not likely to occur in the project area, bald eagles would not be affected by the project.

The proposed action would not result in population-level impacts to migratory birds.